Appendix 9.1A
2011-2012 Environmental Health Baseline Report

Blackwater Gold Project

2011-2012 Environmental Health Baseline Report

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TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

ACRONYMS

Abbreviations, and Units of Measure	Definition
%	percent
µg/g	micrograms per gram
µg/m^3	micrograms per cubic metre
µm	micrometre
AAQO	Ambient Air Quality Objectives
ADD	Average Daily Dose
AF	soil adherence factor – dermal
AIR	Application Information Requirements
Application/EIS (the)	Application for an Environmental Assessment Certificate/Environmental Impact Statement
AT	averaging time
ATSDR	Agency of Toxic Substances and Disease Registry
BC	British Columbia
BC *CSR*	British Columbia *Contaminated Sites Regulation*
BC EAO	British Columbia Environmental Assessment Office
BC *EMA*	British Columbia *Environmental Management Act*
BC MELP	British Columbia Ministry of Environment, Lands and Parks
BC MOE	British Columbia Ministry of Environment
BC MWLAP	British Columbia Ministry of Water, Land and Air Pollution
BW	body weight
CAC	criteria air contaminant
CalEPA	California Environmental Protection Agency
CCME	Canadian Council of Ministers of the Environment
CEQG	Canadian Environmental Quality Guidelines
C_F	chemical concentration in food
CF	conversion factor
C_{fish}	concentration of contaminant in fish
CH_4	methane
$C_{invertebrates}$	concentration of contaminant in soil invertebrates
$C_{lg\ mammal}$	concentration of contaminant in large mammal
cm	centimetre
cm^2	square centimetres
CO	carbon monoxide
CO_2	carbon dioxide

Abbreviations, and Units of Measure	Definition
COPC	Chemical of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
C_{plant}	concentration of contaminant in plant tissue
C_s	chemical concentration in soil
$C_{sm\ mammal}$	concentration of contaminant in small mammal
C_{soil}	concentration of contaminant in soil
C_{sw}	chemical concentration in surface water
EA	Environmental Assessment
EC	Environment Canada
EC_{50}	effective concentration to induce a 50% effect
Eco-SSL	Ecological Soil Screening Level
ED	Exposure Days
EDI	Estimated Daily Intake
EPC	Exposure Point Concentration
ER	Exposure Ratio
ERA	Environmental Review Assessment
ET	Exposure Time (in hours per day)
F	fraction from site
FAS	fraction absorbed from site
FSR	Forest Service Road
g/d	grams per day
HC	Health Canada
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
ILCR	Incremental Lifetime Cancer Risk
IR	ingestion or inhalation rate
IR_{fish}	fish ingestion rate
$IR_{invertebrates}$	soil invertebrates ingestion rate
IRIS	Integrated Risk Information System
$IR_{lg\ mammal}$	large mammal ingestion rate
IR_{plant}	plant tissue ingestion rate
$IR_{sm\ mammal}$	small mammal ingestion rate
IR_{soil}	soil ingestion rate
IR_{sw}	surface water ingestion rate
ISQG	Interim Sediment Quality Guidelines

Abbreviations, and Units of Measure	Definition
kg	kilogram
kg/d	kilograms per day
kg/m^3	kilograms per cubic metres
kg/mg	kilograms per milligram
km	kilometre
L/d	litres per day
LOAEC	Lowest Observable Adverse Effect Concentration
LOAEL	Lowest Observable Adverse Effect Level
LSA	Local Study Area
m	metre
m^3/d	cubic metres per day
m^3/h	cubic metres per hour
MDL	method detection limit
mg/cm^2	milligrams per square centimetre
mg/d	milligrams per day
mg/kg	milligrams per kilogram
mg/kg/d	milligrams per kilogram body weight per day
mg/L	milligrams per litre
n/a	not available/applicable
NAAQO	National Ambient Air Quality Objectives
NAPS	National Air Pollution Surveillance
NO_2	nitrogen dioxide
NOAEL	No Observable Adverse Effect Level
$NOAEL_t$	NOAEL for a mammalian test species
$NOAEL_w$	NOAEL for a mammalian wildlife test species
NOx	nitrogen oxide
NRC	National Research Council
NRCC	National Research Council of Canada
NTLU	Non-Traditional Land Use
PAH	polycyclic hydrocarbon
PAH Consulting	Pincock, Allen and Holt
P_{air}	particulate concentration in air
PEL	Probable Effects Level
PIRI	Partnership in Risk Based Corrective Action Implementation
PM	particulate matter

Abbreviations, and Units of Measure	Definition
$PM_{2.5}$	particulate matter no greater than 2.5 micrometres in aerodynamic diameter
ppm	parts per million
PQRA	Preliminary Quantitative Risk Assessment
PRG	Preliminary Remediation Goal
proponent (the)	New Gold Inc.
Project (the)	Proposed Blackwater Gold Project
RAF	Relative Absorption Factor
RAF_D	Relative Absorption Factor – dermal
RAF_I	relative absorption factor – inhalation
RAF_O	relative absorption factor – oral
RAIS	Risk Assessment Information System
RfC	Reference Concentration
RfD	Reference Dose
RSA	Regional Study Area
SA	skin surface area
SARA	*Species at Risk Act*
SLERA	Screening Level Ecological Risk Assessment
SO_2	sulphur dioxide
SOx	sulphur oxide
SQG	Soil Quality Guidelines
SQG_E	Soil Quality Guidelines Ecological
SQG_{HH}	Soil Quality Guidelines Human Health
t/h	tonnes per hour
TCEQ	Texas Commission on Environmental Quality
TDI	Tolerable Daily Intake
TLU	Traditional Land Use
TRV	Toxicological Reference Value
US EPA	United States Environmental Protection Agency
VC	Valued Component
VOC	volatile organic compound
WHO	World Health Organization

EXECUTIVE SUMMARY

This Environmental Health Baseline Report provides the information needed to facilitate evaluation of the human and ecological health risks associated with the proposed Blackwater Gold Project (the Project). This report describes the Preliminary Quantitative Risk Assessment (PQRA) process used to evaluate human health, and the Screening Level Ecological Risk Assessment (SLERA) methods for evaluating ecological health, in anticipation of determining the potential effects that may arise from the Project.

Risk assessment methods are used to develop a comprehensive understanding of the source of Chemicals of Potential Concern (COPCs), their release mechanisms, their fate and transport mechanisms once released to the environment, and the methods by which sensitive receptors might be exposed. Conceptually, PQRA and SLERA procedures both consist of the same four main steps:

- *Problem formulation*: the three key elements of risk (receptors, COPCs, and exposure pathways) were identified to qualitatively determine whether or not a potential risk exists at the site;
- *Toxicity assessment*: dose-response information for each COPC was reviewed, and the acceptable doses each receptor may receive without experiencing adverse health effects were estimated;
- *Exposure assessment*: the potential exposure dose of each COPC that each receptor could receive from each complete exposure pathway was estimated. An exposure dose is a function of the COPC concentration in various environmental media, biological and behavioural characteristics of the receptor, and chemical-specific parameters that influence COPC absorption; and
- *Risk characterization*: the results of the toxicity assessment were integrated with the results of the exposure assessment to provide a quantitative assessment of health risk.

The PQRA and SLERA address potential risks to human and ecological receptors present at the Project through relevant exposure pathways resulting from potential exposure to identified impacts on soil, surface water, and country foods, based on available historical and current site data. Based on the findings of this risk assessment, conclusions were made about the potential risk to human health and ecological receptors.

<u>Human Health Risk Assessment</u>

A conservative approach was taken in determining the primary exposure scenarios of concern for the Project's PQRA.

The exposure scenario assessed for non-carcinogenic chemicals involved an Aboriginal toddler accompanying an adult who spent all his time in the region engaged in traditional harvesting of country foods (i.e., hunting or fishing) or recreational activities (i.e., hiking) within the study areas of the Project. The toddler could potentially be exposed to background concentrations of COPCs via direct contact with soil, inhalation of dust, or ingestion of soil, surface water, vegetation, wild game, or fish. Similarly, the assessment of carcinogenic chemicals focused on an Aboriginal adult who spends the same amount of time in the study areas and also engages in traditional activities. He/she could also potentially be exposed to background concentrations of COPCs via direct contact with soil, inhalation of dust, or ingestion of soil, surface water, wild game, or fish.

Chemical screening identified the following COPCs as requiring further assessment in the PQRA:

- Aluminum;
- Arsenic;
- Cadmium; and
- Molybdenum.

The findings of the PQRA are as follows:

- Maximum baseline concentrations for arsenic and molybdenum exceeded human health criteria in soil, while maximum baseline concentrations for aluminum, arsenic, and cadmium exceeded human health criteria in surface water;
- The average values of the selected background levels were accepted as the Project baseline concentrations. Hazard quotients (HQs) were calculated by dividing the average concentration by each parameter's respective toxicological reference value (TRV). HQ values were noted to be below 1 for all criteria air contaminants (CACs);
- The HQs calculated for aluminum, cadmium, and molybdenum are noted to be below Health Canada (HC's) target risk of 0.2 for the toddler receptor, suggesting that adverse health effects would not likely occur;
- Arsenic is noted to be above HC's target risk of 0.2 for the toddler receptor. The exposure pathways responsible for the exceedance for the non-carcinogenic receptor are soil ingestion, surface water ingestion, and fish ingestion. Additionally, it should be noted that uncertainties exist in the risk assessment process, both in the derivation of TRVs, as well as the exposure assessment assumptions (i.e., consumption rates). Actual exposures are likely to be substantially lower than those presented in this assessment; and
- The risk estimate for arsenic is noted to be above HC's target risk level of 1.0×10^{-5} for the adult receptor. The main exposure pathways responsible for the exceedance

for the carcinogenic receptor are noted to be surface water ingestion and fish ingestion. Furthermore, it should be noted that uncertainties exist in the risk assessment process, both in the derivation of TRVs as well as the exposure assessment assumptions (i.e., consumption rates). Actual exposures are likely to be substantially lower than those presented in this assessment.

Ecological Risk Assessment

This report also presents a SLERA of potential adverse effects from COPCs on Valued Components (VCs). The SLERA used both historical and current sampling data, and is consistent with the methodology recommended by Environment Canada (EC) and the Canadian Council of Ministers of the Environment (CCME) (1996, 1997a) for conducting SLERAs. For the purposes of presentation of baseline information, terrestrial ecological receptors of primary concern selected for the SLERA were large mammals (e.g., grizzly bear, caribou), small mammals (e.g., marten, hare, and shrew), birds (e.g., raptors, songbirds, waterfowl), amphibians (e.g., western toad), fish (e.g., rainbow trout), terrestrial and aquatic plants, and soil and aquatic invertebrates. These ecological receptors may be potentially exposed to background concentrations of COPCs in direct contact with soil and ingestion of soil, surface water, and food items.

Based on the screening conducted for soil, the maximum baseline concentrations for arsenic and molybdenum exceeded their respective ecological guidelines, and were carried forward as COPCs in soil for this baseline Environmental Review Assessment (ERA). The remaining COPCs found in soil were below their respective ecological guidelines and were not considered an ecological concern.

Based on the screening for surface water, the maximum concentrations for aluminum, arsenic, cadmium, chromium, copper, lead, vanadium, and zinc exceeded criteria. The remaining COPCs found in surface water were below their respective guidelines and were not considered an ecological concern.

In addition, the screening conducted for sediment concentrations identified arsenic, cadmium, chromium, copper, lead, mercury, and zinc compounds as COPCs in sediment, and were carried forward in the ERA. The remaining COPCs found in sediments were not considered an ecological concern in the assessment.

The findings of the SLERA are as follows:

- Maximum baseline concentrations for arsenic and molybdenum exceed ecological soil criteria for mammals. Additionally, maximum baseline concentrations for arsenic and zinc exceed surface water criteria for mammals. Following risk assessment modelling, exposure ratios (ERs) for molybdenum are noted to be above 1.0 for grizzly bear, caribou, and hare, while the remaining ERs are below 1.0. It should be noted that ERs greater than 1.0 do not indicate adverse effects are certain. The main driver of risk for mammals is likely due to the high background concentrations of molybdenum in the soil within the study areas of the Project and the particularly conservative TRVs used in the SLERA;

- For birds, maximum baseline concentrations for arsenic, molybdenum, and zinc exceed their respective soil and surface water criteria. Furthermore, maximum baseline concentrations for arsenic, cadmium, chromium, copper, lead, mercury, and zinc exceed their respective sediment criteria. Following risk assessment modelling, exposure ratios for zinc are noted to be greater than 1.0 for the olive-sided flycatcher and the ring-necked duck. It should be noted that ERs greater than 1.0 do not indicate adverse effects are certain. The main driver of risk for the birds is believed to be the high background concentrations of zinc in surface water and the highly conservative TRVs used in the SLERA. The ERs for the remaining COPCs are below 1.0;
- Amphibians near the Project are not expected to be exposed continuously to the maximum or the 95th percentile (i.e., conservative exposure) of baseline concentrations of arsenic and molybdenum in soil. Available toxicological literature on amphibians focuses mainly on organic compounds (e.g., pesticides and fertilizers) affecting early life stages (i.e., eggs and tadpoles). It should be noted that baseline background conditions within the study areas of the Project are not influenced by human activity. During the environmental survey, no visual observations indicated that amphibians were adversely affected by their environment. Given that the metals assessed are not 100% bioavailable, and in the absence of any acceptable TRVs, it is not possible to conclude that unacceptable health risks from arsenic and molybdenum in soil are expected for this receptor;
- For freshwater aquatic organisms, maximum baseline concentrations exceed criteria for aluminum, arsenic, cadmium, chromium, copper, lead, vanadium, and zinc. Exposure ratios are noted to be greater than 1.0 for zinc in fish and aquatic plants, and greater than 1.0 for copper in aquatic invertebrates and aquatic plants. It should be noted that ERs greater than 1.0 do not indicate adverse effects are certain. The main driver of risk is believed to be the high background concentrations of copper and zinc in surface water and their conservative TRVs. The ERs for the remaining COPCs are below one for freshwater aquatic organisms; and
- For terrestrial plants and soil invertebrates, the maximum baseline concentrations for arsenic and molybdenum exceed soil criteria. The ERs for both COPCs are noted to be above 1.0 for both receptors. The main driver of risks is believed to be the high background concentrations of both arsenic and molybdenum in soil. However, as discussed previously, an ER greater than 1.0 does not indicate adverse effects are certain.

1.0 INTRODUCTION

This Environmental Health Baseline Report provides the information needed to facilitate evaluation of the human and ecological health risks associated with the current background conditions for the proposed Blackwater Gold Project (the Project). This report describes the Preliminary Quantitative Risk Assessment (PQRA) process used to evaluate human health, and the Screening Level Ecological Risk Assessment (SLERA) method for evaluating ecological health, in anticipation of determining the potential effects that may arise from the Project. Using available historical and current site data, the PQRA and SLERA address potential risks to human and ecological receptors present at, and within the study areas of (as defined in Section 1.1.1), the Project. Relevant exposure pathways are identified based on the relationships between potential exposures and identified effects (e.g., inhalation exposures and chronic pulmonary obstruction diseases).

The Environmental Health Risk Assessment (EHRA) involves a process of cataloguing, assessing, combining, and evaluating biophysical information collected from the environment. Based on this information, the potential health effects of current background conditions will be determined for the various exposure pathways of readily bioavailable chemicals on biological systems or receptors that may come in contact with soil, air, water, or food. The risk assessment required consideration of both the toxic properties of COPCs and the levels of exposure to background concentrations.

This environmental health baseline report provides the biophysical information necessary to assess the potential risks to human and ecological health in the absence of the Project, and provides a context for the assessment of future risks should the Project become operational. This report describes the details of a human health PQRA and a SLERA associated with current background conditions of the Project. The degree of potential human health risk posed by background concentrations of chemicals from a subject site was generally quantified through prescribed methods and assumptions about the behaviour and activities of the human receptors. Consistent methods and conservative assumptions ensure exposures and risks were not underestimated (HC, 2010a).

The SLERA is a formal set of scientific methods for estimating the probabilities and magnitudes of undesired effects on plants, animals, and ecosystems resulting from events in the environment, including the release of pollutants, physical modifications of the environment, and natural disasters (Fava et al., 1987). More detailed discussions of PQRA and SLERA methods, results, and findings are presented in the sections below.

The report first presents the baseline biophysical information of the Local Study Area (LSA) and Regional Study Area (RSA) surrounding the Project. After providing a descriptive overview of the LSA and RSA surrounding the Project, the report then describes the methods and information sources used for evaluation of the current baseline human health conditions. COPCs are identified and screening methods are described, with evaluations for human exposure and toxicity and risks characterized, followed by an uncertainty analysis conducted for toxicity and exposure assessments.

The report then evaluates the ecological risks, listing all COPCs, and describes the screening activities completed for soil, surface water, and sediments. Environmental exposure pathways are identified and the potential receptors are then presented, including mammals, birds, amphibians, fish, soil and aquatic invertebrates, and terrestrial and aquatic plants that coexist in the ecosystem. Exposure and toxicity assessments are also provided for mammals, birds, amphibians, fish, aquatic invertebrates, aquatic and terrestrial plants, and soil invertebrates. The report concludes with an evaluation of the level of certainty of this SLERA, and offers a summary and the conclusions reached for the baseline environmental health of the Project.

1.1 Spatial Boundaries

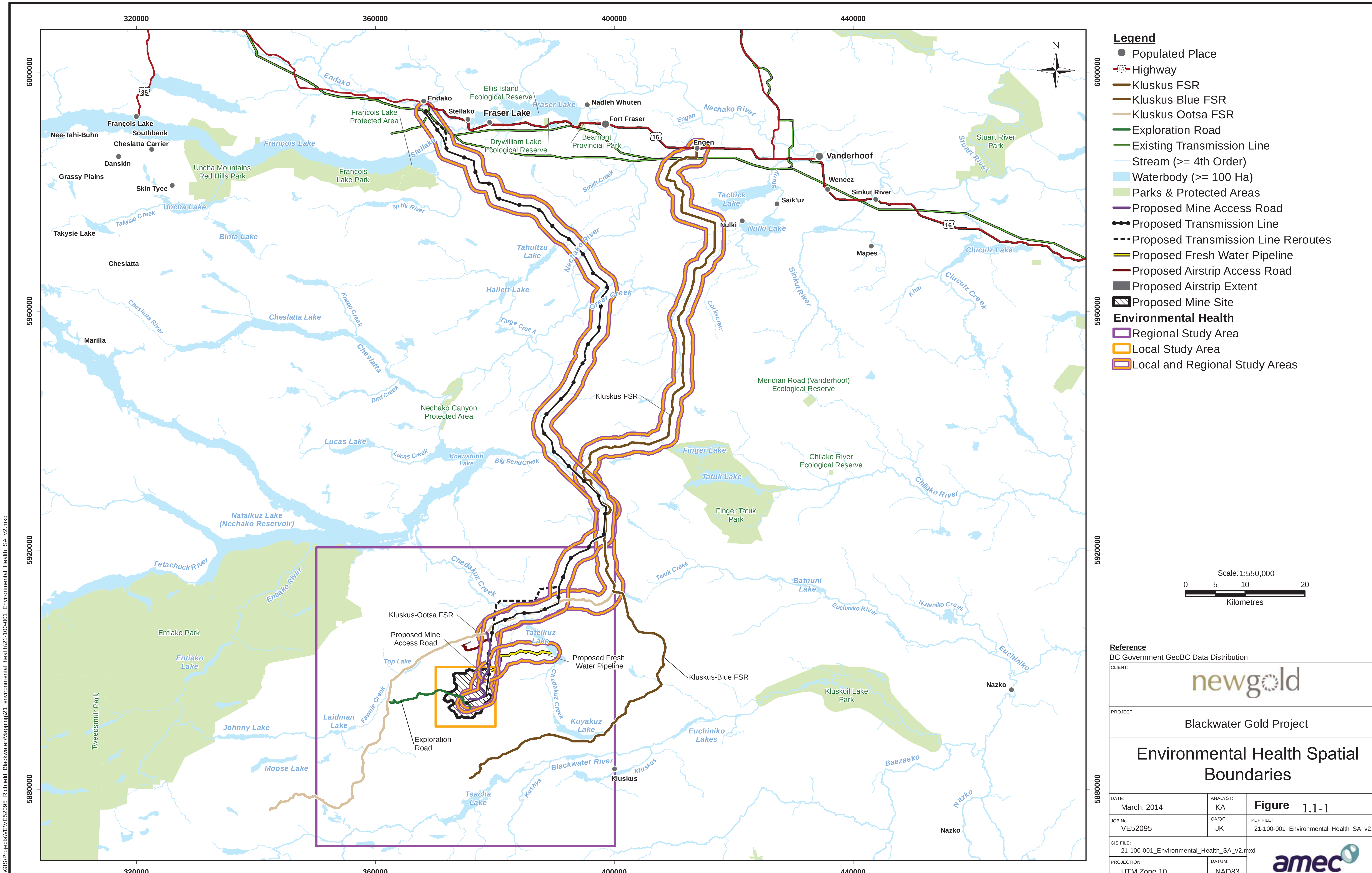
Spatial boundaries used to prepare this baseline report were consistent with those used to conduct the Environmental Assessment (EA) for the Project.

The boundaries were defined in order to consider the extent of terrestrial and freshwater aquatic ecosystems and applicable resources that may potentially be affected by the Project. Maps outlining the spatial extent of the Project footprint, LSA, and RSA are provided in **Figure 1.1-1**. The environmental health LSA for the mine site has been determined to be the same as the air quality LSA (Section 5), and has been defined as a 10 kilometre (km) x 10 km area centred on the Project property encompassing the zone of potential direct effects specific to the Project. The environmental health RSA for the mine site has also been defined as the same as the air quality RSA (Section 5). This is a 50 km x 50 km area centred on the proposed mine property.

The proposed mine site is readily accessible by vehicle from the network of Forest Service Roads (FSR) originating at the community of Engen, approximately 20 km west of Vanderhoof, off Highway 16 (**Figure 1.1-1**). The existing access road to the Project makes use of the Kluskus FSR for 103 km, and continues on the Ootsa FSR for an additional 43 km, to reach the 18 km-long current and existing exploration road. A proposed new 15 km exploration road will be built to enable continued exploration activities, and will connect with the Ootsa FSR. This new exploration road would become the mine access road for the Project. The study areas for this assessment will also include a 1 km wide area on either side of the mine access road, originating at the community of Engen and continuing on the Kluskus-Ootsa FSRs. This description of the study area for the proposed mine access road is consistent with the study area described in Section 5.

The Project will require the construction of a 133 km long transmission line to provide power to the mine site. The proposed line will originate south of the community of Endako, and will include crossings at several watersheds before reaching the Project mine site. For this assessment, a 1 km wide study area on either side of the proposed transmission line right-of-way will be used (**Figure 1.1-1**). This description of the study area for the transmission line is consistent with the study area described in Section 5.

The mine access road and proposed transmission line are both recognized as relevant study areas in the construction and operational stages of the Project. However, the focus of this baseline PQRA and SLERA will be directed towards the current conditions of the study areas surrounding the footprint of the proposed mine site.



Legend
Populated Place
Highway
Kluskus FSR
Kluskus Blue FSR
Kluskus Ootsa FSR
Exploration Road
Existing Transmission Line
Stream (>= 4th Order)
Waterbody (>= 100 Ha)
Parks & Protected Areas
Proposed Mine Access Road
Proposed Transmission Line
Proposed Transmission Line Reroutes
Proposed Fresh Water Pipeline
Proposed Airstrip Access Road
Proposed Airstrip Extent
Proposed Mine Site
Environmental Health
Regional Study Area
Local Study Area
Local and Regional Study Areas
Scale: 1:550,000
0 5 10 20
Kilometres
N
320000
360000
400000
440000
6000000
5960000
5920000
5880000
Endako
Stellako
Fraser Lake
Nadleh Whuten
Fort Fraser
Engen
Vanderhoof
Weneez
Sinkut River
Saik'uz
Nulki
Mapes
François Lake
Southbank
Nee-Tahi-Buhn
Cheslatta Carrier
Danskin
Grassy Plains
Skin Tyee
Takysie Lake
Cheslatta
Marilla
Nazko
Kluskus
Ellis Island Ecological Reserve
Francois Lake Protected Area
Drywilliam Lake Ecological Reserve
Beaumont Provincial Park
Uncha Mountains Red Hills Park
Francois Lake Park
Stuart River Park
Nechako Canyon Protected Area
Meridian Road (Vanderhoof) Ecological Reserve
Chilako River Ecological Reserve
Finger Tatuk Park
Kluskoil Lake Park
Entiako Park
Tweedsmuir Park
Kluskus FSR
Kluskus-Ootsa FSR
Proposed Mine Access Road
Proposed Fresh Water Pipeline
Kluskus-Blue FSR
Exploration Road
Natalkuz Lake (Nechako Reservoir)
Reference
BC Government GeoBC Data Distribution
CLIENT:
newgold
PROJECT:
Blackwater Gold Project
Environmental Health Spatial Boundaries
DATE: March, 2014
ANALYST: KA
Figure 1.1-1
JOB No: VE52095
QA/QC: JK
PDF FILE: 21-100-001_Environmental_Health_SA_v2.pdf
GIS FILE: 21-100-001_Environmental_Health_SA_v2.mxd
PROJECTION: UTM Zone 10
DATUM: NAD83
amec

2.0 METHODS AND SOURCES

Risk assessment methods were used to develop a comprehensive understanding of the source of COPCs, their release mechanisms, their fate and transport mechanisms after released to the environment, and the methods by which sensitive receptors might be exposed.

2.1 Methods

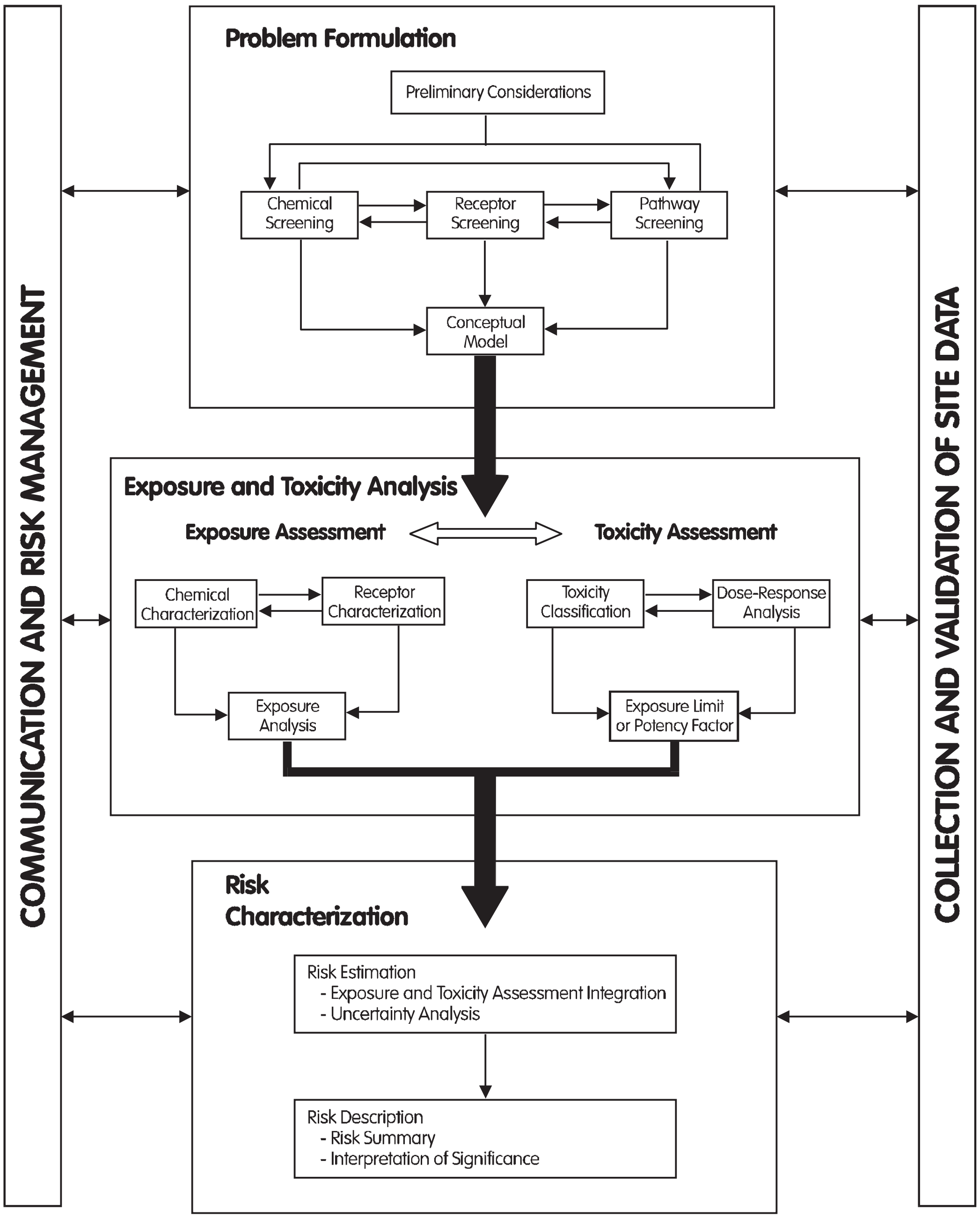
Conceptually, PQRA and SLERA procedures both consisted of the same four main steps:

- *Problem formulation*: the three key elements of risk (i.e., receptors, COPCs, and exposure pathways) were identified to qualitatively determine whether or not a potential risk exists at the site;
- *Toxicity assessment*: dose-response information for each COPC was reviewed, and the doses a receptor may hypothetically receive without experiencing adverse health effects were estimated;
- *Exposure assessment*: the potential dose of the COPC that a receptor may receive from each complete exposure pathway was estimated. The dose was a function of the COPC concentration in various environmental media, biological and life characteristics of the receptor, and chemical-specific parameters that influence COPC behaviour in the environment; and
- *Risk characterization*: the results of the toxicity assessment were integrated with the results of the exposure assessment to provide a quantitative assessment of health risk.

This shared risk assessment approach is further illustrated in **Figure 2.1-1**. According to this framework, the risk assessment progressed from a more qualitative first phase (problem formulation), through exposure and toxicity analysis, and culminated in a final quantitative risk characterization. Based on the risk characterization, baseline human and/or ecological health can then be assessed based on the magnitude of the predicted risk, the degree of uncertainty, and the potential consequences to environmental health.

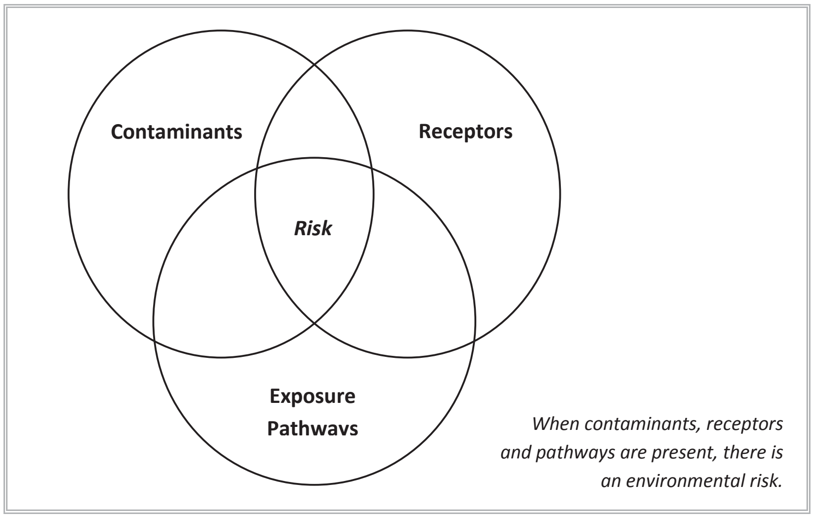
The problem formulation step of a risk assessment involves identifying the three key elements of risk: COPCs, receptors, and exposure pathways by which a receptor could be exposed to background concentrations of COPCs. If any one of these three key elements of risk was missing, there can be no risk. **Figure 2.1-2** illustrates the basis for environmental risks.

The PQRA and SLERA evaluated each of these factors in order to determine the degree of overlap (i.e., risk) associated with the exposures to COPCs.



Source: HC 2010c

Figure 2.1-1: Risk Assessment Framework



Source: HC 2010a

Figure 2.1-2: Basis for Environmental Risks

Uncertainty is an inherent aspect of the risk assessment process, as it involves assumptions regarding the Project, human and ecological receptors, and mathematical modelling. Uncertainties arise in a number of areas due to an inherent lack of precision about the true value of a parameter (e.g., body weight, inhalation rate). In most instances, uncertainties are addressed by assuming conservative scenario values that serve to exaggerate exposures, in order to ensure that risks are overestimated rather than underestimated.

2.2 Information Sources

Environmental risk "is the chance that human health or the environment will suffer harm as the result of the presence of environmental hazards" (United States Environmental Protection Agency (US EPA), 1985a).

According to the British Columbia Ministry of Environment's (BC MOE) "*Quantitative Human Health Risk Assessment* – Phase 1 Review of Methods and Framework Recommendation" (BC MOE, 1993), Human Health Risk Assessment (HHRA) is defined as:

- The process whereby all available scientific information is brought together to produce a description of the nature and magnitude of the risk associated with exposure of human receptors to an environmental chemical. This information includes:
  - Identification of chemicals present in the environment;
  - Toxicity assessment: an evaluation of the types of toxicity that the chemical can produce and an evaluation of the conditions of exposure—dose and duration—under which the chemical's toxicity can be produced;

- o Exposure assessment: an identification of the conditions—dose, timing and duration—under which the population whose risk is being evaluated is or could be exposed to the chemical; and
- o Risk characterization: an estimation of the risk and uncertainty in that risk; (BC MOE, 1993).

The approach adopted in evaluating the potential risks to human health of the Project was consistent with the PQRA approach recommended by HC (2010a), which has established a four-step paradigm for conducting health-based risk assessments. This paradigm has also been adopted by Canadian federal and provincial health and environmental agencies (e.g., BC MOE, Atlantic Partnership in Risk Based Corrective Action Implementation (PIRI), and the Ontario Ministry of the Environment).

SLERAs were typically conducted using an iterative approach involving increasingly stringent tiers of evaluation. The SLERA for the Project was completed according to the "Recommended Guidance and Checklist for Tier 1 Ecological Risk Assessment of Contaminated Sites in British Columbia" (BC Ministry of Environment, Lands and Parks (BC MELP), 1998), and the Canadian Council of Ministers of the Environment's (CCME) "A Framework for Ecological Risk Assessment" (CCME, 1997a). BC MELP (1998) defines SLERAs as the determination of the probability of an effect occurring to an ecological system.

2.3 Methods for Data Collection and Data Analysis

The selection of COPCs and receptors was based entirely on baseline data collected from other biophysical disciplines, including:

- Hydrology, surface water, and sediment quality;
- Air quality;
- Freshwater aquatics;
- Terrestrial environment;
- Wildlife environment; and
- Human health.

Environmental health assessment involves integrating information from each of the disciplines outlined above, given this; a conservative scenario risk assessment was completed. Methods for data collection and analysis and sampling locations, along with sample figures, are further described in the aforementioned discipline sections. A summary of the data from each discipline used for this Environmental Health assessment is provided in **Appendix 1**. Risks were assessed using the most conservative information available from each of the disciplines. If risks were acceptable for the conservative scenario, then risks for all other lesser exposure scenarios would also be acceptable.

3.0 RESULTS/DISCUSSION

3.1 Human Health Preliminary Quantitative Risk Assessment

3.1.1 Problem Formulation

The first step of the baseline risk assessment (i.e., problem formulation) is to evaluate whether a particular chemical is currently present at levels that could pose a potential unacceptable risk to human health. Considerations included the fate and behaviour of the chemicals in the environment, and the toxicity based on various sources of exposure (i.e., air, water, soil, and food) and routes of exposure (i.e., inhalation, ingestion, and dermal) to the human receptor. In addition, the problem formulation evaluates which exposure pathways are operational, leading to direct or indirect exposure to sensitive receptors. For example, if a chemical is considered toxic, the risk may still remain negligible if the concentration of the chemical in the source media is low, or there is no possibility that a receptor can be exposed to the chemical. The problem formulation step involves three key elements:

- *Chemical characterization:* screening and identification of the background concentrations of COPCs;
- *Identification of potential receptors:* identification of persons that may be affected by chemical exposures originating from the Project, with special attention directed at sensitive or susceptible individuals (e.g., infants and young children, the elderly); and
- *Identification of exposure pathways:* determination of potential routes of exposure, taking into account the properties of the chemical, its manner of release, and its behaviour in the environment.

3.1.1.1 Screening and Identification of COPCs

Risk-based guidelines were established by regulatory agencies to be conservative so that they would be protective of human health and the environment. They provide confidence that if the guidelines are not exceeded, the risks would be acceptable for both human and ecological receptors, regardless of the exposure scenario. The level of detail of the risk assessment adopted for a particular situation should be equal to the degree and extent of potential effects to human receptors, and may progress to a more detailed assessment where evidence indicates that adverse effects may likely occur.

If the maximum baseline concentration of a chemical in soil and/or surface water was less than its respective human health-screening criterion, it was excluded as a COPC for this assessment.

If the maximum baseline concentration of a chemical in soil and/or surface water was greater than its respective human health-screening criterion, it was included as a COPC for this assessment. The conservatism of each screening guideline was such that an exceedance does not necessarily mean there was an unacceptable risk; rather, an exceedance simply served to identify the chemical as being of potential concern so that risks might be quantitatively assessed.

Screening and identification of COPCs was completed by comparing maximum soil and surface water concentrations to human health-based soil and water quality guidelines. In total, 18 metals were included in the COPC screening procedure. Not all essential nutrients such as calcium, magnesium, potassium, and sodium were evaluated further. The results of the COPC screening procedure are summarized in **Table 3.1-1**, and each metal included in the COPC screening procedure is discussed sequentially in the subsections that follow. A summary of all available soil and surface water data used in this assessment is provided in **Appendix 1**. It is important to note that each of the COPCs retained in the risk assessment are naturally occurring elements. Elements can be neither created nor destroyed, and human activities only serve to redistribute these naturally present metals, some of which have naturally high baseline concentrations.

3.1.1.2 Screening and Identification of COPCs in Soil

For the purposes of identifying COPCs, soil chemistry data collected at specific locations within the study areas of the proposed mine site were compiled and evaluated using the following federal and provincial regulatory guidelines:

- British Columbia *Contaminated Sites Regulation (*BC *CSR)* (Government of British Columbia (BC), 1996) of the BC *Environmental Management Act (*BC *EMA)* (Government of BC, 2003), Schedule 4: Generic Numerical Soil Standards (for urban park);
- Canadian Environmental Quality Guidelines (CEQG): “Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health” (CCME, 2007), assuming a residential/parkland land use. According to HC (2010a, b, c) guidance documents, residential/parkland is the only land use category that would be considered applicable to the Project; and
- For the Soil Quality Guidelines (SQG), the CCME developed both SQG Human Health (SQG_{HH}) and SQG Ecological (SQG_{E}) values based on various exposure pathways, and selected the lower of the two values as the final SQG. As the PQRA is restricted to the evaluation of human receptors, reported concentrations were compared to the SQG_{HH} component values, where possible, for the purposes of selecting final COPCs in soil for the Project.

In the absence of a BC *CSR* guideline for a specific chemical, the maximum concentrations were screened against the CCME guidelines, assuming a residential/park land use. These standards were developed to be protective of both environmental and human health.

Table 3.1-1: Screening of Chemicals of Potential Concern in Soil and Surface Water

	Soil (mg/kg)			Surface Water (mg/L)			
		Screening Guideline			Screening Guideline		
Metal COPC	Maximum Concentration[a]	CCME[b]	Government of BC[c]	Maximum Concentration[d]	Health Canada[e]	Government of BC[f, g, h]	Adjusted US EPA (RSLs)[i]
Aluminum	n/a	n/a	n/a	3.16	0.2 (dissolved)	0.2 (dissolved)[f]	3.2
Antimony	0.25	20	20	0.00089	0.006	n/a	n/a
Arsenic	80.8	12	n/a	0.029	0.01	0.025[g]	n/a
Barium	152.0	500	n/a	0.092	1	n/a	0.62
Beryllium	1.7	4	4	0.0026	n/a	0.004	0.0062
Cadmium	2.0	10	n/a	0.0053	0.005	n/a	n/a
Chromium	27.4	64	n/a	0.025	0.05	n/a	n/a
Cobalt	15.7	50	50	0.003	n/a	n/a	0.15
Copper	34.1	63	n/a	0.15	1	0.5[f]	n/a
Lead	29.6	140	n/a	0.0108	0.01	0.05[f]	n/a
Mercury	0.25	6.6	n/a	0.00002	0.001	0.001[f]	n/a
Molybdenum	14.8	10	10	0.0075	n/a	0.25[f]	0.016
Nickel	15.7	50	100	0.0057	n/a	n/a	0.062
Selenium	0.25	1	3	0.0009	0.01	0.01[f]	0.016
Silver	0.70	20	20	0.00009	n/a	n/a	0.016
Thallium	11.8	1	n/a	0.0001	n/a	0.002[h]	n/a
Vanadium	72.4	130	200	0.0069	n/a	n/a	0.028
Zinc	114.0	200	n/a	4.7	5	5[f]	n/a

Notes: [a]Maximum soil concentrations. Baseline soil concentrations provided by AMEC Soil Quality and Vegetation Group); [b]Canadian Environmental Quality Guidelines: "Canadian Soil Quality Guideline for the Protection of Environmental and Human Health" (CCME, 2007). Value represents guideline protective of residential/parkland uses; [c]BC *Environmental Management Act*, *Contaminated Sites Regulation*, Schedule 4: Numeric Soil Standards (Government of BC, 1996); [d]Maximum surface water (total) concentrations. Baseline surface water concentrations provided AMEC Water/Sediment Quality Group; [e]HC drinking water quality guidelines (HC, 2012); [f]BC Water Quality Guideline (Criteria) Reports for Drinking Water for the Protection of Human Health (BC MOE, 2006a). Maximum guidelines; [g]BC Water Quality Guideline (interim maximum) for Drinking Water for the Protection of Human Health (BC MOE, 2006a); [h]BC Compendium of Working Water Quality Guideline for Drinking Water for the Protection of Human Health (BC MOE, 2006b); [i]US EPA Region IX Regional Screening Level (RSL) (Formerly Preliminary Remediation Goals (PRGs)) tapwater supporting table (US EPA, 2012) values were adjusted according to HC when using guidelines from other jurisdictions. Criteria values were divided by five in order to comply with HC.

Highlighted cell indicates metal is a COPC in specified medium for PQRA. Metal was selected as a COPC in soil if the maximum baseline concentration exceeded the screening guideline in soil, and as a COPC in surface water if the maximum baseline concentration exceeded the screening guidelines in surface water.

BC = British Columbia; CCME = Canadian Council of Ministers of the Environment;
COPC = Chemical of Potential Concern; mg/kg = milligrams per kilogram; mg/L = milligrams per litre;
n/a = not available/applicable; RSL = Regional Screening Level; US EPA = United States Environmental Protection Agency.

The results of the screening and identification of COPCs in soil for the Project is provided above in **Table 3.1-1**. Soil sampling and inspection locations within the study areas of the Project are further discussed in the Soils, Terrain, and Surficial Geology Baseline Report and in the Vegetation Assessment.

3.1.1.3 Screening and Identification of COPCs in Surface Water

Analytical surface water chemistry data collected at water quality locations within the study areas of the Project (Section 5) were compiled and evaluated for the purpose of identifying COPCs using:

- BC "Water Quality Guidelines (Criteria) Reports," Drinking Water Quality (BC MOE, 2006a); and
- "Guidelines for Canadian Drinking Water Quality" (HC, 2012).

In the absence of a BC MOE guideline for a specific chemical, the maximum concentrations were screened against the HC guidelines for Canadian drinking water quality. HC (2010a) recommends that, where no Canadian jurisdiction has established a human health-based environmental quality guideline for a particular chemical, the US EPA "Region IX Regional Screening Level (RSL)" (US EPA, 2012) may be used. For non-carcinogens, the RSLs were adjusted to reflect 20 percent (%) of the US EPA guideline (HC, 2010a). No such adjustment was required for carcinogenic chemicals. Therefore, in the absence of applicable Canadian guidelines, the screening for the COPCs used the US EPA "Region IX RSL" tapwater supporting tables (US EPA, 2012), adjusted as specified.

Surface water sampling locations within the study areas of the Project are further discussed in Surface Water and Sediment Quality Baseline Section. The results of the screening and identification of COPCs in surface water for the PQRA is provided above in **Table 3.1-1**.

3.1.1.4 Summary of Identified COPCs

Based on the baseline screening completed for chemicals in soil, arsenic and molybdenum have been carried forward in the PQRA as COPCs in soil for the Project site.

Of the 37 baseline soil samples collected by the Soils, Terrain, and Surficial Geology and Vegetation disciplines, five exceeded guidelines for arsenic, while one exceeded guidelines for molybdenum.

Based on the baseline screening completed for chemicals in surface water, aluminum, arsenic, and cadmium have been carried forward in the PQRA as COPCs in surface water for the Project site.

For arsenic, four out of 412 baseline surface water samples collected by the Water Quality discipline were reported to exceed criteria, while two baseline surface water samples for cadmium were reported to exceed their respective criteria. The maximum baseline concentrations for lead in surface water at one sampling location (WQ20-Meta) was reported to slightly exceed HC's drinking water quality guidelines (HC, 2012), but not BC Water Quality Guideline (Criteria) Reports for Drinking Water (BC MOE, 2006a). Given that only one (outlier) of 412 samples slightly exceeded HC's maximum concentration criteria for lead (**Table 3.1-1**), but did not exceed site-specific criteria (BC MOE, 2006a), lead was excluded as a COPC in this PQRA.

3.1.1.5 Criteria Air Contaminants

Anticipated air emissions related to the proposed open pit mining Project include particulate matter (PM), sulphur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOCs). In addition, ground-level ozone (O_3) is often included, as it is a product of secondary reactions involving Project emissions. These substances are categorized as Criteria Air Contaminants (CACs).

Baseline air quality data pertaining to the Project study area were based on the results of long-term ambient monitoring at different locations representing regional and inter-regional concentrations of CACs.

Several databases were identified and evaluated using such references as the number of CACs, instrumentation, location, the monitoring period, and relevance to the Project.

Table 3.1-2 summarizes the background baseline concentrations for CACs for the Project study areas. The details describing these background concentrations can be found in Section 5.

Table 3.1-2: Summary of Air Quality Background Baseline Concentrations

CAC	Average Baseline Background Concentrations (mg/m^3)
NO_2	0.008
SO_2	0.001
$PM_{2.5}$	0.004
PM_{10}	0.009
O_3	0.048
CO	0.12

Notes: Background baseline concentrations provided by AMEC Air Quality

CAC = criteria air contaminant; mg/m^3 = milligrams per cubic metre; NO_2 = nitrogen dioxide; SO_2 = sulphur dioxide; $PM_{2.5}$ = particulate matter no greater than 2.5 micrometres in aerodynamic diameter; PM_{10} = particulate matter no greater than 10 micrometres in aerodynamic diameter; O_3 = ozone; CO = carbon monoxide.

3.1.1.6 Identification of Potential Receptors

In order to characterize the risks associated with contamination within the study areas, the receptors that would be exposed to COPCs need to be identified. Because of the current unrestricted access in the RSA for the Project, it would be expected that potential receptors could include all age groups (as defined by HC 2010a), including infants (0 to 6 months), toddlers (7 months to 4 years), children (5 to 11 years), teens (12 to 19 years), and adults (20+ years). Depending on age, lifestyle, and genetic and environmental factors, different individuals will have vastly different potentials to be exposed to COPCs. To account for this uncertainty, health risks were evaluated using biological characteristics for the most vulnerable age class: toddler for non-carcinogens, and adult for carcinogens (HC, 2010a).

The study areas of the Project overlap with the traditional lands of several Aboriginal groups. **Table 3.1-3** summarizes the Aboriginal groups with traditional territories that overlap with the study areas of the Project (refer to Project Description).

Table 3.1-3: Summary of Traditional Territories and Project Components

Aboriginal Groups	Project Component Overlap with Traditional Territories		
	Mine Site	**Kluskus-Ootsa FSRs or Mine Access Road**	**Transmission Line**
Lhoosk'uz Dene Nation	Yes	Yes	Yes
Nadleh Whut'en First Nation	No	Yes	Yes
Nazko First Nation	No	Yes	No
Saik'uz First Nation	No	Yes	Yes
Skin Tyee Nation	Yes	Yes	Yes
Stellat'en First Nation	No	No	Yes
Ulkatcho First Nation	Yes	Yes	Yes

Notes: FSR = Forest Service Road. Source: Project Description (Table 11.2-1)

Since human habitation exists within the study areas of the Project, it was conservatively assumed that there were residential land uses. Cabins that were assumed to be used as temporary bases for traditional or recreational land use activities (i.e., hunting, trapping, and fishing) were identified within the study areas of the Project. Whether these cabins represent potential year-round residential locations was unknown, but it was conservatively assumed that this was the case.

In general, Aboriginal families are considered to have local, year-round participation in such traditional activities as hunting, fishing, and the gathering and consumption of country foods. Aboriginal families were assumed to exhibit overstated lifestyle habits in the Project study areas (e.g., high consumption rates of country foods, continual year-round residency) compared to non-Aboriginal groups, to ensure that exposures were not underestimated.

Other recreational land users (i.e., non-Aboriginal receptors) are also believed to spend time within the study areas of the Project. Non-Aboriginal receptors or transient individuals who use the study areas for merely recreational purposes (i.e., non-traditional land uses (NTLUs)) were considered to spend less time than a year-round residential receptor. Therefore, the risk assessment focused on the Aboriginal receptor to represent the worst-case scenario.

The critical non-carcinogenic receptor was assumed to be an Aboriginal toddler accompanying an adult engaged in traditional harvesting of country foods (hunting, fishing, plant-gathering) or recreational activities (e.g., hiking) within the study areas of the Project. Health risks from non-carcinogenic COPCs were evaluated using toddler characteristics, as toddlers ingest more soil and water per unit body mass, and have higher rates of hand-to-mouth activities than any other age class, increasing their exposure to COPCs in soil.

The critical carcinogenic receptor was assumed to be an Aboriginal adult who also engages in traditional activities described above. Health risks from carcinogenic COPCs were typically evaluated using adult characteristics, as most cancers develop over a longer period of time (long latencies), usually over the entire lifespan. Arsenic was the only carcinogenic COPC identified in the baseline assessment.

3.1.1.7 Identification of Operable Pathways

After identifying the receptors at the site that could be exposed to COPCs, the method by which the receptor could be exposed to the contamination (the source-to-receptor exposure pathway) needed to be identified. Pathways were considered complete when there was a potential for the receptor to be exposed to a COPC. Incomplete pathways represent situations where exposure or contact with the COPCs was unlikely to occur, and therefore posed negligible risk to the receptor. An analysis of the potential exposure pathways for receptors at the site is summarized in a Conceptual Site Exposure Model (**Figure 3.1-1**). The potential exposure media in the area of the Project included soil, surface water, vegetation, fish, and wild game.

Human receptors can potentially be exposed to COPCs in various environmental media by the following pathways (HC, 2010a):

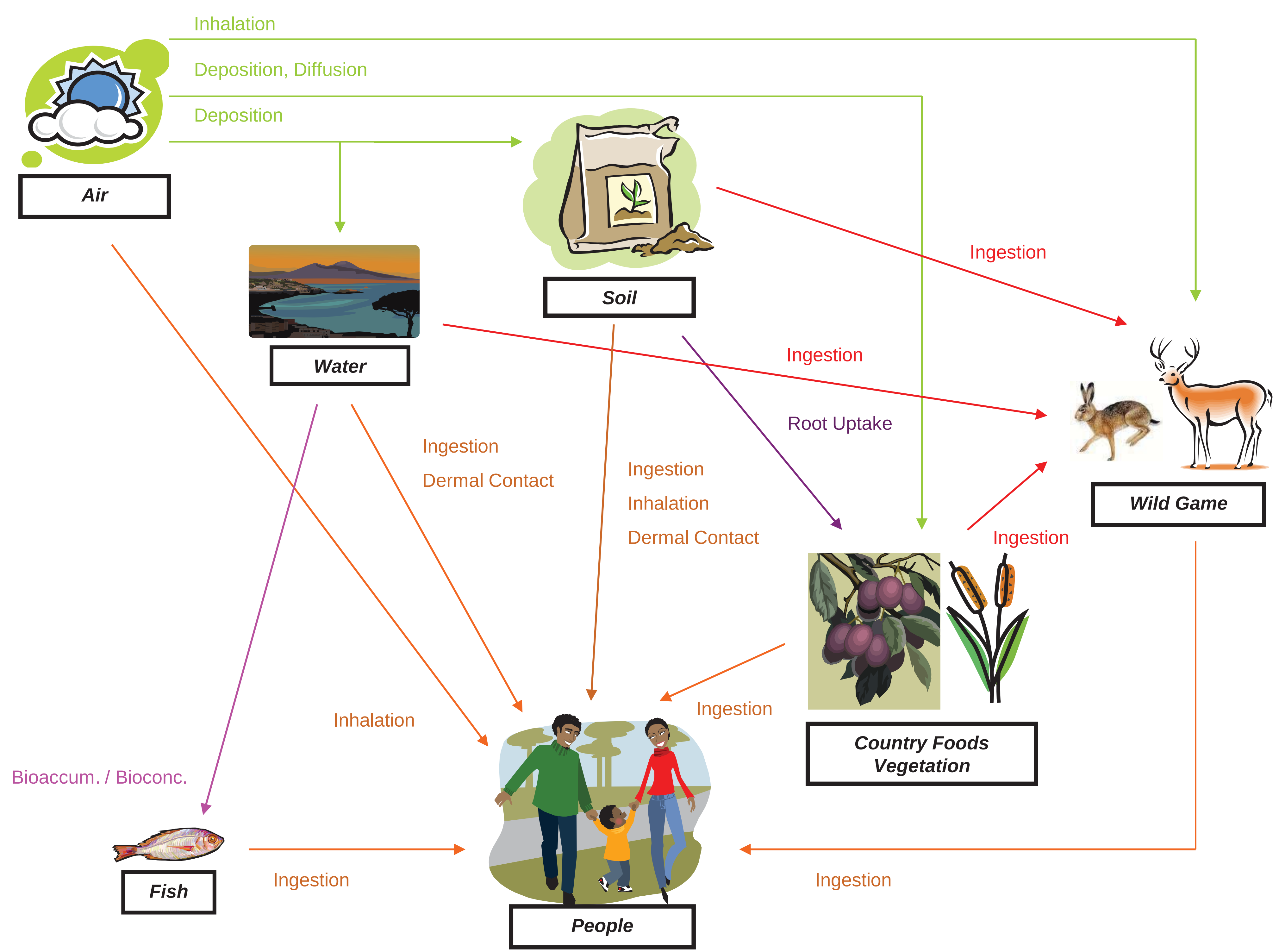
- *Inhalation of emissions:* this exposure pathway is considered complete (i.e., potential exposure pathway could result in receptors being exposed at a point of exposure), since particulate matter and emissions from the Project disperse off site, and receptors in the RSA may breathe the chemicals when they reach ground level;
- *Ingestion of surface water or groundwater:* there are currently no known potable uses of surface water or groundwater near the Project study areas. However, because of activities being conducted by recreational users and the reliance on country foods by Aboriginal groups, people may be present in the area for extended periods of time

and ingesting surface water. Individuals who may be engaging in such activities may be consuming water from the local surface water bodies. Under such circumstances, they may be exposed to COPCs in the water for short periods of time, and so the surface water pathway is considered complete for the Project;

- *Dermal contact with surface water:* several watersheds that may be used for recreational purposes have been identified within the study areas of the Project. Individuals using surface water for recreational or subsistence purposes (i.e., swimming or fishing) may come into direct contact with COPCs that have been discharged into surface water bodies located within the study areas. Prevention of surface water discharges is a key objective of the Project design. Collection, storage, and recycling of process and site drainage water are anticipated. This route of exposure was considered a complete pathway, and requires further assessment;
- *Inadvertent ingestion of soil:* there are currently no access restrictions within the study areas of the Project. Therefore, anybody can enter the study areas and be exposed to the soil through normal activities. Incidental exposure via soil ingestion may occur when residual soil particles remain on the hands and are accidentally ingested. Other possible routes of soil ingestion include exposures through respiration. Therefore, this route of exposure is considered a complete pathway and requires further assessment;
- *Inhalation of re-suspended soil particles:* COPCs present in surface soils may potentially be re-suspended into the air as a result of weather conditions, vehicle traffic, or other disturbances. Receptors within the Project study areas may be exposed to background concentrations of chemicals in the soil as they inhale the re-suspended particles. Since some surfaces of the study areas are exposed (i.e., not under asphalt or concrete), the re-suspension of soil particles would likely occur. Therefore, a complete exposure pathway exists and requires further assessment;
- *Dermal contact with soil:* chemicals adsorbed onto the soil particles may be redistributed through the re-suspension of the soil particles and migrate off site. Deposition of these soil particles onto the surface soil can occur at some distant from the site, meaning receptors may come in direct contact. People within the study areas of the Project may potentially come in direct contact with the surface soil if they touch the soil directly or indirectly. As the soil particles adhere to the skin of the receptors, chemicals in the particles may be absorbed through the epidermal layer of the skin. People may then be exposed to background concentrations of chemicals present in the soil via this complete exposure pathway. This route of exposure requires further assessment;
- *Ingestion of vegetation:* Aboriginal groups engage in the harvesting of native vegetation for subsistence, medicinal, and traditional activities. Chemicals deposited in the soil from the ambient air within the study areas of the Project may potentially

be accumulated in the plant tissues. The ingestion of vegetation is considered a complete exposure pathway and requires further assessment;

- *Ingestion of wild game:* hunting for wild game commonly occurs in the region for either recreational or subsistence purposes. Aboriginal people consume wild game for subsistence purposes. Wild game could be exposed to background concentrations of chemicals readily bioavailable within the study areas of the Project through direct inhalation of the chemicals in the air, ingestion of the soil and water, and consumption of vegetation. The white-tailed deer was selected as the species for human health exposure modelling in this PQRA. Chemicals that accumulate in wild game tissues represent a potential source of exposure for human receptors that consume the wild game. This is considered a complete exposure pathway and requires further assessment; and
- *Ingestion of fish:* Aboriginal people are anticipated to fish these surface water bodies and may rely on the fish for subsistence. Due to the range of species consumed by Aboriginal people, the PQRA assumed that a generic resident freshwater fish was consumed, rather than limiting the assessment to a specific fish species. There are no specific chemical accumulation characteristics for this generic freshwater fish (i.e., one species accumulating more than another does), but rather it is assumed that all fish species (i.e., generic freshwater fish) will accumulate chemicals at the same rate and incorporate them into their biological tissues at the same concentrations. This exposure pathway is considered complete, and risks associated with the consumption of fish will be further assessed.



CLIENT: newgold		DWN BY: MY	PROJECT: Blackwater Gold Project	DATE: March 2014
		CHK'D BY: JK		PROJECT NO: VE52277
AMEC Environment & Infrastructure 4445 Lougheed, Suite 600, Burnaby, B.C., V5C 0E4 Tel. 604-294-3811 Fax 604-294-4664	amec	DATUM: NAD83	TITLE: Human Health Conceptual Site Exposure Model	REV. NO.: A
		PROJECTION: N/A		FIGURE No. 3.1-1
		SCALE: N/A		

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3.1.2 Exposure Assessment

The receptors are assumed to be an adult Aboriginal resident accompanied by an Aboriginal toddler resident who may participate in traditional (i.e., hunting) and recreational (i.e., hiking) activities within the study areas of the Project. A summary of the exposure pathways considered complete for human receptors and included in the exposure assessment are:

- Direct contact with soil (ingestion and dermal contact);
- Inhalation of re-suspended soil particles;
- Ingestion of surface water;
- Ingestion of vegetation (i.e., roots and leaves);
- Ingestion of wild game (white-tailed deer); and
- Ingestion of fish (generic freshwater fish).

Soil, surface water, vegetation, and fish baseline sampling was completed to characterize the concentrations of chemicals in the exposure media within the vicinity of the Project by collecting samples from across the region. Soil samples were collected from the upper 1 m of organic or mineral matter. Surface water samples and fish were collected from the watersheds located in areas most frequently used. Soil and vegetation samples were collected within the study areas of the Project.

The sample locations are reported in their respective baseline reports. The analysis of baseline soil, surface water, vegetation, and fish sampling data can be found in **Appendix 1**.

3.1.2.1 Characterization of Potential Receptors

As previously mentioned in Section 1.3.1.5, and given the use of the property, the potential receptor of concern for the PQRA was identified as a local Aboriginal member from one of the seven Aboriginal groups identified in the Project description whose traditional territories are located within the study areas of the Project. For the non-carcinogenic scenario, the critical receptor is considered to be an Aboriginal toddler accompanying an adult during traditional hunting or recreational activities within the study areas of the Project, who spends all their time in or around the area. The adult Aboriginal was considered the critical receptor for the carcinogenic scenario.

These assumptions provide the basis of the exposure assessment. **Table 3.1-4** has been adapted from HC (2010a), and provides a summary of the characteristics of potential receptors. With respect to dermal exposures, it was assumed that receptors would be exposed through direct dermal contact with an individual's hands, arms, and legs.

The food ingestion values described in the table above are consumption values considered from various recent studies and surveys on consumption in all of Canada. HC (2010a) recommends that, when available, site-specific values should be employed for subsistence users and populations. Chan et al. (2011) conducted a First Nations food, nutrition, and environment study for the First Nations of BC with the active participation of First Nations; the study describes the traditional diet of First Nations people found on the land and waters around their communities.

Table 3.1-4: Summary of Human Health Receptor Characteristics for the Project

Receptor Characteristic	Receptor Parameters		Source
	Toddler	Adult	
Age	7 months to 4 years	>20 years	HC, 2010a
Exposure duration (years)	4.5	60	Based on 80-year lifespan
Body weight (kg)	16.5	70.7	Richardson, 1997
Soil ingestion rate (g/d)	0.08	0.02	CCME, 2006
Surface water ingestion rate (L/d)	0.6	1.5	Richardson, 1997
Inhalation rate (m^3/d)	8.3	16.6	Allan et al., 2008
Food ingestion (g/d)			
Roots and traditional below-ground plants[1]	105	188	Richardson, 1997
Traditional above-ground plants[1]	67	137	Richardson, 1997
Fish[1]	85	270	Richardson, 1997
Wild Game[1]	85	270	Richardson, 1997
Skin surface area (cm^2)			
Hands	430	890	Richardson, 1997
Arms (upper and lower)	890	2,500	Richardson, 1997
Legs (upper and lower)	1,690	5,720	Richardson, 1997
Total Body	6,130	17,640	Richardson, 1997
Soil loading to exposed skin (mg/cm^2)			
Soil adhesion to skin (based on hands)	0.1	0.1	Kissel et al., 1996, 1998
Soil adhesion to skin (other than hands)	0.01	0.01	Kissel et al., 1996, 1998

Notes: [1]Ingestion rates for Canadian First Nations populations;
CCME = Canadian Council of Ministers of the Environment; cm^2 - square centimetres;
g/d = grams per day; HC = Health Canada; kg = kilogram; L/d = litres per day;
m^3/d = cubic metres per day; mg/cm^3 = milligrams per cubic centimetre.

Random BC First Nation communities were invited to participate in the survey and provide input into the design of study and research protocols (Chan et al., 2011). Individuals ages 19 years and over living on reserve and self-identified as First Nations were invited to participate in the study. Data were collected from 1,103 participants (men and women) from 21 randomly selected communities in the province of BC (Chan et al., 2011).

Table 3.1-5 summarizes the estimated high consumption of major traditional foods adopted from Chan et al. (2011) and used in this PQRA as consumption rates for the Aboriginal adult receptors. Toddler consumption rates were estimated based on the same proportions between adults and toddler First Nation receptors in HC (2010a).

Table 3.1-5: Estimated Consumption Rates of Major Traditional Foods by First Nations Populations in BC

Traditional Food	Receptor Parameters		Traditional Food	Receptor Parameters		Traditional Food	Receptor Parameters	
	Toddler[a]	Adult		Toddler[a]	Adult		Toddler[a]	Adult
Fish Consumption (g/d)			***Wild Game (g/d)***			***Plant Vegetation (g/d)***		
Salmon, any	21.61	68.60	Moose Meat	33.20	105.40	Labrador Tea Leaves	0.23	0.48
Sockeye Salmon	12.00	38.11	Deer Meat	8.39	26.64	Rat Root	0.039	0.08
Chinook Salmon	6.59	20.92	Elk Meat	2.76	8.78	Balsam Tree	0.0049	0.01
Coho Salmon	4.12	13.08	Moose Liver	1.38	4.39		-	-
Trout, any	3.60	11.43	Moose Kidney	1.15	3.66		-	-
Chum Salmon	2.19	6.97	Deer Liver	0.92	2.93		-	-
Pink Salmon	1.65	5.23	Rabbit Meat	0.92	2.93		-	-
Rainbow Trout	1.20	3.81	Caribou Meat	0.53	1.67		-	-
Lake Trout	0.60	1.91	Grouse	0.52	1.64		-	-
Dolly Varden	0.60	1.91	Beaver Meat	0.46	1.46		-	-
Steelhead Trout	0.27	0.87	Black Bear Fat	0.18	0.57		-	-
Whitefish	0.27	0.87	Sheep Meat	0.18	0.56		-	-
Herring	0.20	0.64	Black Bear Meat	0.12	0.37		-	-
Northern Pike	0.10	0.32	Ducks	0.07	0.21		-	-
			Geese	0.07	0.21		-	-
Total Fish	55.02	174.67	**Total Wild Game**	50.85	161.42	**Total Plant Vegetation**	0.28	0.57

Note: [a]Toddler consumption rates are extrapolated as a percentage of the adult food consumption rates (according to the same proportions as described in HC (2010a).

3.1.2.2 Exposure Point Concentrations

Exposure Point Concentrations (EPCs) are chemical concentrations in soil, surface water, and foods to which receptors were assumed to be exposed. For the purpose of the PQRA, EPCs in soil, surface water, and country foods were assumed to be equivalent to the 95th percentile concentration detected within the study areas of the Project. Health Canada (2010a) states that “where, in the opinion of the risk assessor, the data are sufficiently numerous and rigorous to warrant an alternate statistical treatment of on-site data, the use of the 95th percentile concentration is consistent with HC’s policy for evaluating a reasonably conservative concentration in the human health PQRA” (HC, 2010a). A summary of the 95th percentile of baseline concentrations for soil, surface water, vegetation, and fish data can be found in **Table 3.1-6**.

Table 3.1-6: Human Health Exposure Point Concentrations – 95th Percentile of Baseline Concentrations

Metal COPC	95th Percentile Soil Concentration (mg/kg)	95th Percentile Surface Water Concentration (mg/L)	95th Percentile Plant Tissue Concentration (mg/kg)	95th Percentile Fish Concentration (mg/kg)	95th Percentile Wild Game Concentration (mg/kg)
Aluminum	n/a	0.42	7.040	0.85	0.13
Arsenic	21.4	0.0014	0.41	0.067	0.00055
Cadmium	1.6	0.000081	1.52	0.015	0.00003
Molybdenum	5.1	0.00086	8.2	0.0076	0.0013

Notes: COPC = Chemical of Potential Concern; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; n/a = not available.

3.1.2.3 Exposure Frequency and Duration

For the purpose of the PQRA, the exposure scenario assumes that local Aboriginal receptors are living within the study areas of the Project and are being exposed to background conditions of the surrounding environment 24 hours per day and 365 days per year for their entire lifetime (worst-case scenario). A summary of the assumptions concerning the exposure duration and frequency of the Aboriginal receptors is provided in **Table 3.1-7**.

Table 3.1-7: Summary of Human Health Receptor Characteristics for the Project

Exposure Assumption	Aboriginal Receptors	
	Toddler	Adult
Hours per day	24	24
Days per week	7	7
Weeks per year	52	52
Days per year	365	365
Years	4.5	60
Life Expectancy	n/a	80

Notes: n/a = not applicable

Source: Health Canada 2010a, Table 4: Exposure Duration and Frequency for PQRA.

3.1.2.4 Estimation of Potential Exposure via Incidental Ingestion and Dermal Contact with Soil

In this assessment, dermal exposures were combined with oral exposures. For the incidental ingestion pathway in general, exposure to soil depends on the amount of soil ingested on a daily basis (mg/d), and the number of days per year that exposures are likely to occur (frequency and duration of exposure).

The calculations estimating incidental soil ingestion and dermal contact with soil are presented in **Appendix 2**. The general equation used to calculate the dose due to soil ingestion and dermal contact is as follows:

Soil Ingestion:

$$ADD = \frac{C_s \cdot IR \cdot F \cdot RAF_o \cdot ED \cdot CF}{AT \cdot BW}$$

where:

where:	ADD	=	Average Daily Dose (milligrams per kilogram body weight per day (mg/kg/d))
	C_s	=	95th percentile of baseline chemical concentration in soil (mg/kg)
	IR	=	ingestion rate (mg/d)
	F	=	fraction from site (unitless)
	RAF_o	=	relative absorption factor, oral (unitless)
	ED	=	days per year exposed/365 days per year
	CF	=	conversion factor (kilograms per milligram (kg/mg))
	AT	=	averaging time (365 days a year x 4.5 years for toddler, x 60 years for adult)
	BW	=	body weight (kg)

Soil Dermal Contact:

$$ADD = \frac{(C_S \cdot SA_H \cdot SL_H) + (C_S \cdot SA_O \cdot SL_O) \cdot RAF_D \cdot F \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_s	=	95th percentile of baseline chemical concentration in soil (mg/kg)
	SA_H	=	skin surface area (based on hands) (square centimetres (cm^2)/event)
	SL_O	=	soil loading to exposed skin (hands) (milligrams per centimetre squared (mg/cm^2))
	SA_O	=	skin surface area (other than hands) (square centimetres (cm^2)/event)
	SL_O	=	soil loading to exposed skin (other than hands) (milligrams per centimetre squared (mg/cm^2))
	FAS	=	fraction absorbed from site (unitless)
	RAF_D	=	absorption adjustment factor, dermal (unitless)
	ED	=	days per year exposed/365 days per year
	CF	=	conversion factor (kg/mg)
	AT	=	averaging time (365 days per year x 4.5 years for toddler or 60 years for adult)
	BW	=	body weight (kg)

Values for the parameters above are outlined in **Table 3.1-4** through **Table 3.1-7**.

3.1.2.5 Estimation of Potential Exposure via Inhalation of Dust

The local Aboriginal receptors may inhale dust as a result of disturbance of the surface soil. The calculations estimating dust inhalation are presented in **Appendix 2**. The general equation used to estimate the dose to receptors via inhalation of dust is the following:

$$ADD = \frac{C_s \cdot P_{air} \cdot IR \cdot F \cdot RAF_I \cdot ET \cdot ED}{AT \cdot BW}$$

where:

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_s	=	95th percentile of baseline chemical concentration in soil (mg/kg)
	P_{air}	=	particulate concentration in air (kilograms per cubic metre (kg/m^3))
	IR	=	inhalation rate (cubic metres per hour (m^3/h))
	RAF_I	=	relative absorption factor, inhalation (unitless)
	ET	=	hours per day exposed (h/d)
	ED	=	days per year exposed/365 days per year
	AT	=	averaging time (365 days a year x 4.5 years for toddler, x 60 years for adult)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters are outlined in **Table 3.1-4** through **Table 3.1-7**.

To determine the concentration of a COPC present in dust in air, HC (2010a) notes that COPC concentration in the dust particle should be assumed to be equal to the concentration present in soil. HC (2010a) indicates that an average airborne concentration of respirable particulate matter (PM) should be assumed to be 0.76 micrograms per cubic metre (µg/m^3). A reasonable dust level created by vehicle traffic on unpaved roads is 250 µg/m^3. For this assessment, 0.76 µg/m^3 was used as the average airborne concentration of respirable PM.

3.1.2.6 Estimation of Potential Exposure via Ingestion of Surface Water

The calculations estimating surface water ingestion are presented in **Appendix 2**. The equation used to estimate potential exposures to the local Aboriginal receptors via ingestion of surface water is the following:

$$ADD = \frac{C_{sw} \cdot IR \cdot RAF_O \cdot ED}{AT \cdot BW}$$

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_{sw}	=	95th percentile of baseline chemical concentration in surface water (mg/L)
	IR	=	ingestion rate of water (litres per day (L/d))
	RAF_O	=	relative absorption factor, oral (unitless)
	ED	=	days per year exposed/365 days per year
	AT	=	averaging time (365 days a year x 4.5 years for toddler, x 60 years for adult)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters are outlined in **Table 3.1-4** and **Table 3.1-7**.

3.1.2.7 Estimation of Potential Exposure via Dermal Contact with Surface Water

The calculations estimating dermal contact with surface water are presented in **Appendix 2**. The equation used to estimate potential exposures to the local Aboriginal receptors via dermal contact with surface water is the following:

$$ADD = \frac{DA_{event} \cdot EV \cdot ED \cdot EF \cdot SA}{AT \cdot BW}$$

where:

	ADD	=	Average Daily Dose (mg/kg/d)
	DA_{event}	=	dermal absorbed dose per event (mg/cm^2-event)
	EV	=	event frequency (event(s)/day)
	ED	=	exposure duration (4.5 years for toddler, 60 years for adult)
	EF	=	exposure frequency (365 days/year)
	SA	=	total body skin surface area (cm^2/event)
	AT	=	averaging time (365 days a year x 4.5 years for toddler, x 60 years for adult)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters are outlined in **Table 3.1-4** and **Table 3.1-7**.

3.1.2.8 Estimation of Potential Exposure via Ingestion of Contaminated Food (Produce, Wild Game, or Fish)

The calculations estimating the ingestion of contaminated foods are presented in **Appendix 2**. The equation used to estimate potential exposures to the local Aboriginal receptor via ingestion of contaminated foods is the following:

$$ADD = \frac{C_F \cdot IR \cdot RAF_O \cdot ED}{AT \cdot BW}$$

where:

	ADD	=	Average Daily Dose (mg/kg/d)
	C_F	=	95th percentile of baseline chemical concentration in country foods (mg/kg)
	IR	=	ingestion rate for food (kilograms per day (kg/d))
	RAF_O	=	relative absorption factor, oral (unitless)
	ED	=	days per year exposed/365 days per year
	AT	=	averaging time (365 days a year x 4.5 years for toddler, x 60 years for adult)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters are outlined in **Table 3.1-4** through **Table 3.1-7**.

3.1.3 Toxicity Assessment

The purpose of the toxicity assessment is to identify both the types of adverse health effects a chemical may potentially cause as well as the relationship between the amount of the COPCs to which receptors were exposed (dose) and the adverse effect (response). This is referred to as the dose-response relationship, and it forms the basis for estimating the amount of a chemical that can be received by human receptors from short- and long-term exposure without experiencing adverse effects to their health. In addition, the toxicity assessment involves classification of the potential toxicological effects of chemicals as carcinogenic or non-carcinogenic. A toxicity assessment is conducted for all COPCs that are screened into the assessment and considers possible modes of toxicity associated with following different exposure routes and durations.

Exposure limits are usually developed by regulatory agencies (e.g., US EPA, HC) based on a technical review of all of the available scientific information. These limits considered the most sensitive toxicological endpoints in individuals and adjusted them accordingly with uncertainty factors. In general, such exposure limits are developed to protect the most sensitive individuals in a population, including sensitive life stages (e.g., the elderly, pregnant women) and individuals with compromised health (e.g., people with asthma). Typically, exposures below these limits would not be associated with adverse health effects and would therefore not represent a concern. As exposures increase to levels above the exposure limit, the probability of health effects occurring increases accordingly. However, exceedances of the exposure limit do not necessarily mean that adverse health effects will definitely occur, but rather represent an increase in the probability of experiencing adverse health effects. A profile of the COPC health effects and exposure limits associated with the PQRA is provided in **Appendix 3**.

3.1.3.1 Criteria Air Contaminants

For the CACs, the exposure limits used in this assessment are the respective BC Ambient Air Quality Objectives (AAQO) and the National Ambient Air Quality Objectives (NAAQO). A summary of the TRVs for the criteria pollutants is presented in **Table 3.1-8.** Baseline background concentrations of CACs were provided by the Air Quality discipline. The baseline background concentrations for the Project site were reported to be below BC AAQO and NAAQO.

Table 3.1-8: Summary of Toxicological Reference Values for Criteria Pollutants

CAC	Averaging Period	BC AAQO (mg/m³)[a]	NAAQO (mg/m³)[b]	Average Baseline Background Concentrations (mg/m³)
NO_2	1-hour	n/a	0.4	0.008
	24-hour	n/a	0.2	
	Annual	n/a	0.1	
SO_2	1-hour	0.9	0.9	0.001
	24-hour	0.26	0.3	
	Annual	0.025	0.06	
$PM_{2.5}$	24-hour	0.025	0.03	0.004
	Annual	0.008	n/a	
PM_{10}	24-hour	0.05	n/a	0.009
O_3	1-hour	0.16	0.16	0.048
CO	1-hour	28	35	0.12
	8-hour	11	15	

Notes: [a]BC regulations as a geometric mean; (b) NAAQO acceptable levels
AAQO = Ambient Air Quality Objectives; BC = British Columbia; CAC = criteria air contaminant; mg/m^3 = milligrams per cubic metre; n/a = not available; NAAQO = National Ambient Air Quality Objectives; NO_2 = nitrogen dioxide; SO_2 = sulphur dioxide; $PM_{2.5}$ = particulate matter no greater than 2.5 micrometres in aerodynamic diameter; PM_{10} = particulate matter no greater than 10 micrometres in aerodynamic diameter; O_3 = ozone.

3.1.3.2 Carcinogens

For carcinogens, the oral TRV is called a slope factor, and the inhalation TRV is called a unit risk, which is an upper-bound estimate of the probability of a carcinogenic response per unit intake of a chemical over a lifetime. According to the US EPA (2013), either central or upper-bound estimates may be appropriate for evaluation of the carcinogenic risk, based on the type of assessment required. Central estimates are applicable for characterizing a typical individual's risk, while upper-bound estimates conservatively exaggerate the risk to ensure that the risk is not underestimated if the underlying model is correct. Central estimates are useful for assessing aggregate risk across a population and for comparing or ranking environmental hazards. Upper-bound estimates provide information about the precision of the comparison or ranking. Cancer slope factors/unit risks from HC (2010b) were used in this assessment. The TRVs used in this risk assessment for the carcinogenic COPC (arsenic) are summarized in **Table 3.1-9**.

Table 3.1-9: Toxicological Reference Values

Metal COPCs	Oral TRV (mg/kg/d)	Dermal TRV (mg/kg/d)	Chronic Inhalation TRV (mg/m^3)	Chronic Inhalation TRV (mg/kg/d)	Cancer Slope Factor Oral (1/mg/kg/d)	Cancer Slope Factor Dermal (1/mg/kg/d)	Cancer Slope Factor Unit Risk ($1/mg/m^3$)
Aluminum	1[b]	1[d]	0.005[c]	0.0014[e]	n/a	n/a	n/a
Arsenic	0.0003[b]	0.0003[d]	0.000015[f]	0.0000085[e]	1.8[a]	1.8[d]	6.4[a]
Cadmium	0.001[a, *]	0.001[d]	0.0001[b]	0.000056[e]	n/a	n/a	9.8[a]
Molybdenum	0.023[a]	0.023[d]	0.005[c]	0.0028[e]	n/a	n/a	n/a

Notes: [a]Health Canada (2010b); * provisional value provided by Health Canada (2010); [b]US EPA (2013) – IRIS; [c]Texas Commission on Environmental Quality (TCEQ) (2013); [d]Extrapolation from oral TRV; [e]Extrapolation from inhalation TRV; [f]California Environmental Protection Agency (CalEPA) (2013); n/a = not applicable; mg/kg/d = milligrams per kilogram per day.

3.1.3.3 Non-Carcinogens

Compounds with known or potential non-carcinogenic effects are assumed to have a dose below which no adverse effect occurs, or conversely, above which an effect may (but not always) be seen. This toxicological reference value or dose is called the threshold dose. In laboratory experiments, this dose is known as the No Observable Adverse Effect Level (NOAEL). The lowest dose at which an adverse effect is seen is called the Lowest Observable Adverse Effect Level (LOAEL). HC has used these types of values to develop the TRVs for chronic exposures to compounds with potential non-carcinogenic effects. For compounds with potential non-carcinogenic effects, the TRV provides reasonable certainty that if the specified exposure dose is below the threshold, then no non-carcinogenic health effects are expected to occur, even if daily exposure were to occur for a lifetime.

The TRVs for non-carcinogens used in this risk assessment are summarized in **Table 3.1-9**. For compounds where TRVs are not available from HC, exposure limits similar to the TRVs are available from a number of different jurisdictions, including the Texas Commission on Environmental Quality (TCEQ) (2013), California Environmental Protection Agency (CalEPA) (2013), and the US EPA (2013).

It should be noted that metals may exhibit different toxicological mechanisms of action depending on the route of exposure (e.g., ingestion, dermal, inhalation). Different TRVs are often provided for oral and inhalation exposure routes, depending on whether toxicity studies have been conducted and assessed for that route. In general, very few studies are available for dermal TRVs; in the absence of established dermal TRVs, they are extrapolated from oral TRVs.

These exposure limits have been used in conjunction with the exposure estimates as calculated in **Appendix 2** to characterize potential risks associated with exposures to each of the COPCs for the identified human receptors.

3.1.3.4 Relative Absorption Factors

To estimate the potential risk to human health that may be posed by the presence of a COPC in various environmental media (such as soil, water, or air), it is first necessary to estimate the human exposure dose of each COPC. The exposure dose is similar to the administered dose or applied dose of a laboratory experiment. The exposure dose is then combined with an estimate of the toxicity of the compound to produce an estimate of risk posed to human health.

The estimate of toxicity of a compound, termed the dose-response value, can be derived from human epidemiological data, but it is most often derived from experiments with laboratory animals. In animals, as in humans, the administered dose of a compound is not necessarily completely absorbed. Moreover, differences in absorption exist between laboratory animals and humans, as well as between different media and exposure routes. In many cases, a correction factor in the calculation of risk is needed to account for such differences between absorption in the dose-response study and absorption likely to occur upon human exposure to a compound. Without such a correction, the estimate of human health risk may be overestimated.

This correction factor is termed the Relative Absorption Factor (RAF). The RAF is used to adjust the human potential dose so that it is expressed in the same terms as the doses used to generate the dose-response curve in the dose-response study. The RAF is the ratio between the estimated human absorption factor for the specific medium and exposure route and the known or estimated absorption factor for the laboratory study from which the dose-response value was derived.

$$\text{RAF} = \frac{\text{(fraction absorbed in humans for the environmental exposure)}}{\text{(fraction absorbed in the dose-response study)}}$$

The use of an RAF allows for appropriate adjustments if the efficiency of absorption between environmental exposure and experimental exposure is known or expected to differ because of physiological effects and/or matrix or vehicle effects. Relative absorption factors can be less than 1 or greater than 1, depending on the particular circumstances at hand. If it is believed that absorption from the site-specific exposure is the same as absorption in the laboratory study, then the RAF is 1.0.

A summary of RAFs used in the assessment is provided in **Table 3.1-10**. It should be noted that relative absorption values (RAVs) were obtained directly from HC (2010a and 2010b), and TCEQ (2013).

Table 3.1-10: Summary of Relative Absorption Factors

Metal COPC	Oral Soil	Dermal Soil	Inhalation
Aluminum	1[a]	0.02[c]	1[a]
Arsenic	1[a]	0.03[b]	1[a]
Cadmium	1[a]	0.01[b]	1[a]
Molybdenum	1[a]	0.01[b]	1[a]

Note: [a]HC 2010a; [b]HC 2010b [c]TCEQ 2013;
COPC = Chemical of Potential Concern

3.1.4 Risk Characterization

Risk characterization, the final step in the risk assessment process, integrates the results of the exposure and toxicity assessments for each COPC in order to estimate the potential for carcinogenic and non-carcinogenic human health effects from exposure to that COPC. This section summarizes the results of the risk characterization for each receptor evaluated in the risk assessment.

The risk characterization compares estimated site-specific risk levels to target risk levels. HC's allowable Incremental Lifetime Cancer Risk (ILCR) target is set at 10^{-5}, or 1 in 100,000 (HC, 2010a). For non-carcinogens, HC's target HQ is set at 0.2 (HC, 2010a).

3.1.4.1 Approach for Non-Carcinogenic Risk Characterization

For the assessment of non-carcinogenic health effects, the calculated Average Daily Dose (ADD) is compared to the non-carcinogenic TRV. The non-carcinogenic TRV is defined as an estimate of compound intake that is unlikely to cause adverse health effects even if exposure occurs for an entire lifetime.

The potential for exposures to result in adverse non-carcinogenic health effects is estimated by comparing the daily intake with the TRV. The resulting ratio, which is unitless, is known as the HQ for that compound. The HQ is calculated using the following formula:

$$HQ = \frac{ADD}{TRV}$$

where: HQ = Hazard Quotient (unitless)
ADD = Average Daily Dose (mg/kg/d)
TRV = Toxicological Reference Value (mg/kg/d)

For exposures to receptors at the Project RSA (excluding estimated background daily intake for off-site sources, including consumer products, food, air, and water), HC considers that when the HQ for a given COPC and pathway does not exceed 0.2, no unacceptable risks exist.

3.1.4.2 Approach for Carcinogenic Risk Characterization

For carcinogenic chemicals, the risk estimate (ILCR) was determined by the following equation:

$$ILCR = ADD \ x \ TRV$$

where: ILCR = Incremental Lifetime Cancer Risk (unitless)
ADD = Average Daily Dose (mg/kg/d)
TRV = Toxicological Reference Value (mg/kg/d)

Based on HC (2010a), an ILCR greater than 10^{-5}, or 1 in 100,000, is considered to represent an unacceptable level of risk.

3.1.4.3 Criteria Air Contaminants

Baseline air quality data pertaining to the Project study areas are based on the results of long-term ambient monitoring at different locations representing regional concentrations of CACs. Concentrations of CACs were provided by the Air Quality discipline (Section 5.2) from data sources that included:

- Canadian Air and Precipitation Monitoring Network (CAPMoN);
- National Air Pollution Surveillance Program (NAPS);
- BC MOE Monitoring Network; and
- Continuous on-site monitoring of Project particulate matter.

The average values of the selected background levels were accepted as the Project baseline concentrations corresponding to each averaging period (Air Quality: Section 5.2). HQs were calculated by dividing the average concentration by each parameter's respective TRV. A summary of the TRVs for the CACs (NO_2, SO_2, and $PM_{2.5}$) is presented in **Table** 3.1-8. For CACs, HC (2010a) accepts that when the HQ for a given parameter does not exceed 1, no unacceptable risks exist. HQ values for all CACs were noted to be below 1.0. The HQ values for the CAC emissions are presented in **Table 3.1-11**.

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Table 3.1-11: Hazard Quotients for Exposure to Criteria Air Contaminants

CAC	HQ
NO_2	0.08
SO_2	0.04
$PM_{2.5}$	0.5
PM_{10}	0.18
O_3	0.3
CO	0.01

Notes: CAC = Criteria Air Contaminant; HQ = Hazard Quotient; NO_2 = nitrogen dioxide; SO_2 = sulphur dioxide; $PM_{2.5}$ = particulate matter no greater than 2.5 micrometres in aerodynamic diameter; PM_{10} = particulate matter no greater than 10 micrometres in aerodynamic diameter; O_3 = ozone; CO = carbon monoxide

3.1.4.4 Quantitative Interpretation of Risk Hazard

A quantitative comparison of the estimated exposures and selected exposure limits for the Aboriginal receptors for soil, surface water, vegetation, fish, and wild game are discussed in detail in **Section 1.3.6**. The exposure and risk calculations for the Aboriginal receptors and environmental media are described in **Appendix 2**.

Summaries of the calculated non-carcinogenic and carcinogenic risks associated with COPCs for the Aboriginal receptors are provided in **Table 3.1-12** and **Table 3.1-13**, respectively.

Current risks associated with aluminum, cadmium, and molybdenum are noted to be below HC's risk target level of 0.2 for non-carcinogenic effects. Risks to both the toddler and adult Aboriginal receptors associated with arsenic are noted to be above the HC risk target levels of 0.2 for non-carcinogenic effects and 10^{-5} for carcinogenic effects.

For the non-carcinogenic receptor, the main drivers for baseline risks are noted to be soil ingestion, surface water ingestion, and fish ingestion, suggesting that current background concentrations of arsenic in soil and surface water are relatively high. For the carcinogenic receptor, the main drivers of risk are noted to be surface water ingestion and fish ingestion, suggesting that current background concentrations of arsenic in surface water are relatively high.

Table 3.1-12: Summary of Risks for Aboriginal Receptor – Non-Carcinogenic COPCs

Metal COPC	HQ								Total HQ
	Soil			Surface Water		Plant	Fish	Wild Game	
	Ingestion	Dermal	Inhalation	Ingestion	Dermal	Ingestion	Ingestion	Ingestion	
Aluminum	n/a	n/a	n/a	0.015	0.00016	0.12	0.0028	0.00039	0.14
Arsenic	**0.33**	0.0089	0.00097	0.16	0.0017	0.022	**0.71**	0.0053	**1.24**
Cadmium	0.0038	6.5×10^{-5}	7.4×10^{-7}	0.0015	0.000030	0.013	0.025	4.6×10^{-5}	0.044
Molybdenum	0.0011	9.2×10^{-6}	6.9×10^{-7}	0.0014	0.000014	0.006	0.0011	0.00018	0.0097

Notes: **Bold** and underlined text represents HQ values greater than 0.2
COPC = Chemical of Potential Concern; HQ = Hazard Quotient.

Table 3.1-13: Summary of Risks for Non-Aboriginal Receptor – Carcinogenic COPC

Metal COPC	ILCR								Total ILCR
	Soil			Surface Water		Plant	Fish	Wild Game	
	Ingestion	Dermal	Inhalation	Ingestion	Dermal	Ingestion	Ingestion	Ingestion	
Arsenic	7.8×10^{-6}	2.1×10^{-6}	1.8×10^{-8}	**3.8×10^{-5}**	4.7×10^{-7}	4.2×10^{-6}	**2.1×10^{-4}**	1.6×10^{-6}	**2.7×10^{-4}**

Notes: **Bold** and underlined text represents ILCR values greater than 1×10^{-5}
COPC = Chemical of Potential Concern; ILCR = Incremental Lifetime Cancer Risk

3.1.5 Uncertainty Analysis

Within any of the four steps of the risk assessment process, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption, therefore, introduced some degree of uncertainty into the risk assessment process. Throughout the risk assessment, conservative assumptions are made where possible, so as to overestimate the risks. Therefore, when all of the assumptions were combined, it was much more likely that actual risks, if any, are largely overestimated rather than underestimated to ensure that human health was protected.

As noted previously, the risk assessment comprised the following elements:

- Problem formulation;
- Toxicity assessment;
- Exposure assessment; and
- Risk characterization.

The assumptions that introduce the greatest amount of uncertainty in this risk assessment are discussed in the following section. They are discussed in general terms, because, for most of the assumptions, there was not enough information to assign a numerical value that could be incorporated into the calculation of risk.

3.1.5.1 Problem Formulation

Sampling of soil, surface water, vegetation, and fish, and their analytical methodologies, can result in numerous uncertainties, including the following:

- Uncertainty regarding the true extent of chemical concentrations across the Project study areas, both temporally and spatially. Because the conditions were not expected to be physically uniform, and may be locally variable, no sampling program would ever completely eliminate this uncertainty. Risks would be either overestimated or underestimated.
- Analytical phase, systematic, or random errors in the chemical analyses are inherently possible, and may result in either an overestimation or underestimation of risk. AMEC had attempted to minimize the impact of this uncertainty by implementing adequate Quality Control/Quality Assurance measures during the sampling and analytical components of the investigation.
- Due to the heterogeneous distribution of contaminant concentrations across the Project study areas, it is important to ensure that adequate surrogate COPC concentrations will be truly representative of the risks that may be encountered within the study areas of the Project. For this assessment, the 95th percentile of baseline

concentration is used as the surrogate concentration and, therefore, results in an overestimation of risks.

3.1.5.2 Toxicity Assessment

Because of the inherent uncertainty in predicting toxicological responses from literature studies rather than directly measuring toxicity at the Project site, there is some uncertainty associated with TRVs. In most cases, TRVs are assumed to be conservative, with no toxicity anticipated if site concentrations are below TRVs. This is because most reference values are based on the most sensitive species tested or a similar low effect level.

In addition, toxicity tests upon which TRVs are based are typically conducted under conditions that maximize toxicity, for example, using soluble metal salts and high doses. Uncertainties exist in the toxicity assessment because of the:

- Use of animal models to predict effects on humans;
- Use of short-term toxicity studies (e.g., maximum two years for rodent studies) to predict effects from long-term exposures in humans; and
- Prediction of the adverse health effects of low-dose exposures in humans based on high or maximum tolerated doses.

3.1.5.3 Exposure Assessment

Conservative assumptions in the risk assessment were made to ensure any human receptors that take part in Traditional Land Use (TLU) within the study areas of the Project are provided sufficient protection. Uncertainties may occur in the assessment when using statistical or upper-bound parameters (i.e., 95^{th} percentile) as the representative concentrations. This may result in overestimation or underestimation of risk, depending on the distribution of the COPC concentrations. The risk assessment assumes that the 95^{th} percentile concentration is distributed uniformly across the study areas, whereas in reality, a heterogeneous distribution may likely be the case. Uncertainties may also occur in circumstances where data was below the method detection limit (MDL), resulting in the use of half of the detection limit as a surrogate value. Actual data below the MDL is unknown, and may contribute to an overestimation or underestimation of risk.

3.1.5.4 Risk Characterization

In the risk characterization step, toxicity and exposure information are combined to estimate the potential for carcinogenic and non-carcinogenic health effects. The toxicity factors developed by regulatory agencies are developed using very conservative models and approaches, employing several uncertainty factors. The conservatism of this approach was compounded by the assumption that only a fraction of the TRVs for non-carcinogenic and carcinogenic compounds are derived from the site, while the remainder are allocated to nonsite related food and other background exposures. The use of this approach is far more likely to overestimate potential risk than to underestimate hazard.

3.1.6 Human Health Risk Assessment Summary and Conclusions

This report presents a PQRA associated with potential exposures to COPCs identified in association with soil, surface water, and traditional country foods at the Project site. The PQRA used both historical and current sampling data, and is consistent with the methodology required by HC (2010a) for conducting preliminary human health risk assessments at federal sites in Canada.

Based on an evaluation of the site, it was determined that the primary carcinogenic exposure scenario of concern involved an adult Aboriginal who is a local, year-round resident and participates in such traditional activities as hunting, fishing, and the gathering and consumption of country foods. Similarly, the critical receptor for non-carcinogenic exposures was assumed to be an Aboriginal toddler accompanying the adult receptor who is also a local, year-round resident and partakes in the same traditional activities. Aboriginal families were assumed to exhibit exaggerated lifestyle habits (i.e., high consumption rates of country foods, continual year-round residency) to ensure that exposures were not underestimated.

Health risks from carcinogenic COPCs were evaluated using the adult characteristics, because most cancers develop over a longer period of time (long latencies), usually over the entire lifespan. Health risks from non-carcinogenic metals were evaluated based on the toddler receptor because toddlers ingest more soil and water per unit body mass, and have higher rates of hand-to-mouth activities than any other age class, increasing their exposure to metals through incidental ingestion.

The findings of the PQRA are as follows:

- Maximum baseline concentrations for arsenic and molybdenum exceeded human health criteria in soil, while maximum baseline concentrations for aluminum, arsenic, and cadmium exceeded human health criteria in surface water;
- The average values of the selected background levels were accepted as the Project baseline concentrations. HQs were calculated by dividing the average concentration by each parameter’s respective TRV. HQ values were noted to be below 1 for all CACs;
- Aluminum, cadmium, and molybdenum are noted to be below HC’s target risk of 0.2 for the toddler receptor, suggesting that adverse health effects would not likely occur;
- Arsenic is noted to be above HC’s target risk of 0.2 for the toddler receptor. The main exposure pathways responsible for the exceedance for the non-carcinogenic receptor are soil ingestion, surface water ingestion, and fish ingestion. However, it

should be noted that uncertainties exist in the risk assessment process, both in the derivation of TRVs as well as the exposure assessment assumptions (consumption rates). These uncertainties are addressed by the use of conservative assumptions in the exposure modelling and in the derivation of the TRVs. Therefore, actual exposures and the resulting risks are likely to be substantially lower than those presented in this assessment; and

- Arsenic is noted to be above HC's target risk level of $1.0x10^{-5}$ for the adult receptor. The main exposure pathways responsible for this exceedance for the carcinogenic receptor are noted to be surface water ingestion and fish ingestion. However, uncertainties exist in the risk assessment process, both in the derivation of TRVs as well as the exposure assessment assumptions (consumption rates). The uncertainties are addressed in the PQRA by the use of conservative assumptions in the exposure modelling and the derivation of the TRVs. Therefore, actual exposures and the resulting risks are likely to be substantially lower than those presented in this assessment.

3.2 Screening Level Ecological Risk Assessment

3.2.1 Problem Formulation

The problem formulation step of the SLERA defined the issues of the Project as they related to ecological receptors. In this step, COPCs for the SLERA are identified, and an Ecological Conceptual Site Model is developed that described basic assumptions regarding fate and transport of COPCs, ecological receptors, and exposure pathways.

3.2.1.1 Screening and Identification of Chemicals of Potential Concern

Risk-based guidelines were purposely set by regulatory agencies to be conservative, so that they could easily be used in screening procedures. They provided confidence that if the guidelines were not exceeded, the risk for adverse effects on ecological receptors would be considered acceptable, regardless of the exposure scenario. The level of detail of the risk assessment adopted for a particular situation should be commensurate with the degree and extent of potential effects to ecological receptors.

If the maximum baseline concentration of a chemical was less than its respective risk-based criterion, then the chemical was excluded as a COPC.

If the maximum baseline concentration of a chemical was greater than its respective risk-based criterion, then the chemical was included as a COPC. In this context, the conservatism of each risk-based guideline was such that an exceedance does not necessarily mean there was an unacceptable risk. Rather, an exceedance simply served to identify the chemical as being of potential concern so that the risks may be quantitatively assessed when using exposure assumptions.

Ecological COPCs were identified by comparing the maximum baseline concentrations for soil, surface water, and sediments with the CCME ecological guidelines (or other toxicity-based guidelines as appropriate) and local background concentrations. Any COPC for which the maximum baseline concentration exceeded guidelines was carried forward and assessed in the SLERA unless removed on the basis of other scientifically defensible considerations. Any removal of chemicals from further assessment was justified. For chemicals where the concentrations were below the method detection limits, half the detection limit was used as the surrogate value for any assessment and calculations.

For the purpose of the SLERA, the study areas for the Project were considered to be residential/parkland land use because:

- It is an environment dominated primarily by open woodland areas and barren areas;
- There are no commercial or industrial developments on the land, and it was expected to provide habitat for ecological receptors; and
- It is the lowest, most applicable, and most conservative land use guideline when more than one possible exposure scenario exists.

3.2.1.2 Screening for Soil

Analytical chemistry data for soil samples collected within the study areas of the Project were assessed and evaluated using the following provincial and federal regulatory guidelines for the purposes of identifying COPCs:

- BC *CSR* of the BC *EMA*, Schedule 4: Generic Numerical Soil Standards (for parkland and residential use); and
- CCME's CEQG: "Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health" (CCME, 2007) for residential/parkland land use.

In many cases, both SQG_{HH} and SQG_{E} were derived from the CCME guidelines, with the lower of the two values being selected as the basis of the SQG. Given that the SLERA is restricted to the evaluation of ecological receptors, the SQG_{E} was used for the identification of COPCs in soil.

In the absence of a BC *CSR* guideline for a specific chemical, the maximum concentrations were screened against the CCME guidelines, assuming a residential/park land use. These standards were developed to be protective of both environmental and human health. Half of the MDL value was used as a surrogate for concentrations that were noted to be below the MDL for the purposes of screening and the calculation of statistical summaries. The results of the screening for COPCs in soil are shown in **Table 3.2-1**.

3.2.1.3 Screening for Surface Water

The reported concentration data for surface water were assessed and evaluated for the purposes of identifying COPCs using:

- BC "Surface Water Quality Guidelines" (BC MOE, 2006a, b); and
- CCME's Canadian Environmental Quality Guidelines: "Canadian Water Quality Guidelines for the Protection of Aquatic Life" (CCME, 2007).

The maximum concentration in the surface water was compared with the guidelines, and those chemicals that had exceeded their respective guideline were carried forward into the SLERA. In the absence of a BC MOE guideline for a specific chemical, the maximum concentrations were screened against the CCME guidelines. The identification of COPCs in surface water collected within the study areas of the Project is provided in **Table 3.2-1**. For the purposes of screening and the calculation of statistical summaries, half of the MDL value was used as a surrogate for concentrations that were below the MDL.

Table 3.2-1: Screening of Chemicals of Potential Concern in Soil and Surface Water

Metal COPC	Soil (mg/kg)			Surface Water (mg/L)		
	Maximum Concentration[a]	Screening Guideline		Maximum Concentration[d]	Screening Guideline	
		CCME[b]	Government of BC[c]		Freshwater Aquatic Life Health	Wildlife Health[j]
Aluminum	n/a	n/a	n/a	**3.16**	0.1[e, f]	5[h]
Antimony	0.25	20	20	0.00089	0.002[g]	n/a
Arsenic	**80.8**	12	n/a	**0.029**	0.005[e, f]	*0.025[h]
Barium	152.0	500	n/a	0.092	5[g]	n/a
Beryllium	1.7	4	4	0.0026	0.0053[g]	*0.1[i]
Cadmium	2.0	10	n/a	**0.0053**	0.000003[e]	*0.08[i]
Chromium	27.4	64	n/a	**0.025**	0.001[e, g]	*0.05[i]
Cobalt	15.7	50	50	0.003	0.11[f]	1[i]
Copper	34.1	63	n/a	**0.15**	0.002[h]	0.3[h]
Lead	29.6	140	n/a	**0.0108**	0.003[f]	0.1[h]
Mercury	0.25	6.6	n/a	0.00002	0.000026[e]	0.003[h]
Molybdenum	**14.8**	10	10	0.0075	0.073[e]	0.05[h]
Nickel	15.7	50	100	0.0057	0.025[e]	0.1[i]
Selenium	0.25	1	3	0.0009	0.001[e]	0.004[h]
Silver	0.70	20	20	0.00009	0.0001[e]	n/a
Thallium	11.8	1	n/a	0.0001	0.0008[e]	n/a
Vanadium	72.4	130	200	**0.0069**	0.006[g]	0.1[i]
Zinc	114.0	200	n/a	**4.7**	0.03[e]	2[j]

Notes: [a]Maximum baseline soil concentrations. Baseline soil concentrations provided by AMEC Soil Quality and Vegetation Group; [b]Canadian Environmental Quality Guidelines: "Canadian Soil Quality Guideline for the Protection of Environmental Health" (CCME, 2007). Value represents guideline protective of residential/parkland use; [c]BC *Environmental Management Act*, *Contaminated Sites Regulation*, Schedule 4: Numeric Soil Standards (Government of BC, 1996); [d]Maximum surface water (total) concentrations. Baseline surface water concentrations provided by AMEC Water and Sediment Quality Group [e]CCME Canadian Environmental Quality Guidelines: "Canadian Water Quality Guideline for the Protection of Aquatic Life" (CCME, 2007); [f]BC Water Quality Guideline (Criteria) Reports for the Protection of Freshwater Aquatic Life (BC MOE, 2006a); [g]BC Compendium of Working Water Quality Guidelines for the Protection of Freshwater Aquatic Life (BC MOE, 2006b); [h]BC Water Quality Guideline (Criteria) Reports for the Protection of Wildlife or Livestock (BC MOE, 2006a); [i]BC Compendium of Working Water Quality Guidelines for the Protection of Wildlife or Livestock (BC MOE, 2006b); [j]Wildlife Health – water quality guideline designed to protect all livestock, typically based on studies involving reduced growth and longevity. Metal was selected as a COPC in soil if the maximum baseline concentration exceeded screening guideline in soil, and in water if maximum baseline concentration exceeded screening guidelines in water. **Bold** and underlined indicate metal exceeded guidelines.
* indicates interim guideline, under review; BC = British Columbia; CCME = Canadian Council of Ministers of the Environment; COPC = Chemical of Potential Concern; mg/kg = milligrams per kilogram; mg/L - milligrams per litre; n/a = not applicable/available

3.2.1.4 Screening for Sediments

Analytical chemistry data for sediments were assessed and evaluated using the following provincial and federal regulatory guidelines for the purposes of identifying COPCs:

- BC "Sediment Quality Guidelines," a compendium of working sediment quality guidelines for BC (BC MOE, 2006c); and
- CCME's "Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life" (CCME, 2002).

In the absence of a BC MOE guideline for a specific chemical, the maximum concentrations were screened against the CCME guidelines. For the purposes of screening and the calculation of statistical summaries, half of the MDL value was used as a surrogate for concentrations that were below the MDL. Sediment samples were collected within the Project study areas. The maximum baseline sediment concentrations for arsenic, cadmium, and zinc were reported to exceed CCME's Probable Effect Levels (PEL) criteria for sediment quality (**Table 3.2-2**). The maximum baseline background concentrations for arsenic, cadmium, chromium, copper, lead, mercury, and zinc were all reported to exceed CCME's Interim Sediment Quality Guidelines (ISQG). These metals were carried forward for further assessment as COPCs in sediments for this assessment.

Sediment data collected within the Project can be found in **Appendix 1**. Sample locations for sediments are discussed further in Section 5.

Table 3.2-2: Identification of Chemicals of Potential Concern in Sediments

Metal COPC	Maximum Baseline Concentration (mg/kg)	Number of Samples Analyzed	CCME, BC MOE		Other Jurisdictions	COPC
			ISQG	PEL		
Aluminum	30,800	50	n/a	n/a		No
Antimony	3.7	50	n/a	n/a	25[a]	No
Arsenic	245	50	5.9	17		**Yes**
Barium	279	50	n/a	n/a		No
Beryllium	1.9	50	n/a	n/a		No
Cadmium	9.83	50	0.6	3.5		**Yes**
Chromium	67.3	50	37.3	90		**Yes**
Cobalt	16.1	50	n/a	n/a		No
Copper	61.8	50	35.7	197		**Yes**
Lead	50.7	50	35	91.3		**Yes**
Mercury	0.28	50	0.17	0.486		**Yes**
Molybdenum	6.10	50	n/a	n/a		No
Nickel	45.3	50	n/a	n/a	75[b]	No
Selenium	3.7	50	n/a	n/a	2	No
Silver	3.7	50	n/a	n/a	0.5	No

Metal COPC	Maximum Baseline Concentration (mg/kg)	Number of Samples Analyzed	CCME, BC MOE		Other Jurisdictions	COPC
			ISQG	PEL		
Thallium	0.46	50	n/a	n/a		No
Tin	7.8	50	n/a	n/a		No
Vanadium	69.3	50	n/a	n/a		No
Zinc	2,980	50	123	315		**Yes**

Notes: [a]*A compendium of working water quality guidelines for BC (*BC MOE, 2006); [b]*Technical Guidance for Screening Contaminated Sediment* (New York State Department of Environmental Conservation, 1999).
Bold and underlined l indicates metal is a COPC in sediments for SLERA
BC MOE = British Columbia Ministry of Environment; CCME = Canadian Council of Ministers of the Environment; COPC = Chemical of Potential Concern; ISQG = Interim Sediment Quality Guidelines; PEL = Probable Effects Level; mg/kg = milligrams per kilogram; n/a = not available

3.2.1.5 Summary of Identified COPCs

Based on the maximum baseline concentrations of COPCs in soil, surface water, and sediments, a summary of the identified COPCs that were carried forward into the SLERA is provided in **Table 3.2-3**.

Table 3.2-3: Summary of Identified Chemicals of Potential Concern

Metal COPC	Soil	Surface Water		Sediments
		Freshwater Aquatic	Wildlife	
Aluminum	No	**Yes**	No	No
Antimony	No	No	No	No
Arsenic	**Yes**	**Yes**	**Yes**	**Yes**
Barium	No	No	No	No
Beryllium	No	No	No	No
Cadmium	No	**Yes**	No	**Yes**
Chromium	No	**Yes**	No	**Yes**
Cobalt	No	No	No	No
Copper	No	**Yes**	No	**Yes**
Lead	No	**Yes**	No	**Yes**
Mercury	No	No	No	**Yes**
Molybdenum	**Yes**	No	No	No
Nickel	No	No	No	No
Selenium	No	No	No	No
Silver	No	No	No	No
Thallium	No	No	No	No
Tin	No	No	No	No
Vanadium	No	**Yes**	No	No
Zinc	No	**Yes**	**Yes**	**Yes**

Note: COPC = Chemical of Potential Concern

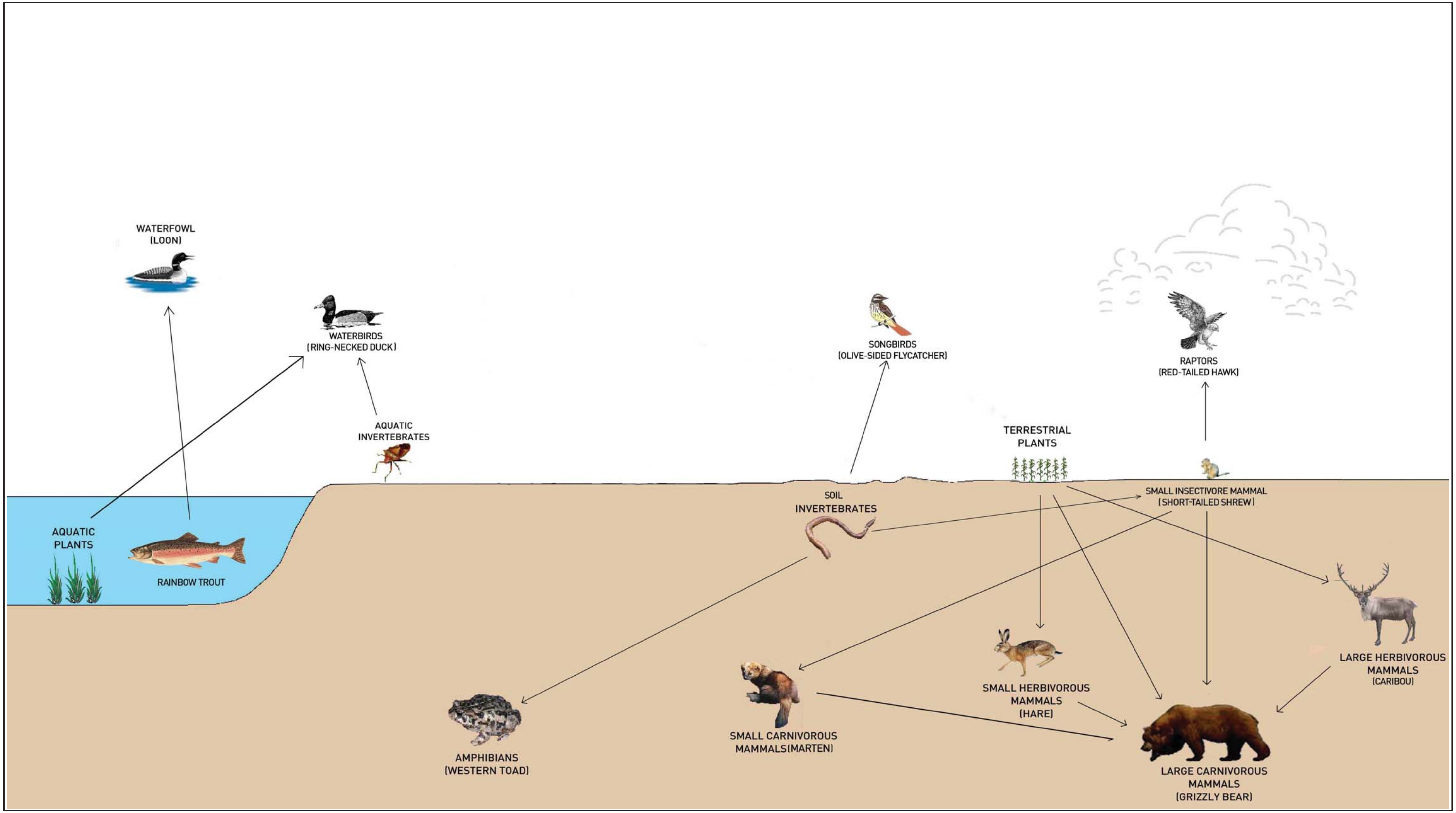
3.2.1.6 Ecological Conceptual Site Exposure Model

Since there were no significant sources of organic parameters, all COPCs identified for the Project are inorganic parameters. The inorganic parameters identified as COPCs are present as insoluble complexes at circum-neutral pH and tend to be associated with soil particles rather than in the dissolved phase, thereby minimizing subsurface migration.

The study areas associated with the Project are located in an undeveloped natural area (assumed to be residential/parkland land use) with nearby watersheds. Ecological receptors that might reasonably be expected to reside at or frequent the Project study areas include terrestrial vegetation, soil invertebrates, reptiles, amphibians, mammals, and birds. Ecological receptors such as aquatic vegetation, invertebrates, amphibians, and fish are also expected to be present in nearby lakes and creeks. Given the COPCs present in soil, sediments, and surface water, ecological receptors are potentially exposed to background concentrations of COPCs via several primary exposure pathways:

- Mammals can potentially be exposed to background concentrations of COPCs through food, soil, and water ingestion;
- Birds can potentially be exposed to background concentrations of COPCs through food, soil, sediments, and water ingestion;
- Amphibians can potentially be exposed to background concentrations of COPCs through direct contact with soil and surface water;
- Fish can potentially be exposed to background concentrations of COPCs through direct contact with surface water and food;
- Terrestrial vegetation can potentially be exposed to background concentrations of COPCs in soil;
- Soil invertebrates can potentially be exposed to background concentrations of COPCs in soil;
- Aquatic vegetation can potentially be exposed to background concentrations of COPCs in surface water; and
- Aquatic invertebrates can potentially be exposed to background concentrations of COPCs in surface water.

Chemicals, media, ecological receptors, and exposure pathways examined in the SLERA are illustrated in the Ecological Conceptual Site Exposure Model (**Figure 3.2-1**). The selection rationale for the ecological receptors is further explained in **Section 1.5.2**.



Notes: A. Ingestion of soil (Not Shown) B. Ingestion of Water (Not shown) C. Direct Contact With Soil (Not Shown) D. Direct Contact with Water (Not Shown) E. Inhalation of Air (Not Shown) F. Inhalation of Dust (Not Shown)

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amec

DWN BY:	MY
CHK'D BY:	JK
DATUM:	NAD83
PROJECTION:	N/A
SCALE:	N/A

PROJECT: Blackwater Gold Project

TITLE: Ecological Conceptual Site Exposure Model

DATE:	April 2012
PROJECT NO:	VE52277
REV. NO.:	A
FIGURE No.	3.2-1

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3.2.2 Receptor Characterization

The receptor characterization step in the SLERA includes the description of the Project site with respect to the ecological habitats or resources present or likely to be present. Receptor characterization is designed to:

- Identify VCs (biological communities, populations, individuals or habitats potentially at risk, including rare, threatened, or endangered species);
- Identify potential exposure pathways and routes by which ecological receptors may be exposed to background concentrations of chemicals readily bioavailable in the environment; and
- Determine the appropriate assessment endpoints for the SLERA.

3.2.2.1 Valued Components

A receptor is defined as an organism or group of organisms that have the potential to be affected by a chemical or other stressors. Receptors selected for assessment represent VCs that were defined as resources or environmental features that are important to human populations, have economic and/or social value, or have intrinsic ecological significance. The VCs have local, regional, provincial, national, and/or international profiles, and serve as a baseline from which the effects of development can be evaluated, including changes in management or regulatory policies. Because it is not possible to evaluate all ecological species that may potentially be present at a site, representative receptors are selected based on several criteria (CCME, 1996), including:

- Threatened or endangered species;
- Sensitivity to chemicals;
- Biological and ecological relevance;
- Ability to measure or predict effects; and
- Social relevance (i.e., species of recreational, commercial, or social importance).

VCs are not always identified at the species level; rather, VCs can represent major groups of receptors deemed to be important, and are sometimes defined at the trophic level. For example, benthic invertebrates may be identified as an important ecological component, due to their role as filter feeders and prey for fish; individual species of invertebrates are not typically identified as VCs.

The exception is when at-risk species (endangered or otherwise threatened) are present (e.g., western toad). When such species are present, additional consideration should be given to providing protection at the level of the species or individual.

According to the *Species at Risk Act* (*SARA*) (Government of Canada, 2002), species at risk are categorized as:

- *Extinct:* a wildlife species that no longer exists anywhere in the world;
- *Extirpated:* a wildlife species that no longer exists in the wild in Canada, but exists elsewhere;
- *Endangered*: a wildlife species that is facing imminent extirpation or extinction;
- *Threatened*: a wildlife species likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction; and
- *Special concern*: a wildlife species that may become a threatened or endangered species because of a combination of biological characteristics and identified threats.

3.2.2.2 Identification of Potential Receptors

VCs are limited to three groups of ecological receptors that may be exposed to background concentrations of COPCs readily bioavailable in media:

1. Aquatic receptors directly exposed to background concentrations of chemicals readily bioavailable in surface water and/or sediment.
2. Wildlife exposed to background concentrations of chemicals via ingestion of surface water and food items or by direct soil contact.
3. Terrestrial plants and soil invertebrates exposed by direct soil contact.

Several VCs representing major ecosystem components were identified for inclusion in the SLERA, including mammals, birds, amphibians, fish, invertebrates (soil and aquatic), and vegetation (terrestrial and aquatic).

Justification for the selection of each receptor, as well as details on receptor characteristics and potential uptake pathways for each receptor, are provided in the following subsections.

3.2.2.3 Mammals

Mammals, including large and small carnivorous/omnivorous, herbivore ungulate, small herbivorous furbearing, and small insectivore furbearing, were selected as VCs to address concerns that their health could be adversely affected by background concentrations of chemicals readily bioavailable within the study areas of the Project. Mammals selected as VCs for the SLERA are described below.

<u>Large Carnivorous/Omnivorous Mammals</u>

Large carnivorous/omnivorous mammals were assessed as receptors because they were identified as a VC in the proposed Application Information Requirements (AIR). The grizzly bear (*Ursus arctos*) was recognized as a VC in the AIR by the Wildlife discipline (AIR: Section 5.4.8). Details regarding the reasons for their selection as a VC are provided in the Wildlife Baseline. Grizzly bears were assessed as a representative species for this SLERA, and it was assumed that if risks were acceptable for a typical grizzly bear, then risks would be acceptable for all other large carnivorous/omnivorous mammals. In BC, grizzly bears occur across over four-fifths of the land area of the province, with the exception of Vancouver Island and Haida Gwaii (BC MWLAP, 2002). The home range of the grizzly bear extends across northern BC, southward through the Coast Mountains, and down through the Rocky and Purcell mountains to the US border (BC MWLAP, 2002). The natural abundance of grizzly bears at any particular location depends on the productivity of the habitat. The number of animals per 100 km^2 of habitat varies from 25 or more at Kodiak Island, where salmon and lush vegetation are plentiful, to less than 0.5 on the sparsely vegetated Arctic tundra. In BC, densities tend to be higher on the coast (7 to 10 per 100 km^2) and somewhat lower in the interior (3 to 6 per 100 km^2) (BC MWLAP, 2002). Compared to the expected mine footprint, the grizzly bear would be expected to spend a very small proportion of its time on site. The predominant pathways by which grizzly bears can be exposed to background concentrations of COPCs within the study areas of the Project are ingestion of food, water, and soil. The grizzly bear is omnivorous, preying directly on a variety of mammals (e.g., mice, lemmings, voles, ground squirrels, caribou), as well as feeding on fish, berries, and vegetation.

<u>Large Herbivorous Mammals</u>

Large herbivorous ungulate mammals were assessed as a receptor because they were identified as a VC in the proposed AIR. The Wildlife discipline recognized the caribou (*Rangifer tarandus*) and moose (*Alces alces*) as VCs for the Project (AIR, Section 5.4.8). Details regarding their selection as VCs are provided in the Wildlife Baseline. For this SLERA, the caribou is assessed as a representative species, and it is assumed that if risks are acceptable for a typical caribou, then risks would be acceptable for all other large herbivorous ungulate mammals. In BC, woodland caribou occur east of the Coast Mountains, from the Yukon border south to the Itcha-Ilgachuz in the Western Chilcotin, and eastwards to the foothills of the northern Rocky Mountains; in the Caribou, Selkirk, Purcell, and Monashee mountains in the southeast; and throughout the highlands and plateaus in the province’s northern and central interior (BC MELP, 2000). Environmental changes have reduced their range in BC, especially in the central and southern half of the province. Today, caribou occupy about 85% of their historic range in BC, with mountain caribou occupying about 60% of their historic range (BC MELP, 2000). Compared to the expected mine footprint, the caribou would be expected to spend a very small proportion of its time on site. The predominant pathways by which the caribou may be exposed to background concentrations of COPCs within the study areas of the Project are ingestion of food, water, and soil.

Small Carnivorous/Omnivorous Mammals

Small furbearing carnivorous mammals were assessed as a receptor because they were identified as a VC in the proposed AIR. The Wildlife discipline recognized the marten (*Martes americana*) as a VC for the Project (AIR, Section 5.4.8). Details regarding their selection as a VC are provided in the Wildlife Baseline. The marten was assessed as a representative species for this SLERA, and it was assumed that if the risk of adverse effects for a typical marten was acceptable, they also would be acceptable for all other small, carnivorous, furbearing mammals. Martens occur in conifer-dominated forests throughout BC, including Vancouver Island, Haida Gwaii, and some of the smaller coastal islands. They have long been considered an old-growth dependent species; while it is true that they thrive in older forests, recent research has shown that it is the structural make-up of the forest, not its age, that is of greatest importance (BC MWLAP, 2003). In BC, the best marten habitats are in relatively moist forests. Martens occur at all elevations along the coast and in the central and northern parts of the province, but are most common at high elevations in the southern interior (BC MWLAP, 2003). They do not regularly subsist in open habitats such as grasslands, agricultural areas, and recent clear-cuts, or thinned forest plantations with little groundcover. Compared to the expected mine footprint, the marten would be expected to spend a very small proportion of its time on site (BC MWLAP, 2003). The predominant pathways by which the marten may be exposed to background concentrations of COPCs readily bioavailable within the study areas of the Project are ingestion of food, soil, and water. The marten feeds on a variety of small mammals as well as birds, fish, insects, eggs, fruits, and nuts.

Small Herbivorous Mammals

Small, furbearing herbivorous mammals were not identified as a VC in the AIR or by the Wildlife discipline; however, they were recognized as a receptor for this SLERA because of their abundance near the Project study areas and their role in the biotransfer of COPCs along the food chain. The snowshoe hare (*Lepus americanus)* was assessed as a representative species, and it was assumed that if the risk was acceptable for a typical snowshoe hare, the risk would be acceptable for all other small, herbivorous, furbearing mammals. Snowshoe hares can potentially be exposed to background concentrations of COPCs within the study areas of the Project via ingestion of food, soil, and surface water.

Small Insectivorous Mammals

Small, insectivorous mammals were not identified as a VC in the AIR or by the Wildlife discipline; however, they were recognized as a receptor for this SLERA because of their abundance and small home range within the vicinity of the Project study areas. They were also recognized as a receptor because of their high food intake in relation to their small body size (i.e., their high metabolism makes them more susceptible to the adverse effects of COPCs). The short-tailed shrew (*Blarina brevicauda)* was assessed as a representative species, and it was assumed that if the risk was acceptable for a typical short-tailed shrew, then the risk would also be acceptable for all other small insectivorous mammals. The short-tailed shrew may potentially be exposed to background concentrations of COPCs readily bioavailable within the study areas of the Project activities via ingestion of food, soil and surface water.

3.2.2.4 Birds

Birds, including raptors, songbirds, and waterbirds/waterfowl, were selected as a VC to address concerns that their health could be adversely affected by background concentrations of chemicals readily bioavailable within the study areas of the Project. Birds selected as VCs for the SLERA are described below.

Raptors

The surrounding region provides suitable habitat for a number of avian species, both as long-term inhabitants and migratory species. Raptors or birds of prey were identified as a VC in the proposed AIR by the Wildlife discipline (AIR, Section 5.4.7). For the purposes of this assessment, the red-tailed hawk (*Buteo jamaicensis*) has been categorized as a representative receptor for raptors, since it was recognized as a VC in the Wildlife section. Details regarding their selection as a VC were provided in Section 5: Wildlife. It was assumed that if the risk was acceptable for a red-tailed hawk, with its characteristics that are typical of raptors, then they would also be acceptable for all other raptors. The predominant pathways by which raptors may be exposed to background concentrations of COPCs readily bioavailable within the study areas of the Project include ingestion of food, water, and soil. Raptors are carnivorous, preying on a variety of small birds and mammals.

Songbirds

Songbirds were assessed as a receptor because they were identified as a VC in the proposed AIR by the Wildlife discipline (AIR, Section 5.4.7). The olive-sided flycatcher (*Contopus cooperi*) is commonly found in the region, and was assessed as a representative species in this SLERA. Details regarding their selection as a VC are provided in Section 5: Wildlife. It was assumed that if the risk was acceptable for the olive-sided flycatcher, then the risk would be acceptable for all other songbirds. The predominant pathways by which songbirds may be exposed to background concentrations of COPCs within the study areas of the Project are ingestion of food, water, and soil. Songbirds feed on a variety of insects, invertebrates, and vegetation.

Waterbirds/Waterfowl

Waterfowl were assessed as a receptor because they were identified as a VC in the proposed AIR by the Wildlife discipline (AIR, Section 5.4.7). The ring-necked duck (*Aythya collaris*) was identified in the region, and selected as a VC in the Wildlife section: it was, therefore assessed as a representative surrogate species in this SLERA. Details regarding their selection as a VC are provided in Section 5: Wildlife. As a diving duck, the ring-necked duck feeds on a variety of aquatic vegetation and invertebrates. As is the case with the other surrogate species identified in this report, it was assumed that if the risk was acceptable for the ring-necked duck, then the risk would be acceptable for all other dabbling waterbirds. The predominant pathways by which waterbirds may be exposed to background concentrations of COPCs readily bioavailable within the study areas of the Project are ingestion of food, sediments, and water.

The Pacific loon (*Gavia pacifica*) was not identified as a VC in the AIR or by the Wildlife discipline; however, they were recognized as a receptor for the SLERA because of their ecological significance as a piscivorous bird within the vicinity of the Project study areas. As is the case with the other surrogate species identified for the SLERA, it was assumed that if the risk was acceptable for the Pacific loon, the risk would be acceptable for all other waterfowl. The predominant pathways by which this piscivorous waterfowl may be exposed to background concentrations of COPCs readily bioavailable within the study areas of the Project are ingestion of fish and surface water.

3.2.2.5 Amphibians

Amphibians were assessed as a receptor because they were identified as a VC in the Wildlife section and in the proposed AIR (Section 5.4.6). The western toad (*Anaxyrus boreas)* was assessed as a surrogate species, and it was assumed that if the risk was acceptable for the western toad, the risk would be acceptable for all other amphibians. Details regarding their selection as a VC are provided in Section 5: Wildlife. The western toad may potentially be exposed to background concentrations of COPCs readily bioavailable within the study areas of the Project through direct contact with soil and ingestion of soil invertebrates. The western toad feeds on a range of invertebrates.

3.2.2.6 Fish

Freshwater fish such as rainbow trout (*Oncorhynchus mykiss*), kokanee (*Oncorhynchus* nerka), and mountain whitefish (*Prosopium williamsoni)*, were recognized as VCs in the proposed AIR by the Fisheries discipline (AIR, Section 5.3.7). For the purposes of this SLERA, the rainbow trout has been selected as a surrogate receptor, because of their importance in the ecosystem both as a predator and as a food source for piscivorous birds and mammals. It was assumed that if the risk was acceptable for the rainbow trout, the risk would be acceptable for all other freshwater fish.

3.2.2.7 Invertebrates – Soil

Invertebrates were assessed as a receptor because they were recognized as a VC in the proposed AIR by the Wildlife discipline (AIR, Section 5.4.9). Open areas not covered by building footprints or areas with various soil conditions likely support indigenous soil invertebrates such as earthworms, grubs, arthropods, etc.

In terms of sensitivity to toxicants, earthworms are generally considered to be one of the most sensitive receptors for soil chemicals. Earthworms are in near-constant direct dermal contact with soil. Earthworms are probably the most important soil invertebrate in promoting soil fertility (Edwards, 1992). Their feeding and burrowing activities break down organic matter, release nutrients, and improve aeration, drainage, and aggregation of soil. Earthworms are also important components of the diets of many higher animals. Due to their importance in a healthy ecosystem, as well as their ubiquity in the environment, earthworms were selected as a representative surrogate for all soil invertebrate species in the SLERA.

3.2.2.8 Invertebrates – Aquatic and Benthic

Aquatic and benthic invertebrates are an important group of organisms in most freshwater systems. Macro-invertebrates can act as prey for many fish species and are critical for the proper function of aquatic ecosystems. Aquatic invertebrates are in direct contact with surface water.

Benthic invertebrates are in direct contact with sediments and pore water, and thus receive more exposure to sediment-borne chemicals than any other group. Additionally, invertebrates as a group tend to be one of the most sensitive to environmental chemicals, so protection of invertebrates also tends to result in protection of other species. Invertebrates are often used as indicators of environmental degradation, because of their rapid and predictable response to various environmental chemicals and other stressors. Aquatic and benthic invertebrates are a critical source of food for predatory fish such as trout and waterbirds. For this assessment, only risks to aquatic invertebrates were evaluated, with the potential exposure pathway being surface water.

3.2.2.9 Plants – Terrestrial

Terrestrial plants were assessed as a receptor to ensure that their health near the Project study areas would not be adversely affected by accumulating COPCs from the soil. Certain plants in the study areas of the Project represent important country foods for local Aboriginal community populations. As autotrophs, plants are the foundation of any terrestrial ecosystem, including those heavily influenced by humans. The type and quality of vegetative growth is the most visible indicator of forest health. Terrestrial plants were evaluated as a generic group rather than as individual species.

3.2.2.10 Plants – Aquatic

Aquatic plants play an important role in most freshwater systems. Aquatic plants exist in a variety of forms, including submerged, emergent, and free-floating. Aquatic plants, including algae, oxygenate the water and form the basis of the aquatic food chain. Submerged macrophytes also provide habitat and cover for a variety of fish. Birds use emergent forms, such as cattails, bullrushes, and reeds, for cover and food. Aquatic plants were evaluated as a generic group rather than as individual species.

3.2.2.11 Species Not Assessed

Other species or groups of organisms not selected as VCs may also inhabit the study areas of the Project, and may potentially be exposed to background concentrations of COPCs. However, given the number of species potentially present in the area, it is neither practical nor appropriate to consider all species.

3.2.2.12 Assessment Endpoints

Assessment endpoints are descriptions of ecosystem properties that are to be assessed. For SLERAs, these often include properties at higher levels of organization, such as population abundance or diversity (Suter et al., 2000).

Assessment endpoints identified for the SLERA were:

- Survival and reproduction of large mammals (represented by the grizzly bear and caribou);
- Survival and reproduction of small mammals (represented by the marten, short-tailed shrew, and hare);
- Survival and reproduction of bird species, such as raptors, songbirds, shorebirds, and waterfowl (represented by the red-tailed hawk, olive-sided flycatcher, and Pacific loon);
- Survival and reproduction of amphibian populations (represented by the western toad);
- Survival and reproduction of fish populations (represented by rainbow trout);
- Survival and growth of soil invertebrates (represented by the earthworm);
- Survival and growth of aquatic invertebrates (represented by the community as a whole);
- Survival and growth of terrestrial plants (including grasses, shrubs, bushes, and trees); and
- Survival and growth of aquatic plant communities.

Measurement endpoints are conceptually related to assessment endpoints, but are quantifiable using standard toxicological methods such as laboratory exposures. For wildlife, measurement endpoints are usually defined as some low-effect threshold concentration in a sensitive species. For this SLERA, the Lowest Observable Adverse Effect Levels (LOAELs) or Lowest Observable Adverse Effect Concentrations (LOAECs) derived from laboratory studies using oral exposures in representative small mammals, fish, and birds were selected as the measurement endpoints. The LOAEL was the lowest concentration at which a relevant adverse effect (e.g., diminished growth or fewer offspring) was demonstrated in a study using appropriate exposure conditions. Where toxicological data for the surrogate species (VC) was not available, LOAELs were estimated using allometry (i.e., the relationship of body size to anatomy, physiology, and behaviour). For plants and invertebrates, it is not possible to estimate concentrations that would constitute thresholds for toxic effects at a particular site from published toxicity data due to the diversity of soils, sediments, chemical forms, species, and test procedures used in the generation of these data. Therefore, for these VCs, measurement endpoints sometimes consisted of benchmark concentrations derived from multiple endpoints (e.g., 10th percentile of effective concentration to induce a 50% effect (EC_{50}) data from several different endpoints).

3.2.3 Exposure Assessment

The exposure assessment includes an analysis of the pathways through which VCs may be exposed to background concentrations of COPCs, and an estimate of the concentrations to which they may be exposed. For a COPC to have deleterious effects on ecological receptors, the organism or receptor must come into contact with the COPC. The route by which this occurs is referred to as an exposure pathway, and is dependent on the natures of both the chemical and the receptor. A complete exposure pathway is one that meets the following criteria:

- A source of constituents of interest must be present;
- Release and transport mechanisms and media must be available to move the constituents from the source to the ecological receptors;
- An opportunity must exist for the ecological receptors to contact the affected media; and
- A means must exist by which the constituent is taken up by ecological receptors, such as ingestion, inhalation, or direct contact with skin or membranes.

The exposure assessment consists of several steps, including the description of the fate and transport of COPCs in the environment, an examination of potential exposure pathways, and estimation of exposure levels for each VC.

3.2.3.1 Pathway Analysis

<u>Root Uptake</u>

Plants are potentially exposed to background concentrations of COPCs via root uptake, and, in some cases, foliar uptake. Root uptake is the primary route of exposure for terrestrial plants.

For metals and metalloids, root uptake of a COPC was a function of:

- Chemical characteristics that are responsible for the mobility of the element in the soil environment,
- Soil characteristics (e.g., pH, clay and organic matter content and type, and moisture content), and
- Selective absorption from soil solution by the root.

Many metals and metalloids are readily assimilated through plant roots if they are dissolved in water. Metals may be taken up passively with the mass flow of water into roots or by membrane transport systems responsible for uptake of nutrient elements. Depending on the metal's chemical properties, it can be translocated via the vascular system to most areas of the plant.

Direct Soil Contact

The primary route of exposure for soil invertebrates is direct contact with, or ingestion of, COPCs in soil. Earthworms are known to take up various inorganic and organic soil chemicals through consumption of humus (well-decomposed organic material) in surface soil and less decomposed leaf litter at the ground surface. The uptake of metals into the tissue of earthworms depends primarily on the metal's physicochemical properties. Site-specific factors, such as organic content of the soil, can also affect bioavailability.

The feeding and burrowing habits of earthworms determine their exposure to chemicals in soil and litter. Earthworms may be categorized into three groups based on feeding habits and the structure of burrows:

- Litter-feeding species forage on surface litter, but build deep, vertical burrows up to 3 m below the surface;
- Geophagus species consume large amounts of soil during feeding on humus in near-surface strata, and construct primarily shallow (<1 m), horizontal burrows; and
- Worms resting during cold or dry conditions construct ephemeral vertical burrows in upper (<1 m) soil strata.

Depending on the depth of contamination, geophagus organisms and those living on or near the soil surface may have very different exposure to chemicals than worms feeding on litter pulled down into burrows in the subsoil (Curl et al., 1987). For a situation like that at the Project site, burrowing depth is the dominant factor affecting exposure. Lee (1985) reviewed studies of earthworm burrow morphology for several species in various countries. A few species (e.g., *Microchaetus microchaetus*, *Octochaetus multiporus*) are known to burrow to depths as great as 3 m below the surface, but they are not present in Canada. The more common species of *Lumbricus* and *Eisenia* generally burrow only in the upper 0.8 m, or even the upper 0.1 m (Lee, 1985). Zicsi (1983) identified several European species that burrow up to 1.5 m. Other studies have demonstrated that even among species known to be capable of creating deep casts, the largest fraction of biomass is frequently found in the upper soil strata where concentrations of organic materials are greatest (Suter et al., 2000). For example, densities of *Aporrectodea caliginosa*, which burrows to depths up to 0.3 m or more, were greatest from 0 cm to 8 cm in depth, intermediate in the layers from 8 cm to 15 cm and 15 cm to 20 cm, and lowest from 20 cm to 30 cm (Pitkanen and Nuutinen, 1997).

Given the distribution of metals in soil at the Project site, exposure of earthworms to COPCs via direct contact with contaminated soil was assumed to be a complete exposure pathway in the SLERA.

Although dermal soil contact is a potential operating pathway for terrestrial wildlife such as the hare and shrew, the contribution from this pathway in most cases is negligible compared to other pathways, such as ingestion.

<u>Incidental Ingestion of Soil</u>

Wildlife is exposed to background concentrations of chemicals in soil via several pathways, including ingestion and dermal contact. While both pathways can potentially result in uptake depending on the properties of the chemical, the predominant pathway for both birds and mammals is usually ingestion. Feathers and fur limit the amount of direct chemical contact with the skin, but soil that adhered to feathers or fur may be ingested during grooming or preening (Sample and Suter, 1994).

Soil comprises a small fraction of the diet for many organisms. The actual quantity of soil ingested depends on the life history traits of the species. For burrowing mammals such as the hare, which may frequently be in direct contact with the soil, the quantities of soil ingested may be significant. A major source of soil ingested by both mammals and birds is soil adhered to the surface and the gut of prey items, such as earthworms. Quantities of soil ingested from these different sources are not typically identified. Rather, exposure is quantified through the estimation of average overall soil consumption (as a fraction of diet) for each species.

Of the COPCs consumed by an organism in the soil, only a fraction was absorbed through the gut and is available to cause toxicity. For the purposes of this risk assessment, it is assumed that the entire quantity of COPCs in soil consumed by mammals and birds is available and can potentially result in adverse effects.

<u>Ingestion of Food/Prey</u>

Mammals such as the grizzly bear, caribou, hare, and marten can be exposed to background concentrations of COPCs in soil via consumption of vegetable matter (e.g., leaves, berries) of plants that have accumulated COPCs from soils. Plants growing in soils containing concentrations of chemicals may accumulate, and can potentially distribute those chemicals to portions of the plant consumed by herbivores and omnivores. Similarly, soil invertebrates in contact with contaminated soil can accumulate metals, which can be assimilated by insectivores or birds upon consumption of prey.

Although uptake from soil to vegetation and soil invertebrates varies according to soil chemistry, a reasonable estimate of metal accumulation can be achieved using uptake factors and equations based on studies in which measured concentrations in soil and vegetation or invertebrates were reported.

Direct Exposure to COPCs in Sediment

Sediment-dwelling organisms are potentially exposed to background concentrations of COPCs in sediment and interstitial (pore) water via several pathways, including ingestion, dermal contact, and uptake across respiratory membranes. All pathways are potentially present for benthic invertebrates and may contribute in part to the overall uptake of chemicals from sediment. However, the exposure assessment for sediments primarily involves determining the bulk concentrations of COPCs in sediment. Rooted aquatic plants (e.g., cattails or salt grass) are assumed to be exposed to background concentrations of COPCs from the surface water, but they may also take up COPCs by their roots from sediments.

The actual uptake varies for each chemical and depends on a number of factors. Sediment consists of a combination of solid and liquid material. For most chemicals, uptake is assumed to occur from the aqueous phase. In general, metals associated with the solid phase are largely unavailable for uptake by organisms. Uptake for most exposure routes occurs primarily from pore water. Bioavailability of metals in sediments is the determining factor in metal toxicity.

Direct Exposure to COPCs in Surface Water

Metals in surface water can exist in several forms, most commonly in dissolved forms or absorbed to suspended particulates. Metals dissolved in surface water readily bind to respiratory surfaces and induce adverse effects in fish or amphibians. For metals dissolved in surface water, the primary uptake pathway for fish and larval stages of amphibians was via the gills. Uptake by ingestion and dermal adsorption is considered to be negligible when compared to uptake via the gills. Toxicological effects are most closely associated with the dissolved fraction of metals, and most toxicological models assume metals must be in solution to induce toxicity. Nevertheless, in practical terms, this has little bearing on the evaluation of exposure in a SLERA, as aqueous toxicological data is, in almost all cases, simply related to total metal concentration.

Uptake from surface water is a major exposure pathway for aquatic invertebrates and plants. Aquatic invertebrates accumulate and transfer COPCs up the food chain. Aquatic invertebrate organisms are exposed to background concentrations of COPCs through the water column. Aquatic plants exist in one of two forms: rooted to the sediment (submerged or emergent), or free-floating. Uptake in free-floating plants is limited to chemicals in surface water only, while rooted species potentially accumulate chemicals from sediment as well as surface water. However, as most chemicals must be in the dissolved phase for root uptake, uptake from sediment actually occurs via the sediment pore water. Moreover, despite physiological differences between rooted aquatic plants and terrestrial plants, uptake from surface water is the major exposure pathway, and more important than uptake from roots (Nigam et al., 1998). In many species, roots primarily served a physical role as anchors, rather than as an organ by which nutrients and chemicals are assimilated. Therefore, the dominant uptake pathway for metals into aquatic plants is the aqueous pathway.

Ingestion of Benthic Invertebrates

Waterbirds may be exposed to background concentrations of COPCs via ingestion of invertebrates that have accumulated these chemicals from sediment. The level to which this accumulation occurs in benthic invertebrates is a function of the physicochemical properties of the COPC, the rate of uptake into invertebrate tissue, and the ability of the COPC to be sequestered, metabolized, or otherwise eliminated. In general, metals are not accumulated to a significant degree compared to other COPCs, because uptake is strongly regulated, and organisms sequester or eliminate metals through various pathways. Therefore, ecological receptors can be exposed to metals through ingestion of benthic invertebrates, but exposure levels are generally similar to or lower than those in sediment are, and the risk from this pathway is considered minor for these COPCs.

Bioaccumulation and Biomagnifications in Terrestrial and Aquatic Organisms

Ecological receptors at the top of the food web (e.g., piscivorous birds and mammals) are susceptible to adverse effects as a result of consuming prey that have accumulated these COPCs. Biomagnification occurs when the following conditions exist at all trophic levels:

- Chemical is ingested as food;
- Bio-transformation is not significant;
- Elimination rate is low; and
- Transfer occurs at several trophic levels.

Chemicals that bioaccumulate in fish are potentially available for uptake by consumers of fish. Exposure to these chemicals via consumption of fish is a relevant exposure pathway for piscivorous avian species and piscivorous mammals within the Project study areas. As uptake can vary from site to site due to differences in sediment chemistry, the best estimate of metal content in invertebrates and wildlife species is achieved by sampling and measuring metal content in tissues.

3.2.3.2 Exposure Estimates and Parameters

Exposure estimates are provided for ecological receptors with complete exposure pathways. For terrestrial plants and soil invertebrates, which are only exposed to background concentrations of COPCs in soil via root uptake or direct contact, exposure estimates are represented by soil concentrations. For mammals and birds, exposure estimates are presented as weight-normalized daily doses. Available baseline data was provided by each discipline (e.g., soil, surface water, and sediment) and used for calculating ADD. Baseline data used for the SLERA can be found in **Appendix 1**.

Maximum measured chemical concentrations were used for the screening stages of COPCs. However, to account for variability in the data, exposure estimates for the exposure assessment were based on the 95th percentile of soil, surface water, and sediment baseline concentrations. The use of the 95th percentile concentration is consistent with risk assessment policy for evaluating ecological risk (HC, 2010a).

3.2.3.3 Exposure Estimates for Mammals

Grizzly Bear

For grizzly bears, ADDs (in mg/kg/d) are calculated by summing the uptake via ingestion of soil, plant tissue, small and large mammals, and surface water. Doses calculated in such a manner can be compared to reference doses reported in the literature, which are also based on weight-normalized doses. This approach assumes mechanisms of toxicity for chemicals are the same regardless of the method of intake. Estimated doses of COPCs in the grizzly bear were calculated using standard exposure equations incorporating uptake from ingestion of soil and food (Sample and Suter, 1994).

Seasonal availability and distribution of food is an important determinant of home range size and diet. Grizzly bears are carnivorous/omnivorous and opportunistic in their feeding habits, and home ranges are usually made up of several feeding areas connected by travel routes. Grizzly bears consume different foods in different seasons. Grizzly bears found in the interior of BC typically have less access to salmon than coastal bears, but tend to find alternate sources of food (e.g., vegetation, mammals). In the beginning of spring, they mainly feed on vegetation, and also opportunistically prey on winter-weakened ungulates, or carcasses of ungulates that have died during the winter (BC MWLAP, 2002). During summer months, grizzly bears predominantly feed on a variety of vegetation (e.g., plants and berries). Throughout the active season, interior grizzlies will prey on small mammals (e.g., ground squirrels), roots, pine nuts, and insects whenever they are available (White et al., 1998).

Due to a large home range and a diverse concentration of suitable food resources, it is difficult to identify a definitive breakdown of a grizzly bear's diet near the Project. Although diets vary among individual populations of grizzly bears, vegetation and plants were reported to contribute 91% of the diets of grizzly bears in BC (Hobson et al., 2000). The high contribution of vegetation in their diet also accounted for the importance of the ungulates in their early spring and late fall diets (McLellan and Hovey, 1995). For the purposes of this SLERA, it was assumed that a 450 kg grizzly bear consumes 91% of its diet as vegetation, and the remaining 9% of its diet as meat sources (e.g., small and large mammals) (BC MOE, 1996). For the estimation of the ADD, no area-use factor was incorporated in the equations; i.e., 100% of the diet was assumed to be taken from or near the site.

For the interior grizzly bear, the total ingestion rate of food was estimated at 10.4 kg/d, and the total ingestion rate of water was estimated at 24.2 L/d using body-weight scaling equations (BC MOE, 1996). The ingestion rate of soil for the grizzly bear was conservatively estimated at 3% of total food intake (US EPA, 1993). **Table 3.2-4** lists the exposure parameters for the grizzly bear receptor.

Worked calculations estimating ADD for mammals are presented in **Appendix 4**. The grizzly bear ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{soil} \cdot IR_{soil}}{BW} + \frac{C_{plant} \cdot IR_{plant}}{BW} + \frac{C_{sm\ mammal} \cdot IR_{sm\ mammal}}{BW} + \frac{C_{\lg\ mammal} \cdot IR_{\lg\ mammal}}{BW} + \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_{soil}	=	concentration of chemical in soil (mg/kg)
	IR_{soil}	=	soil ingestion rate (kg/d)
	C_{plant}	=	concentration of chemical in plant tissue (mg/kg)
	IR_{plant}	=	plant tissue ingestion rate (kg/d)
	$C_{sm\ mammal}$	=	concentration of chemical in small mammal (mg/kg)
	$IR_{sm\ mammal}$	=	small mammal ingestion rate (kg/d)
	$C_{lg\ mammal}$	=	concentration of chemical in large mammal (mg/kg)
	$IR_{lg\ mammal}$	=	large mammal ingestion rate (kg/d)
	C_{sw}	=	concentration of chemical in surface water (mg/L)
	IR_{sw}	=	surface water ingestion rate (L/d)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-4** and **Table 3.2-5**, respectively.

Table 3.2-4: Exposure Parameters for Mammals near the Project

Mammal Receptor	Body Weight (kg) [a]	Total Food Intake (kg/d) [b]	Ingestion Rate					
			Soil (kg/d) [c]	Surface Water (L/d) [d]	Plant Tissue (kg/d) [e]	Soil Invertebrates (kg/d) [e]	Meat from Small Mammals (kg/d) [e]	Meat from Large Mammals (kg/d) [e]
Grizzly bear	450	10.4	0.31	24.2	9.48	n/a	0.469	0.469
Caribou	175	4.79	0.14	10.3	4.79	n/a	n/a	n/a
Marten	1	0.069	0.002	0.099	n/a	n/a	0.069	n/a
Snowshoe hare	1	0.069	0.002	0.099	0.069	n/a	n/a	n/a
Short-tailed shrew	0.015	0.0022	0.000065	0.0023	n/a	0.0022	n/a	n/a

Notes: [a]Based on Sample et al., 1996. Reference values for mammalian species; [b]Estimated using allometric equation for total food intake for mammals (total food intake kg = 0.0687 x body weight$^{0.822}$) (US EPA, 1993); [c]Conservatively estimated at 3% of total dietary intake for grizzly bear, caribou, marten, snowshoe hare, and short-tailed shrew (US EPA, 1993); [d]Estimated using allometric equation for total water intake for mammals (total water intake L = 0.099 x body weight$^{0.90}$) (US EPA, 1993); [e]Based on assumed percentage of total food in the diet.
kg = kilogram; kg/d = kilograms per day; L/d = litres per day; n/a = not available/not applicable.

Table 3.2-5: Summary of 95th Percentile of Baseline Concentrations

Metal COPC	95th Percentile Soil Concentration (mg/kg)	95th Percentile Surface Water Concentration (mg/L)	95th Percentile Plant Tissue Concentration (mg/kg)	95th Percentile Whole Fish Concentration (mg/kg)	95th Percentile Sediment Concentration (mg/kg)
Aluminum	n/a	0.42	7.040	26.8	27,540
Arsenic	9.84	0.0014	0.41	0.11	134.3
Cadmium	1.56	0.000081	1.5	0.028	5.5
Chromium	20.2	0.0015	3.4	0.15	33.6
Copper	23.5	0.0015	8.6	2.0	39.1
Lead	22.0	0.00071	6.6	0.086	32.4
Mercury	0.25	0.000004	0.48	0.11	0.18
Molybdenum	5.06	0.00087	8.2	0.03	4.1
Vanadium	50.6	0.0014	8.1	0.11	60.5
Zinc	84.9	0.04	326.1	66.7	1,607.5

Notes: COPC = Chemical of Potential Concern; mg/kg = milligrams per kilogram; mg/L = milligrams per litre; n/a = not available

Caribou

Caribou are medium-sized hoofed mammals, and are members of the deer family (Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2002). They are larger than deer, but smaller than elk and moose. Caribou are potentially exposed to background concentrations of COPCs via ingestion of soil, plant tissue, and surface water located near the Project study areas. For caribou, an ADD (in mg/kg/d) was calculated by summing the uptake via ingestion of soil, plant tissue, and surface water.

Caribou are forest-dwelling, and occupy various cover types. Large males typically weigh 180 kg to 270 kg, while females are considerably smaller, usually weighing 90 kg to 135 kg (BC MELP, 2000). In BC, caribou meet their food requirements by selecting from a wide variety of potential forage species based on availability, digestible nutrient concentration, and palatability. The diet of the caribou varies as the season changes. In summer, when vegetation is more abundant, caribou feed on willow leaves, and in winter, caribou dig through snow to get to moss and lichen. For the purposes of this SLERA, it was assumed that a 175 kg caribou (between average male and female weight) consumed 100% of its diet as vegetation. The total caribou ingestion rates of 4.79 kg/d for food and 10.3 L/d for water were estimated using body weight scaling equations recommended by the US EPA (1993). The soil ingestion rate was conservatively estimated at 3% of total food intake (US EPA, 1993).

Worked calculations estimating ADD for mammals are presented in **Appendix 4**. The caribou ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{soil} \cdot IR_{soil}}{BW} + \frac{C_{plant} \cdot IR_{plant}}{BW} + \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_{soil}	=	concentration of chemical in soil (mg/kg)
	IR_{soil}	=	soil ingestion rate (kg/d)
	C_{plant}	=	concentration of chemical in plant tissue (mg/kg)
	IR_{plant}	=	plant tissue ingestion rate (kg/d)
	C_{sw}	=	concentration of chemical in surface water (mg/L)
	IR_{sw}	=	surface water ingestion rate (L/d)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-4** and **Table 3.2-5**, respectively.

Marten

The marten is a member of the weasel family, and occurs in forested habitat throughout BC. Martens vary in size by locality, sex, age, and habitat quality. On average, martens weigh about 1 kg, and can reach lengths of 63 cm (BC MWLAP, 2003). Although martens are opportunistic feeders, in most areas their primary prey are small mammals (shrew, voles, and mice). Where available, martens prey on larger species (e.g., snowshoe hare), birds and their eggs, amphibians, and insects (BC MWLAP, 2003). Martens are potentially exposed to background concentrations of COPCs via ingestion of soil, small mammals, and surface water located near the Project. An ADD (in mg/kg/d) was calculated by summing the uptake via ingestion of soil, small mammals, and surface water.

For the purposes of this SLERA, it was assumed that a 1 kg marten consumes 100% of its diet as small mammals. The total ingestion rates for the marten used in the assessment of 0.069 kg/d of food and 0.099 L/d of water were provided by Sample et al. (1996). The soil ingestion rate for the marten was conservatively estimated at 3% of total food intake (US EPA, 1993).

Worked calculations estimating ADD for mammals are presented in **Appendix 4**. The marten ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{soil} \cdot IR_{soil}}{BW} + \frac{C_{sm\,mammals} \cdot IR_{sm\,mammals}}{BW} \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_{soil}	=	concentration of chemical in soil (mg/kg)
	IR_{soil}	=	soil ingestion rate (kg/d)
	$C_{sm\ mammals}$	=	concentration of chemical in small mammals (mg/kg)
	$IR_{sm\ mammals}$	=	small mammals ingestion rate (kg/d)
	C_{sw}	=	concentration of chemical in surface water (mg/L)
	IR_{sw}	=	surface water ingestion rate (L/d)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-4** and **Table 3.2-5**, respectively.

Snowshoe Hare

Snowshoe hares eat a variety of plant materials, and their diet varies with the seasons. Green vegetation is consumed when available from spring to fall, and twigs, evergreen needles, and bark form the bulk of the snowshoe hare's winter diet. For the purposes of this SLERA, it is assumed that a 1 kg snowshoe hare (Sample et al., 1996) consumes 100% of its diet as vegetation. The total ingestion rates for the snowshoe hare of 0.069 kg/d of food and 0.099 L/d of water were estimated using body weight scaling equations recommended by the US EPA (1993). The soil ingestion rate was conservatively estimated at 3% of total food intake (US EPA 1993).

Worked calculations estimating ADD for mammals are presented in **Appendix 4**. The snowshoe hare ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{soil} \cdot IR_{soil}}{BW} + \frac{C_{plant} \cdot IR_{plant}}{BW} + \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:

- ADD = Average Daily Dose (mg/kg/d)
- C_{soil} = concentration of chemical in soil (mg/kg)
- IR_{soil} = soil ingestion rate (kg/d)
- C_{plant} = concentration of chemical in plant tissue (mg/kg)
- IR_{plant} = plant tissue ingestion rate (kg/d)
- C_{sw} = concentration of chemical in surface water (mg/L)
- IR_{sw} = surface water ingestion rate (L/d)
- BW = body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-4** and **Table 3.2-5**, respectively.

Short-Tailed Shrew

The short-tailed shrew is the heaviest and strongest shrew in BC. Shrews live in a variety of habitats, including grassy fields and deciduous woods. The short-tailed shrew is primarily an insectivore, with a diet consisting of invertebrates, although they have also been known to feed on mice, salamanders, and plant material. The short-tailed shrew is potentially exposed to background concentrations of COPCs via ingestion of soil, invertebrates, and surface water located within the vicinity of the Project. An ADD (in mg/kg/d) was calculated by summing the uptake via ingestion of soil, invertebrates, and surface water.

For the purposes of this SLERA, it was assumed that a 0.015 kg shrew consumes 100% of its diet as invertebrates. The total ingestion rates for the short-tailed shrew used in the assessment of 0.0022 kg/d of food and 0.0023 L/d of water were provided by Sample et al. (1996). The soil ingestion rate for the short-tailed shrew was conservatively estimated at 3% of total food intake (US EPA, 1993).

Worked calculations estimating ADD for mammals are presented in **Appendix 4**. The short-tailed shrew ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{soil} \cdot IR_{soil}}{BW} + \frac{C_{invertebrates} \cdot IR_{invertebrates}}{BW} \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_{soil}	=	concentration of chemical in soil (mg/kg)
	IR_{soil}	=	soil ingestion rate (kg/d)
	$C_{sm\ mammals}$	=	concentration of chemical in invertebrates (mg/kg)
	$IR_{sm\ mammals}$	=	invertebrates ingestion rate (kg/d)
	C_{sw}	=	concentration of chemical in surface water (mg/L)
	IR_{sw}	=	surface water ingestion rate (L/d)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-4** and **Table 3.2-5**, respectively.

3.2.3.4 Exposure Estimates for Birds

Red-Tailed Hawk

The red-tailed hawk (*Buteo jamaicensis*) is a bird of prey found across BC. These raptors use many types of habitat, and consume a wide variety of prey, including insects, birds, reptiles, and mammals. Small mammals often form the bulk of their diet, although diets can vary greatly depending on the availability of prey (BC MOE, 2013). The red-tailed hawk is potentially exposed to background concentrations of COPCs via ingestion of soil, small mammals, and surface water near the Project study areas.

An ADD (in mg/kg/d) was calculated by summing the uptake via ingestion of soil, small mammals, and surface water. Doses calculated in such a manner are compared to reference doses reported in the literature, providing that these are also based on weight-normalized doses. This approach assumes mechanisms of toxicity for chemicals are the same regardless of the method of intake.

For the purposes of this risk assessment, it was assumed that a 1.2 kg red-tailed hawk (Sample et al., 1996) consumes 100% of its diet as small mammals. The total ingestion rates for the red-tailed hawk used in the assessment of 0.065 kg/d of food and 0.067 L/d of water were estimated using body-weight scaling equations recommended by the US EPA (1993). The soil ingestion rate for the red-tailed hawk was conservatively estimated at 2% of total food intake (Sample and Suter, 1994).

ADD of COPCs was calculated using standard exposure equations incorporating uptake from ingestion of soil, surface water, and food (Sample and Suter, 1994).

Worked calculations estimating ADD for birds are presented in **Appendix 4**. The red-tailed hawk ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{soil} \cdot IR_{soil}}{BW} + \frac{C_{sm\,mammals} \cdot IR_{sm\,mammals}}{BW} + \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_{soil}	=	concentration of chemical in soil (mg/kg)
	IR_{soil}	=	soil ingestion rate (kg/d)
	$C_{sm\ mammals}$	=	concentration of chemical in small mammals (mg/kg)
	$IR_{sm\ mammals}$	=	small mammals ingestion rate (kg/d)
	C_{sw}	=	concentration of chemical in surface water (mg/L)
	IR_{sw}	=	surface water ingestion rate (L/d)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-4** and **Table 3.2-6**, respectively.

Table 3.2-6: Exposure Parameters for Birds near the Project

Mammal Receptor	Body Weight (kg)	Total Food Intake (kg/d) [a]	Ingestion Rate							
			Soil (kg/d) [b]	Surface Water (L/d)	Sediment (kg/d) [b]	Plant Tissue (kg/d) [d]	Soil Invertebrates (kg/d) [d]	Meat from Small Mammals (kg/d) [d]	Meat from Fish (kg/d) [d]	Aquatic Invertebrates (kg/d) [d]
Red-tailed hawk	1.2	0.065	0.0013	0.067	n/a	n/a	n/a	0.065	n/a	n/a
Olive-sided flycatcher	0.037	0.0068	0.0002	0.0065[c]	n/a	n/a	0.0068	n/a	n/a	n/a
Ring-necked duck	1.2	0.065	n/a	0.067	0.0013	0.022	n/a	n/a	n/a	0.044
Pacific loon	4.0	0.14	n/a	0.15[c]	n/a	n/a	n/a	n/a	0.14	n/a

Note: [a]Estimated using allometric equation for total food intake for birds (total food intake kg = 0.00582 x body weight$^{0.651}$) (US EPA, 1993); [b]Conservatively estimated at 2% of total dietary intake (US EPA, 1993); [c]Estimated using allometric equation for total water intake for birds (total water intake L = 0.059 x body weight$^{0.67}$) (US EPA, 1993); [d]Based on estimated percentage of total food in the diet.

kg = kilogram; kg/d = kilograms per day; L/d = litres per day; n/a = not available/not applicable.

Olive-Sided Flycatcher

Olive-sided flycatchers are potentially exposed to background concentrations of COPCs via ingestion of soil, soil invertebrates, and surface water near the Project study areas. An ADD (in mg/kg/d) was calculated by summing the uptake via ingestion of soil, soil invertebrates, and surface water. Doses calculated in such a manner are compared to reference doses reported in the literature, providing that these are also based on weight-normalized doses. This approach assumes mechanisms of toxicity for chemicals are the same regardless of the method of intake.

The olive-sided flycatcher is a medium-sized songbird, 18 cm to 20 cm in length (COSEWIC, 2007). For the purposes of this risk assessment, it was assumed that a 0.037 kg olive-sided flycatcher (Sample et al., 1996) consumes 100% of its diet as soil invertebrates. The total ingestion rates for the olive-sided flycatcher used in the assessment of 0.0068 kg/d of food and 0.0065 L/d of water were estimated using body-weight scaling equations recommended by the US EPA (1993). The soil ingestion rate for the olive-sided flycatcher was conservatively estimated at 2% of total food intake (US EPA, 1993).

ADD of COPCs was calculated using standard exposure equations incorporating uptake from ingestion of surface water, soil, and food (Sample and Suter, 1994).

Worked calculations estimating ADD for birds are presented in **Appendix 4**. The olive-sided flycatcher ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{soil} \cdot IR_{soil}}{BW} + \frac{C_{invertebrates} \cdot IR_{invertebrates}}{BW} + \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:

where:	ADD	=	Average Daily Dose (mg/kg/d)
	C_{soil}	=	concentration of chemical in soil (mg/kg)
	IR_{soil}	=	soil ingestion rate (kg/d)
	$C_{invertebrates}$	=	concentration of chemical in soil invertebrates (mg/kg)
	$IR_{invertebrates}$	=	soil invertebrates ingestion rate (kg/d)
	C_{sw}	=	concentration of chemical in surface water (mg/L)
	IR_{sw}	=	surface water ingestion rate (L/d)
	BW	=	body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-5** and **Table 3.2-6**, respectively.

Ring-Necked Duck

The ring-necked duck is found in freshwater, marshes, and bogs across BC's forested areas. While these ducks are considered diving ducks, they are frequently observed in shallow waters. During migration, the ducks stop to rest and feed in shallow lakes with dense vegetation. Their diet includes aquatic plants and aquatic invertebrates. The predominant pathways by which the ring-necked duck may be exposed to background concentrations of COPCs at the Project study areas include ingestion of sediments, surface water, vegetation, and aquatic invertebrates. An ADD (in mg/kg/d) was calculated by summing the uptake via ingestion of fish and surface water.

For the purposes of this risk assessment, it was assumed that a 1.2 kg ring-necked duck consumes 67% of its diet as vegetation and 33% as aquatic invertebrates (Sample and Suter, 1994). The total ingestion rates for the ring-necked duck used in this assessment of 0.065 kg/d of food and 0.067 L/d of water were estimated using body-weight scaling equations recommended by the US EPA (1993). The ingestion rate of sediments for the ring-necked duck was conservatively estimated at 2% of total food intake (US EPA, 1993).

Average daily dose of COPCs were calculated using standard exposure equations incorporating uptake from ingestion of surface water and food (Sample and Suter, 1994).

Worked calculations estimating ADD for birds are presented in **Appendix 4**. The ring-necked duck ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{se\dim ents} \cdot IR_{se\dim ents}}{BW} + \frac{C_{aq\,invertebrates} \cdot IR_{aq\,invertebrates}}{BW} + \frac{C_{vegetaion} \cdot IR_{vegetation}}{BW} + \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where: ADD = Average Daily Dose (mg/kg/d)
$C_{sediments}$ = concentration of chemical in sediments (mg/kg)
$IR_{sediments}$ = sediment ingestion rate (kg/d)
$C_{aq\ invertebrates}$ = concentration of chemical in aquatic invertebrates (mg/kg)
$IR_{aq\ invertebrates}$ = aquatic invertebrate ingestion rate (kg/d)
$C_{vegetation}$ = concentration of chemical in vegetation (mg/kg)
$IR_{vegetation}$ = vegetation ingestion rate (kg/d)
C_{sw} = concentration of chemical in surface water (mg/L)
IR_{sw} = surface water ingestion rate (L/d)
BW = body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-5** and **Table 3.2-6**, respectively.

Pacific Loon

The predominant pathways by which waterfowl may be exposed to background concentrations of COPCs at the Project study areas include ingestion of food and water. Waterfowl feed on a variety of fish. Pacific loons are heavy birds due to their solid bones, and their weight varies, ranging from 1.6 kg to 8 kg, with an average of about 3 kg to 4 kg (McIntyre and Barr, 1997). An ADD (in mg/kg/d) was calculated by summing the uptake via ingestion of fish and surface water.

For the purposes of this risk assessment, it was assumed that a 4 kg Pacific loon consumes 100% of its diet as fish (McIntyre, 1988). The total ingestion rates for the Pacific loon used in this assessment of 0.144 kg/d of food and 0.15 L/d of water were estimated using body-weight scaling equations recommended by the US EPA (1993).

Average daily dose of COPCs were calculated using standard exposure equations incorporating uptake from ingestion of surface water and food (Sample and Suter, 1994).

Worked calculations estimating ADD for birds are presented in **Appendix 4**. The Pacific loon ADD was calculated using the following equation:

$$ADD_{ingestion} = \frac{C_{fish} \cdot IR_{fish}}{BW} + \frac{C_{sw} \cdot IR_{sw}}{BW}$$

where:
- ADD = Average Daily Dose (mg/kg/d)
- C_{fish} = concentration of chemical in fish (mg/kg)
- IR_{fish} = fish ingestion rate (kg/d)
- C_{sw} = concentration of chemical in surface water (mg/L)
- IR_{sw} = surface water ingestion rate (L/d)
- BW = body weight (kg)

Values related to the receptor exposure parameters and the concentrations of chemicals found in soil, surface water, and food sources used in the above calculation are outlined in **Table 3.2-5** and **Table 3.2-6**, respectively.

3.2.3.5 Exposure Estimates for Amphibians

Amphibians are mobile, and thus can integrate exposures from multiple locations. Outside of their breeding season, western toads tend to avoid open water. Juvenile and adult toads are opportunistic, feeding on a variety of invertebrates. The toads found near the Project study areas are assumed to be potentially exposed to background concentrations of COPCs in soil and soil invertebrates.

Ideally, exposure estimates for amphibians are characterized by comparing 95th percentile concentrations of COPCs to specific toxicity limits for amphibians. However, toxicity data for toads exposed to metals is extremely limited. A review of the scientific literature identified no toxicity limits for toad exposure to metals in soil. Risks to amphibians from metals associated with the Project were therefore assessed qualitatively instead of quantitatively.

3.2.3.6 Exposure Estimates for Fish

Fish are potentially exposed to metals in surface water. Rainbow trout are mobile, and thus integrate exposures from multiple locations. Rainbow trout found in freshwater within the study areas of the Project are potentially exposed to background concentrations of COPCs in surface water. Therefore, exposure estimates for fish are based on the 95th percentile concentrations in surface water (**Table 3.2-5**).

3.2.3.7 Exposure Estimates for Soil Invertebrates

Soil invertebrates are considered to be essentially immobile. Exposure estimates for this receptor are based on the 95th percentile of COPC concentrations in soil within the RSAs of the Project (**Table 3.2-5**).

3.2.3.8 Exposure Estimates for Aquatic Invertebrates

Aquatic invertebrates are primarily exposed to background concentrations of COPCs in surface water. Although invertebrates are somewhat mobile, the range of movement of these organisms is generally small compared to the spatial extent of COPCs at most sites. Therefore, they are often considered to be immobile for the purposes of estimating exposure. This is a conservative assumption, as migration results in an average exposure that is lower than the upper limit. Exposure estimates for invertebrates were based on the 95th percentiles of COPC concentrations in surface water (**Table 3.2-5**).

3.2.3.9 Exposure Estimates for Terrestrial Plants

Because plants are immobile, exposure to chemicals cannot be averaged or integrated among areas of a site with higher and lower concentrations. Some fraction of individuals in a population at a site is potentially exposed to the highest concentrations of COPCs. Therefore, exposure estimates are based on upper estimates of concentrations. Although the maximum measured concentration can be used as a very conservative estimate of exposure, use of the maximum would ensure protection of 100% of individuals, which is inconsistent with the objectives of the assessment or standard practices in SLERA. Instead, the 95th percentile of the distribution of COPC concentrations is a reasonable estimate of exposure (**Table 3.2-5**). Sources of uncertainty associated with the exposure estimates for plants include the location of the vegetation in relation to the areas of greatest contamination and the efficiency of plant uptake. Most plants on the site will not be exposed to soil with the highest metal concentrations. Uptake by plant roots is dependent on the depth at which COPCs reside in soil. For COPCs that are relatively immobile in soil, uptake only occurs in the upper soil layers where COPCs can be accessed by plant root systems.

3.2.3.10 Exposure Estimates for Aquatic Plants

Aquatic plants in creeks and lakes within the study areas of the Project are potentially exposed to elevated concentrations of dissolved COPCs in surface water. Most aquatic plants are sessile, remaining fixed in one spatial location, with the exception of some macrophytes that reproduce vegetatively. Exposure estimates for aquatic plants were therefore based on the 95th percentile concentrations in surface water collected from surrounding creeks, streams, and lakes (**Table 3.2-5**).

3.2.4 Toxicity Assessment

The following section details the potential adverse effects on the VCs associated with exposure to COPCs. For each receptor, TRVs representing concentrations of COPCs protective of most ecological receptors were identified. A summary of the VCs and metals identified as COPCs during screening and potential exposure pathways is presented in **Table 3.2-7**.

Table 3.2-7: Summary of VCs, COPCs, and Potential Exposure Pathways

VC	Soil Exposure Pathway	Surface Water Exposure Pathway	Sediment Exposure Pathway	Food Pathway[a]
Mammals				
Grizzly bear	As, Mo	As, Zn	n/a	As, Mo, Zn
Caribou	As, Mo	As, Zn	n/a	As, Mo, Zn
Marten	As, Mo	As, Zn	n/a	As, Mo, Zn
Snowshoe hare	As, Mo	As, Zn	n/a	As, Mo, Zn
Short-tailed shrew	As, Mo	As, Zn	n/a	As, Mo, Zn
Birds				
Red-tailed hawk	As, Mo	As, Zn	n/a	As, Mo, Zn
Olive-sided flycatcher	As, Mo	As, Zn	n/a	As, Mo, Zn
Ring-necked duck	n/a	As, Zn	As, Cd, Cr, Cu, Pb, Hg, Zn	As, Cd, Cr, Cu, Pb, Hg, Zn
Pacific loon	n/a	As, Zn	n/a	As, Zn
Amphibians				
Western toad	As, Mo	n/a	n/a	As, Mo
Fish				
Rainbow trout	n/a	Al, As, Cd, Cr, Cu, Pb, V, Zn	n/a	n/a
Invertebrates				
Soil	As, Mo	n/a	n/a	n/a
Aquatic	n/a	Al, As, Cd, Cr, Cu, Pb, V, Zn	n/a	n/a
Plants				
Terrestrial	As, Mo	n/a	n/a	n/a
Aquatic	n/a	Al, As, Cd, Cr, Cu, Pb, V, Zn	n/a	n/a

Notes: [a]Food pathway includes, but not limited to, vegetation, fish, and invertebrates. VC = Valued Component; Al = Aluminum; As = Arsenic; Cd = Cadmium; Cr = Chromium; Cu = Copper; Pb = Lead; Hg = Mercury; V = Vanadium; Zn = Zinc; n/a = not available/applicable.

Ecological Soil Screening Levels (Eco-SSLs) are concentrations of chemicals in soil that are protective of ecological receptors that commonly come into contact with, and/or consume, biota that live in or on soil. Eco-SSLs are derived separately for four groups of ecological receptors: plants, soil invertebrates, birds, and mammals. Eco-SSLs are derived to be protective of the conservative end of the exposure and effects distribution, and are intended to be applied at the screening stage of a SLERA. As such, these values are presumed to provide adequate protection of terrestrial ecosystems.

3.2.4.1 Aluminum

The maximum baseline concentration of aluminum was reported to exceed criteria for freshwater aquatic species. The health of fish, aquatic invertebrates, and aquatic plants may be adversely affected by exposure to aluminum in surface water. Aluminum is the most commonly occurring metallic element, comprising eight percent of the earth's crust.

During the screening of COPCs, the maximum baseline concentrations for aluminum were found to exceed surface water criteria for freshwater organisms. The derivation of TRVs used for ecological receptors potentially exposed to aluminum in surface water is described below.

Fish

Studies collated by Sutter et al. (1996) provide a lowest chronic value (LCV) of 3.288 mg/L aluminum for fish. A reduction in toxicity associated with increased water hardness was evident for fish. This LCV was adopted as the TRV for aluminum exposure to fish.

Aquatic Invertebrates

The US EPA (1988) provides a lowest value chronic value of 0.22 mg/L aluminum based on a life-cycle test on daphnids. The study revealed a population decrease when aluminum was present. This benchmark value was adopted as the TRV for the assessment.

Aquatic Plants

The US EPA (1988) provides a chronic value of 0.46 mg/L for aluminum based on studies involving aquatic plants (e.g., *Selenastrum capricornutum*). This benchmark value was adopted as the TRV for the assessment.

3.2.4.2 Arsenic

Arsenic is naturally present in rock and soils, with concentrations in soils reflecting the geology of the region as well as anthropogenic inputs. Higher concentrations are associated with igneous and sedimentary rocks, particularly with sulphidic ores (American Petroleum Institute (API), 1998). Extensive discussions of the sources, concentrations, and chemical species are presented in API (1998), and Cullen and Reimer (1989). Arsenic is used in multiple manufacturing and industrial processes, including the production of wood-treating chemicals, herbicides, pesticides, desiccants, metal alloys, glass, pharmaceuticals, and semiconductors. Elevated arsenic soil concentrations are often associated with mining activities, smelters, pesticide/herbicide manufacturing facilities, and agricultural lands (API, 1998).

Arsenic can exist in four oxidation states: +5, +3, 0, and -3. In soil, arsenic is a constituent of numerous minerals, and is frequently found associated with sulphur, most commonly as arsenopyrite (FeAsS). Inorganic arsenate can also be bound to iron and aluminum cations or any other cation that may be present (e.g., calcium, zinc, magnesium, or lead), as well as organic matter in soils (API, 1998). Arsenic primarily occurs in contaminated soils as the inorganic arsenic (V) and arsenic (III), but soil micro-organisms can produce organic forms (Cullen and Reimer, 1989; Huang, 1994). Transformations between inorganic and organic forms are controlled by the oxidation-reduction, precipitation/adsorption, and biomethylation processes, in addition to the biological production and volatilization of the arsines (API, 1998). The availability or solubility of arsenic in soils depends on the source (natural vs. anthropogenic), and the soil's clay content, redox potential, and pH. Generally, factors that tend to increase arsenic availability are anthropogenic sources (e.g., pesticides), low clay content, low redox potential (reducing conditions), and high pH (alkaline conditions) (Cullen and Reimer, 1989; API, 1998).

During the screening of COPCs, the maximum baseline concentrations for arsenic were found to exceed soil, surface water (for freshwater and wildlife organisms), and sediment criteria. The derivation of TRVs used for ecological receptors potentially exposed to arsenic in soil, surface water, and sediments is described below.

Mammals

Arsenic-containing compounds vary in toxicity to mammals depending on their valence state, form (inorganic or organic), physical state (gas, solution, or powder), and factors such as solubility, particle size, rates of absorption and elimination, and presence of impurities. Inorganic arsenic is generally considered more toxic than organic arsenic. The toxicity of arsenic in the trivalent form (arsenic (III)) is several times greater than that of the pentavalent form (arsenic (V)), primarily due to arsenic (III)'s higher potential for cellular uptake. Metalloid arsenic is generally regarded as non-poisonous, due to its insolubility in water and body fluids (Agency for Toxic Substances and Disease Registry (ATSDR), 2007).

Chronic toxicity due to inorganic exposures may result in dermal or neurological symptoms. Dermal effects may include hyperpigmentation or hyperkeratosis on the palms, soles, and torso. Peripheral neuropathy may appear with symmetrical paresthesia. Neurotoxicity begins with sensory changes, paresthesia, and muscle tenderness, followed by weakness that progresses from proximal to distal muscle groups. Chronic hepatic and renal damage is common, with jaundice occurring due to liver injury.

The US EPA (2005) has calculated an Eco-SSL for mammals. This was based on a comparison of the geometric mean of the NOAEL values for growth and reproduction from a number of studies with the LOAEL for reproduction, growth, or survival. The geometric mean of NOAEL values was 2.47 mg arsenic/kg (body weight)/d. However, this value is higher than the lowest bounded LOAEL. Therefore, the TRV was established at 1.04 mg/kg/d, representing the highest NOAEL that was still lower than the lowest LOAEL for reproduction, growth, or survival.

NOAELs (or LOAELs) based on reproduction, growth, or mortality endpoints in rats and mice were adjusted using standard allometric relationships (Sample et al., 1996). If a NOAEL was available for a mammalian test species ($NOAEL_t$), then the equivalent NOAEL for a mammalian wildlife species ($NOAEL_w$) can be calculated by using the adjustment factor for differences in body size (Sample et al., 1996):

$$NOAEL_w = NOAEL_t \left(\frac{bw_t}{bw_w} \right)^{1/4}$$

where $NOAEL_t$ = NOAEL reported in the study for the test species;
bw_t = body weight of the test species; and
bw_w = body weight of the mammals used in the assessment.

The body weights of the mammals used in this assessment and the adjusted TRVs are presented in **Table 3.2-8**.

Birds

The clinical effects of arsenic toxicity in avian species are similar to that in mammals, but birds are generally more sensitive to the adverse effects of arsenic. Recent research suggests that physiological scaling factors developed for mammals may not be appropriate for interspecies extrapolation to birds (Sample et al., 1996). The TRV for birds was based on studies collated by the US EPA (2005). The adopted arsenic TRV for all birds listed in this assessment is 2.24 mg/kg/d.

Amphibians

Toxicity data for amphibians (e.g., western toad) exposed to metals is extremely limited. A review of the scientific literature identified no toxicity limits for amphibian exposure to arsenic in soil.

Fish

Defoe (1982) completed an early life-stage test with fathead minnows exposed to arsenic that resulted in a chronic value of 0.892 mg/L. This chronic value of 0.892 mg/L was adopted as the TRV for arsenic exposure to fish.

Table 3.2-8: Toxicological Reference Value Derivations for Mammals

Receptor	Test Species[a]	Test Species Body Weight (kg) [a]	Receptor Body Weight (kg)	TRV (mg/kg/d)[b]	Adjusted TRV (mg/kg/d) [c]
Arsenic					
Grizzly bear	Mouse	0.03	450	1.04	0.094
Caribou	Mouse	0.03	175	1.04	0.12
Marten	Mouse	0.03	1	1.04	0.43
Snowshoe hare	Mouse	0.03	1	1.04	0.43
Short-tailed shrew	Mouse	0.03	0.015	1.04	1.24
Molybdenum					
Grizzly bear	Mouse	0.03	450	0.26	0.023
Caribou	Mouse	0.03	175	0.26	0.030
Marten	Mouse	0.03	1	0.26	0.11
Snowshoe hare	Mouse	0.03	1	0.26	0.11
Short-tailed shrew	Mouse	0.03	0.015	0.26	0.31
Zinc					
Grizzly bear	Rat	0.35	450	160	26.7
Caribou	Rat	0.35	175	160	33.8
Marten	Rat	0.35	1	160	123.1
Snowshoe hare	Rat	0.35	1	160	123.1
Short-tailed shrew	Rat	0.35	0.015	160	351.7

Notes: [a]Studies on test species and body weight provided by US EPA Eco-SSL (2005) and Sample et al. (1996); [b]Eco-SSL for mammals calculated by the US EPA (2005), or a geometric mean of the NOAEL values for reproduction and growth calculated by Sample et al. 1996; [c]NOAEL for a mammalian wildlife species ($NOAEL_w$) calculated by using the adjustment factor for differences in body size (Sample et al. 1996).
kg = kilogram; mg/kg/d = milligrams per kilogram body weight per day; TRV = Toxicological Reference Value

Soil Invertebrates

Vaughan and Greenslade (1998) investigated the effects of arsenic on earthworms (Eisenia andrei) growing in an artificial soil for 14 days. The lethal concentration effective to induce 50% mortality (LC_{50}) of 472 parts per million (ppm) was derived from the study. In the same study, a 28-day reproduction investigation was completed with adult springtails (Folsomia candida). A No Observable Effect Concentration (NOEC) of 10 ppm and an EC_{50} of 119 ppm were derived from the study.

Savannah River Site listed a TRV of 60 mg/kg for earthworms (US Department of Energy, 1999), but there was no explanation provided for the basis of the TRV.

Studies collated by the US EPA (2005) illustrated a screening benchmark value for arsenic in terrestrial plants of 18 mg/kg. This value was adopted as the TRV. The screening benchmark is intended to protect terrestrial biota from direct soil contact exposures to arsenic.

Aquatic Invertebrates

Vocke et al. (1980) completed a 14-day EC_{50} study involving freshwater organisms exposed to arsenic. The findings of the test resulted in an EC_{50} value of 0.048 mg/L, which was adopted as the TRV for arsenic exposure to aquatic invertebrates.

Terrestrial Plants

Studies collated by the US EPA (2005) illustrated a screening benchmark value for arsenic in terrestrial plants of 18 mg/kg. This value was adopted as the TRV. The screening benchmark is intended to protect plants and other terrestrial biota from exposures to direct soil contact.

Aquatic Plants

Vocke et al. (1980) completed a 14-day EC_{50} study involving freshwater organisms (*Scenedesmus obliquus*) exposed to arsenic. The findings of the test resulted in an EC_{50} value of 0.048 mg/L, which was adopted as the TRV for arsenic exposure to aquatic plants.

3.2.4.3 Cadmium

In the environment, cadmium occurs as a divalent metal that is insoluble in water, but its chloride and sulphate salts are freely soluble (Eisler, 1985). The availability of cadmium to organisms in the environment is dependent on a number of factors, including pH and chemical speciation (Eisler, 1985).

During the screening of COPCs, the maximum baseline concentrations for cadmium were found to exceed surface water (for freshwater organisms) and sediment criteria. The derivation of TRVs used for ecological receptors potentially exposed to cadmium in surface water and sediments is described below.

Birds

The main route of cadmium absorption is by ingestion. Factors reported to affect dietary cadmium absorption from the gastrointestinal tract include age, sex, chemical form, levels of protein, levels of calcium, and the presence of other elements (Nriagu, 1981). Cadmium-induced effects associated with oral intake included nephrotoxicity and also possible effects on the liver, reproductive organs, and the hematopoietic, immune, skeletal, and cardiovascular systems (Shore and Douben, 1994). The TRV for birds was based on studies collated by Sample et al. (1996). The ring-necked duck was the only bird assumed to be exposed to this COPC in sediments via ingestion of food. The adopted TRV for the ring-necked duck exposed to cadmium in sediments is 1.45 mg/kg/d (Sample et al., 1996).

Fish

A reduction in toxicity associated with increased water hardness is evident for several fish species. The LCV for cadmium for fish of 0.0017 mg/L was based on studies collated by Sauter et al. (1976). This was adopted as the TRV for cadmium exposure to fish.

Aquatic Invertebrates

Carlson et al. (1982) provides an EC_{20} lowest value chronic value of 0.00015 mg/L for cadmium based on a life-cycle test on Daphnia magna*.* The study observed a population decrease when cadmium was present. This benchmark value was adopted as the TRV for the assessment.

Aquatic Plants

Aquatic plants are affected by cadmium concentrations ranging from 0.002 mg/L to 7.4 mg/L. These values are in the same range as the values observed in fish and invertebrates. Conway (1977) provides a LCV of 0.002 mg/L, based on a study involving the application of low cadmium concentrations to aquatic plants. The study observed a reduction in the population growth rate in aquatic plants. The LCV of 0.002 mg/L was adopted as the TRV for the assessment.

3.2.4.4 Chromium

Chromium speciation is complex. Chromium is a metallic element that can exist in several valence states. In the aquatic environment, chromium is found in valence states of III or VI. Among the factors that can affect the speciation of chromium in soil and water, and its subsequent uptake into animals and plants, are organic matter content, ferrous ion content, redox state, and pH (Outridge and Scheuhammer, 1993). In general, chromium (VI) is favoured by higher pH, aerobic conditions, low amounts of organic matter, and the presence of manganese and iron oxides, which oxidize chromium (III). Transformation of chromium (VI) to the trivalent form tends to occur in acidic, anoxic soils with high organic content. Chromium (III) adsorbs onto clay particles, organic matter, metal oxyhydroxides, and other negatively-charged particles. Chromium (VI), on the other hand, does not interact significantly with clay or organic matter. As a result, chromium (VI) is more water-soluble and mobile than chromium (III) (Outridge and Scheuhammer, 1993).

During the screening of COPCs, the maximum baseline concentrations for chromium were found to exceed surface water (for freshwater organisms) and sediment criteria. The derivation of TRVs used for ecological receptors potentially exposed to chromium in surface water and sediments is described below.

Birds

The clinical effects of chromium in avian species have shown it to be an essential nutrient for animals (National Research Council (NRCC), 1997). Chromium (III) has been shown to have antioxidative properties in vivo, and it is integral in activating enzymes and maintaining the stability of proteins and nucleic acids. Its primarily metabolic role is to potentiate the action of insulin through its presence in an organometallic molecule called the glucose tolerance factor. The ring-necked duck was the only bird assumed to be exposed to this COPC in sediments via ingestion of food. The adopted TRV for the ring-necked duck exposed to chromium in sediments is 1 mg/kg/d (Sample et al., 1996).

Fish

Stevens and Chapman (1984) conducted toxicity tests with chromium and early life stages of rainbow trout. The test revealed a LCV of 0.068 mg/L chromium in fish. This chronic value was adopted as the TRV for chromium exposure in fish.

Aquatic Invertebrates

Chapman, et al. (1980) studied the chronic effects of chromium on Daphnia magna. The test revealed inhibited reproduction of Daphnia magna. A chronic value of 0.044 mg/L was developed from the freshwater life-cycle test. This chronic value was used as the TRV for aquatic invertebrates.

Aquatic Plants

The aquatic plant toxicity value for chromium was derived from a chronic test, which resulted in 50% inhibition of growth of Selenastrum capricornutum. The chronic test value of 0.397 mg/L (US EPA, 1985) was adopted as the TRV for chromium in aquatic plants.

3.2.4.5 Copper

Copper may be present as soluble compounds, including nitrates, sulfates, and chlorides, and insoluble compounds, such as oxides, hydroxides, carbonates, and sulphides (Bodek et al., 1988). Copper occurs naturally as sulphides, oxides, and sometimes as metallic copper. Weathering of copper minerals results in background levels of copper in natural surface waters. Soluble copper compounds strongly sorb to particles of organic matter, clay, soil, or sand, and demonstrate low mobility in soils (Bodek et al., 1988). Most copper compounds have a high melting point and low vapour pressure, and are not expected to volatilize from moist or dry soil surfaces (Bodek et al., 1988). Copper has two oxidation states (cuprous and cupric).

During the screening of COPCs, the maximum baseline concentrations for copper were found to exceed surface water (for freshwater organisms) and sediment criteria. The derivation of TRVs used for ecological receptors potentially exposed to copper in surface water and sediments is described below.

Birds

Copper is essential for hemoglobin formation, carbohydrate metabolism, catecholamine biosynthesis, and cross-linking of collagen, elastin, and hair keratin (US EPA, 1987). The primary route of exposure to copper is through ingestion. Generally, the normal intake of copper by inhalation is a negligible fraction of the total (Friberg et al., 1986), and absorption through the skin is minimal (Venugopal and Luckey, 1978). For the ring-necked duck, exposure to copper may potentially occur via uptake of sediment during ingestion of food. The TRV for birds is based on studies collated by Sample et al (1996). The adopted TRV for the ring-necked duck exposed to copper in sediments is 47 mg/kg/d.

Fish

Sauter et al. (1976) conducted toxicity tests with copper and early life stages of brook trout. The test revealed a chronic value of 0.0038 mg/L copper in fish (Sauter et al., 1976). This chronic value was adopted as the TRV for copper exposure in fish.

Aquatic Invertebrates

Chapman et al. (1980) studied the chronic effects of copper on Daphnia magna. The test revealed inhibited reproduction of Daphnia magna*.* A chronic value of 0.00023 mg/L was developed from the freshwater life cycle test. This chronic value was used as the TRV for aquatic invertebrates.

Aquatic Plants

The aquatic plant toxicity value for copper of 0.001 mg/L was derived from a chronic study conducted by Steeman-Nielsen and Wium-Anderson (1970), which resulted in lag in growth of algae (Chlorella pyrenoidosa). The chronic value of 0.001 mg/L was adopted as the TRV for chromium in aquatic plants.

3.2.4.6 Lead

Leaching of lead can be relatively rapid from some soils, especially at highly contaminated sites or landfills (Kayser et al., 1982). Lead is most available from acidic sandy soils, which contain little organic material capable of binding lead. Concentrations of lead in soil solution reach a minimum between pH 5 and pH 6, because metal-organic complexes form in this pH range. The solubility of lead in water depends heavily on pH. The uptake of lead by plants also depends on other factors, including cation exchange capacity, soil composition (e.g., organic matter and calcium content), metal concentrations, precipitation, light, and temperature. Lead uptake by plants is favoured at lower pH values and in soils with low organic carbon content (DeMayo et al., 1982).

During the screening of COPCs, the maximum baseline concentrations for lead were found to exceed surface water (for freshwater organisms) and sediment criteria. The derivation of TRVs used for ecological receptors potentially exposed to lead in surface water and sediments is described below.

Birds

Clinical signs of lead toxicity in birds are manifested differently for different species, but the overall signs are encephalopathy, preceded and accompanied by gastrointestinal malfunction (Booth and MacDonald, 1982). Behavioural signs of toxicity include anxiety, apprehension, hyperexcitability, vocalization, rolling of eyes, apparent fear or terror, possible belligerence, pressing of the head against a wall or post, attempts to climb a wall, sudden jumping into the air, and frenzied or manic behaviour (Booth and MacDonald, 1982). Locomotor disturbances of lead poisoning range from a stiff, stilted gait with ataxia and incoordination, to rigidity of all postural muscles, swaying, and posterior weakness, to compulsive hypermotility (i.e., circling, pacing, and running) (Booth and MacDonald, 1982). For the ring-necked duck, exposure to lead may potentially occur via uptake of sediment during ingestion of food. The TRV for ducks was based on studies collated by Sample et al. (1996). The adopted TRV for the ring-necked duck exposed to lead in sediments is 3.85 mg/kg/d.

Fish

Davies et al. (1976) conducted toxicity tests with lead and early life stages of rainbow trout. The test revealed a LCV of 0.018 mg lead/L in fish (Davies et al., 1976). This chronic value was adopted as the TRV for lead exposure in fish.

Aquatic Invertebrates

Chapman, et al. (1980) studied the chronic effects of lead to Daphnia magna. The test revealed inhibited reproduction of Daphnia magna. A chronic value of 0.012 mg/L was developed from the freshwater life cycle test. This chronic value was used as the TRV for aquatic invertebrates.

Aquatic Plants

The aquatic plant toxicity value for lead of 0.5 mg/L was derived from a chronic study conducted by the US EPA (1985) that observed growth inhibition of aquatic plants. The chronic value of 0.5 mg/L was adopted as the TRV for lead in aquatic plants.

3.2.4.7 Mercury

Mercury is a mutagen, teratogen, and carcinogen, with toxicity and environmental effects varying with the form of mercury, dose, and route of ingestion, and with the exposed organism's species, sex, age, and general condition (Eisler, 1987a). Methylmercury is the most toxic form. Inorganic mercury is methylated primarily by bacteria in both anaerobic and aerobic environments. The organic mercury compounds are more readily absorbed and poorly excreted compared with inorganic forms. The primary targets of acute exposures are the central nervous system and kidneys in fish, birds, and mammals.

During the screening of COPCs, the maximum baseline concentrations for mercury were found to exceed sediment criteria. The derivation of TRVs used for ecological receptors potentially exposed to mercury in sediments is described below.

<u>Birds</u>

Birds may be exposed to chronic low levels of mercury present in the environment. There are numerous effects in birds, including delayed testicular development, altered mating behaviour, reduced fertility, and reduced survivability and growth in the young (ATSDR, 1994). For the ring-necked duck, exposure to mercury may potentially occur via uptake of sediment during ingestion of food. The TRV for birds was based on studies collated by Sample et al. (1996). The adopted TRV for the ring-necked duck exposed to mercury in sediments is 0.45 mg/kg/d (Sample et al., 1996).

3.2.4.8 Molybdenum

Molybdenum is usually found in nature as molybdenite (MoS_2). It is an essential nutrient for plants and animals. In plants, it is necessary for the bacterial nitrogen fixing process, and it is a cofactor for several enzymes in animals. Because the bioavailability of molybdenum increases with pH, toxicity would also likely increase with pH.

During the screening of COPCs, the maximum baseline concentrations for molybdenum were found to exceed soil criteria. The derivation of TRVs used for ecological receptors potentially exposed to molybdenum in soil is described below.

<u>Mammals</u>

A geometric mean of the LOAEL values for reproduction and growth was calculated at 0.26 mg/kg/d (Sample et al., 1996).

The NOAELs (or LOAELs) for molybdenum based on reproduction, growth, or mortality endpoints in rats and mice were adjusted using standard allometric relationships (Sample et al. 1996). If a NOAEL is available for a mammalian test species ($NOAEL_t$), then the equivalent NOAEL for a mammalian wildlife species ($NOAEL_w$) can be calculated by using the adjustment factor for differences in body size (Sample et al., 1996):

$$NOAEL_w = NOAEL_t \left(\frac{bw_t}{bw_w}\right)^{1/4}$$

where

$NOAEL_t$ = NOAEL reported in the study for the test species;
bw_t = body weight of the test species; and
bw_w = body weight of the mammals used in the assessment.

The body weight of the mammals used in this assessment and the adjusted TRVs are presented in **Table 3.2-8**.

Birds

Recent research suggests that physiological scaling factors developed for mammals may not be appropriate for interspecies extrapolation to birds (Sample et al., 1996). The adopted TRV for birds is 3.5 mg/kg/d (Sample et al., 1996).

Amphibians

Toxicity data for amphibians (e.g., western toad) exposed to metals is extremely limited. A review of the scientific literature identified no appropriate toxicity limits for amphibian exposure to molybdenum in soil.

Soil Invertebrates

Kabata-Pendias and Pendias (1984) reported unspecified toxic effects for terrestrial biota with the addition of 2 mg/kg molybdenum. This value was adopted as the TRV for soil invertebrates. The benchmark is intended to protect plants and other terrestrial biota from direct soil contact.

Terrestrial Plants

Kabata-Pendias and Pendias (1984) reported unspecified toxic effects on plants with the addition of 2 mg/kg molybdenum. This value was adopted as the TRV for terrestrial plants. The benchmark is intended to protect plants and other terrestrial biota from direct soil contact.

3.2.4.9 Vanadium

Major sources of environmental contamination of vanadium result from the combustion of fossil fuels, the burning of coal wastes, the disposal of coal wastes and fly ash, and releases from metallurgical works and smelters (National Research Council of Canada (NRCC), 1980; World Health Organization (WHO), 1988; Alloway, 1990). Vanadium also enters the environment from natural sources such as continental dust, marine aerosols, and volcanic emissions.

Vanadium is found in rocks and soil in the relatively insoluble trivalent form, and can also be present in the pentavalent form as vanadates (API, 1985). Weathering and decomposed parent rock increases vanadium availability in soils. Jacks (1976) observed that the bulk of vanadium deposited in the environment was retained in the soil, mainly in association with organic matter. The mobility of vanadium in soils is affected by pH. Vanadium is fairly mobile in neutral or alkaline soils relative to other metals, but its mobility decreases in acidic soils. In the presence of humic acids, mobile metavanadate anions can be converted to the immobile vanadyl cations, resulting in local accumulation. Under oxidizing, unsaturated conditions, some mobility is observed, but under reducing, saturated conditions, vanadium is immobile. The pentavalent cation is considerably more soluble than the trivalent cation, is readily dissolved by groundwater, and can be transported over long distances.

If released into water, vanadium is expected to exist primarily in the tetravalent and pentavalent forms. Both species are known to bind strongly to mineral or biogenic surfaces by adsorption. Soluble vanadium present in soil appears to be easily taken up by the roots of plants, usually in the tetravalent or pentavalent form (NRCC, 1980).

During the screening of COPCs, the maximum baseline concentrations for vanadium were found to exceed surface water criteria for freshwater organisms. The derivation of TRVs used for ecological receptors potentially exposed to vanadium in surface water is described below.

<u>Fish</u>

Holdway and Sprague (1979) conducted toxicity tests with vanadium and early life stages of rainbow trout. The test revealed a LCV of 0.08 mg/L of vanadium in fish. This chronic value was adopted as the TRV for vanadium exposure in fish.

<u>Aquatic Invertebrates</u>

Kimball (1978) studied the chronic effects of vanadium on Daphnia magna. The test observed inhibited reproduction of Daphnia magna. A chronic value of 1.9 mg/L was developed from the freshwater life cycle test. This chronic value was used as the TRV for aquatic invertebrates.

Aquatic Plants

Suter et al. (1996) provided the aquatic plant criterion of 0.08 mg/L for vanadium. The criteria for vanadium is intended to be protective of aquatic plants and all sensitive aquatic organisms from direct contact with surface water containing vanadium. The value of 0.08 mg/L of vanadium was adopted as the TRV for vanadium in aquatic plants.

3.2.4.10 Zinc

Zinc is found in almost all minerals, and is the twenty-third most abundant element in the earth's crust. The principal ores of zinc are sphalerite, smithsonite, calamine, and franklinite (O'Neill, 2001). Elemental zinc is not found in the environment, but instead occurs in compounds in the 2+ oxidation state, often as zinc sulphide or zinc oxide. Zinc demonstrates low mobility in most soils, and is strongly adsorbed to soils at pH 5 or greater (Evans, 1989). The solubility of zinc increases with decreasing pH (Alloway, 1990). The bioavailability of zinc in soils is also influenced by total zinc content, pH, organic matter, microbial activity, moisture, and interactions with other macronutrients and micronutrients (Kiekens, 1990).

Zinc is an essential trace element for higher plants and animals. In higher plants, zinc is absorbed as the divalent cation (Zn 2+), which is a metal component of enzymes or a functional, structural, or regulatory cofactor of a large number of enzymes. Zinc is involved in carbohydrate and protein metabolism, and was required for the synthesis of indoleacetic acid. In plants, zinc deficiency is commonly indicated by stunted growth, interveinal chlorosis, and leaf symptomatology, such as small leaves, malformations, and dieback, while zinc excess commonly produces iron chlorosis (Kiekens, 1990).

During the screening of COPCs, the maximum baseline concentrations for zinc were found to exceed surface water (for wildlife and freshwater organisms) and sediment criteria. The derivation of TRVs used for ecological receptors potentially exposed to zinc in surface water and sediments is described below.

Mammals

In animals, zinc is an essential nutrient for regulating a number of metalloenzymes (ATSDR, 2005). Absorption of zinc occurs from all segments of the intestine, although the largest proportion of absorption occurs from the duodenum (ATSDR, 2005). Following absorption by the intestine, zinc is rapidly distributed to the liver, kidneys, prostate, muscles, bones, and pancreas. Zinc salts adversely affect tissues, interfere with the metabolism of other ions such as copper, calcium, and iron, and inhibit erythrocyte production and function.

A geometric mean of the LOAEL values for reproduction and growth was calculated at 160 mg/kg/d (Sample et al., 1996).

NOAELs (or LOAELs) based on reproduction, growth, or mortality endpoints in rats and mice were adjusted using standard allometric relationships (Sample et al., 1996). If a NOAEL is available for a mammalian test species ($NOAEL_t$), then the equivalent NOAEL for a mammalian wildlife species ($NOAEL_w$) can be calculated by using the adjustment factor for differences in body size (Sample et al., 1996):

$$NOAEL_w = NOAEL_t \left(\frac{bw_t}{bw_w} \right)^{1/4}$$

Where

$NOAEL_t$	=	NOAEL reported in the study for the test species;
bw_t	=	body weight of the test species; and
bw_w	=	body weight of the mammals used in the assessment.

Body weights of the mammals used in this assessment and the adjusted TRVs are presented in **Table 3.2-8**.

Birds

The clinical effect of zinc toxicity in avian species is similar to that in mammals, but birds are generally more sensitive to the effects of zinc. Recent research suggests that physiological scaling factors developed for mammals may not be appropriate for interspecies extrapolation to birds (Sample et al., 1996). The adopted TRV for birds was 14.5 mg/kg/d (Sample et al., 1996).

Fish

Sephar (1976) conducted toxicity tests with zinc and the life cycle of Jordanella floridae. The test revealed a chronic value of 0.036 mg/L of zinc in fish. This chronic value was adopted as the TRV for zinc exposure in fish.

Aquatic Invertebrates

Chapman et al. (1980) studied the chronic effects of zinc to Daphnia magna. The test observed inhibited reproduction of Daphnia magna. A chronic value of 0.046 mg/L was developed from the freshwater life cycle test. This chronic value was used as the TRV for aquatic invertebrates.

Aquatic Plants

The aquatic plant toxicity value for zinc of 0.03 mg/L was derived from a chronic study conducted by Bartlett et al. (1974) which demonstrated growth inhibition of aquatic plants. The chronic value of 0.03 mg/L was adopted as the TRV for zinc in aquatic plants.

3.2.5 Risk Characterization

Characterization of risk to ecological receptors in a screening level SLERA can employ qualitative or quantitative methods. Exposure Ratios (ER) provide a quantitative estimate of overall risk. The ER is a unitless value, defined as the ratio of the magnitude of exposure to magnitude of a standard effect:

$$\text{Exposure Ratio} = \frac{\text{Exposure Estimate}}{\text{TRV}}$$

ERs are interpreted as follows:

If the ER is less than 1.0, no unacceptable risks to ecological receptors would be expected, as concentrations are below levels known to cause adverse effects. Conversely, if the ER exceeds 1.0, it may be inferred that adverse effects to individuals are possible.

Given a certain magnitude and type of effect associated with a particular TRV or assessment endpoint, inferences about potential effects can be made. For example, if the level of exposure exceeds a TRV based on a 25% reduction in a growth-based endpoint (ER>1), it can be inferred that one possible outcome may be diminished growth of individuals, potentially (but not necessarily) leading to a reduction in population abundance of that receptor. It is important to note that exceeding an ER of 1 does not necessarily mean adverse effects will occur. Rather, it suggests that there is less confidence that adverse effects will not occur. For a variety of reasons, adverse effects demonstrated in laboratory studies often fail to manifest in the field as a measurable or meaningful effect. It is also important to recognize that the magnitudes of ERs are not directly associated with the magnitudes of potential effects. That is, a large ER (>10) should not be interpreted as a tenfold greater risk than an ER of 1.0.

For those COPCs with ERs greater than 1.0, potential risks at a population level cannot be ruled out and should be evaluated further. Evidence that may be considered other than chemical analysis may include evidence of toxicity at the Project site (e.g., senescent vegetation), toxicity of media in laboratory exposures (i.e., bioassays), the absence of species formerly present or commonly found at similar sites, or diminished populations compared to a reference location. However, since this is an assessment of baseline conditions (background), any exceedances of the ER criteria should not be considered as representative of unhealthy conditions at the site. All exposure estimates are based on laboratory analysis of the different media (soil, water, plants, etc.) which do not distinguish between bioavailable and non-bioavailable forms of metals. Therefore, ER based on these laboratory results may be overestimated.

3.2.5.1 Mammals

During the screening process for mammals, baseline concentrations of COPCs that exceeded guidelines for soil and surface water were carried forward in the assessment. The soil pathway had exceeded wildlife criteria for arsenic and molybdenum, while for the surface water pathway, arsenic and zinc exceeded criteria. Risks to mammals exposed to arsenic, molybdenum, and zinc were characterized by comparing the weight-normalized exposure estimates for each COPC to TRVs for the grizzly bear, caribou, marten, snowshoe hare, and short-tailed shrew. **Table 3.2-9** summarizes the risk estimates for mammals.

Table 3.2-9: Risk Estimates for Mammals

Receptor/COPC	Exposure Estimate (mg/kg/d)	TRV (mg/kg/d)[a]	Exposure Ratio
Grizzly Bear			
Arsenic	0.024	0.09	0.25
Molybdenum	0.18	0.02	**<u>7.50</u>**
Zinc	7.20	26.70	0.27
Caribou			
Arsenic	0.029	0.12	0.24
Molybdenum	0.23	0.03	**<u>7.70</u>**
Zinc	9.00	33.80	0.20
Marten			
Arsenic	0.051	0.43	0.12
Molybdenum	0.011	0.11	0.097
Zinc	7.60	123.10	0.061
Snowshoe Hare			
Arsenic	0.072	0.43	0.17
Molybdenum	0.57	0.11	**<u>5.30</u>**
Zinc	22.60	123.07	0.18
Short-tailed Shrew			
Arsenic	0.40	1.24	0.32
Molybdenum	0.046	0.31	0.15
Zinc	53.60	351.60	0.15

Notes: [a]Adjusted TRV based on body weight of species. Bold and underlined results = exceedances.
COPC = Chemical of Potential Concern; mg/kg/d = milligrams per kilogram body weight per day;
TRV = Toxicological Reference Value

ERs for molybdenum exceed 1.0 for grizzly bear, caribou, and snowshoe hare, and are below 1 for the marten and short-tailed shrew. The main driver of risk for the mammals is believed to be the high background concentrations of arsenic in the soil. Arsenic and zinc ERs are noted to be below 1.0 for grizzly bear, caribou, marten, snowshoe hare, and short-tailed shrew (**Table 3.2-9**).

3.2.5.2 Birds

During the screening process for birds, COPCs that exceeded guidelines for soil and surface water and sediments were carried forward in the assessment. The soil pathway had exceeded wildlife criteria for arsenic and molybdenum, while for the surface water pathway, arsenic and zinc exceeded criteria. The sediment pathway demonstrated exceedances in arsenic, cadmium, chromium, copper, lead, mercury, and zinc. The sediment pathway was only relevant for the ring-necked duck. Risks to birds exposed to COPCs were characterized by comparing the weight-normalized exposure estimates for each COPC to TRVs for the red-tailed hawk, olive-sided flycatcher, ring-necked duck, and Pacific loon. **Table 3.2-10** summarizes the risk estimates for birds.

Table 3.2-10: Risk Estimates for Birds

Receptor/COPC	Exposure Estimate (mg/kg/d)	TRV (mg/kg/d)[a]	Exposure Ratio
Red-tailed hawk			
Arsenic	0.029	2.24	0.013
Molybdenum	0.006	3.5	0.0016
Zinc	5.96	14.5	0.41
Olive-sided flycatcher			
Arsenic	0.47	2.24	0.20
Molybdenum	0.049	3.5	0.014
Zinc	67.8	14.5	**<u>4.7</u>**
Ring-necked duck			
Arsenic	0.52	2.24	0.23
Cadmium	1.2	1.45	0.83
Chromium	0.44	1	0.44
Copper	0.93	47	0.02
Lead	0.56	3.85	0.15
Mercury	0.00029	0.45	0.00064
Zinc	39.8	14.5	**<u>2.7</u>**
Pacific loon			
Arsenic	0.10	2.24	0.2
Zinc	3.5	14.5	0.25

Notes: [a] Adjusted TRV based on body weight of species. **Bold** and <u>underlined</u> results = exceedances.
COPC = Chemical of Potential Concern; mg/kg/d = milligrams per kilogram body weight per day;
TRV = Toxicological Reference Value

ERs for zinc exceed 1.0 for the olive-sided flycatcher and ring-necked duck, and are below 1.0 for the red-tailed hawk and Pacific loon. The main driver of risk for the birds is believed to be the high background concentrations of zinc in surface water. The remaining COPCs are below 1.0 for the red-tailed hawk, olive-sided flycatcher, ring-necked duck, and Pacific loon (**Table 3.2-10**).

3.2.5.3 Amphibians

Amphibians in near the Project are not expected to be continuously exposed to the maximum or 95th percentile (i.e., conservative exposure) of baseline concentrations of arsenic and molybdenum in soil. Available toxicological literature on amphibians focuses mainly on organic compounds (e.g., pesticides, fertilizers) affecting early life stages (eggs and tadpoles). It should be noted that baseline background conditions within the study areas of the Project are not influenced by human activity. During the environmental survey, no visual observations indicated that amphibians were adversely affected by their environment. Given that the metals assessed are not 100% bioavailable, and in the absence of any acceptable TRVs, it is not possible to estimate the health risks from arsenic and molybdenum in soil expected for this receptor.

3.2.5.4 Fish

Rainbow trout in creeks, streams, and lakes near the Project were potentially exposed to metals in surface water. Risks to fish exposed to COPCs in surface water were estimated by comparing the 95th percentile concentration to the LCV benchmark for fish. **Table 3.2-11** summarizes the risk estimates for fish.

Table 3.2-11: Risk Estimates for Rainbow Trout

COPC	Exposure Estimate (mgL)	TRV (mg/L)	Exposure Ratio
Aluminum	0.42	3.29	0.13
Arsenic	0.0014	0.892	0.0016
Cadmium	0.000081	0.0017	0.048
Chromium	0.0015	0.069	0.022
Copper	0.0015	0.0038	0.40
Lead	0.00071	0.019	0.038
Vanadium	0.0014	0.08	0.018
Zinc	0.040	0.036	**<u>1.1</u>**

Notes: **Bold** and underlined results = exceedances; COPC = Chemical of Potential Concern;
TRV = Toxicological Reference Value

ERs for zinc slightly exceed 1.0 for fish within the study areas of the Project. The remaining COPCs' ERs are below 1.0 for fish within the study areas of the Project (**Table 3.2-11**).

3.2.5.5 Soil Invertebrates

Risks to soil invertebrates exposed to COPCs in soil were characterized by comparing 95th percentile concentrations of COPCs in soil to TRVs for the soil invertebrates. **Table 3.2-12** summarizes the risk estimates for soil invertebrates.

Table 3.2-12: Risk Estimates for Soil Invertebrates

COPC	Exposure Estimate (mg/kg/d)	TRV (mg/kg/d)	Exposure Ratio
Arsenic	21.4	18	**<u>1.2</u>**
Molybdenum	5.06	2	**<u>2.5</u>**

Notes: Bold and underlined results = exceedances; COPC = Chemical of Potential Concern; mg/kg/d = milligrams per kilogram body weight per day; TRV = Toxicological Reference Value

The ERs for arsenic and molybdenum exceed 1.0 (**Table 3.2-12**). It may be inferred from these results that levels of arsenic and molybdenum in soil may pose a risk to soil invertebrates within the study areas of the Project. However, major, widespread adverse effects to invertebrate populations are considered unlikely. Given the level of arsenic and molybdenum across much of the site compared to the low effect level TRV, adverse effects would likely be limited to a minor decrease in growth or decrease in the abundance of invertebrates within areas having the highest arsenic and molybdenum concentrations. As such, these adverse effects would not appreciably decrease soil invertebrate populations. It should also be noted that only 1 out of 37 soil samples for molybdenum exceeded criteria, suggesting that the Project study areas do not pose an unacceptable risk to soil invertebrate communities.

3.2.5.6 Aquatic Invertebrates

Risks to aquatic invertebrates exposed to COPCs in surface water were calculated by comparing the 95th percentile of the COPC concentrations in surface water samples to the LCV benchmark (**Table 3.2-13**). The ER for copper exceeded 1.0, and the ERs for the remaining COPCs were noted to be below 1.0.

Table 3.2-13: Risk Estimates for Aquatic Invertebrates

COPC	Exposure Estimate (mgL)	TRV (mg/L)	Exposure Ratio
Aluminum	0.42	1.9	0.22
Arsenic	0.0014	0.45	0.003
Cadmium	0.000081	0.00015	0.54
Chromium	0.0015	0.044	0.034
Copper	0.0015	0.00023	**<u>6.5</u>**
Lead	0.00071	0.012	0.058
Vanadium	0.0014	1.9	0.00074
Zinc	0.040	0.047	0.86

Notes: **Bold** and <u>underlined</u> results = exceedances; COPC = Chemical of Potential Concern; TRV = Toxicological Reference Value

It should be noted that concentrations at the majority of sampling locations were below levels capable of causing adverse effects for most COPCs. In all likelihood, adverse effects from elevated concentrations of COPCs would not be observed across most of the study areas of the Project. Therefore, although some effects may be possible, significant impacts to the aquatic invertebrate community from COPCs in surface water are unlikely.

3.2.5.7 Terrestrial Plants

Risks to terrestrial plants exposed to COPCs in soil were characterized by comparing 95th percentile concentrations of COPCs in soil to TRVs for the soil invertebrates. **Table 3.2-14** summarizes the risk estimates for soil invertebrates.

Table 3.2-14: Risk Estimates for Terrestrial Plants

COPC	Exposure Estimate (mg/kg/d)	TRV (mg/kg/d)	Exposure Ratio
Arsenic	21.4	18	**<u>1.2</u>**
Molybdenum	5.06	2	**<u>2.5</u>**

Notes: **Bold** and <u>underlined</u> results = exceedances; COPC = Chemical of Potential Concern; mg/kg/d = milligrams per kilogram body weight per day; TRV = Toxicological Reference Value

The ERs for arsenic and molybdenum exceed 1.0 (**Table 3.2-14**). It may be inferred from these results that levels of certain inorganic parameters in soil may pose a risk to terrestrial plants.

However, as discussed previously, an ER greater than 1.0 does not indicate adverse effects are certain. ERs for immobile plants are based on using the 95th percentile of COPC concentrations, an approach designed to ensure conservatism in the assessment. Concentrations at the majority of sampling locations are below levels capable of causing adverse effects for most COPCs. In all likelihood, adverse effects from elevated concentrations of COPCs would not be observed across most of the Project site and, if present, would likely be limited to small areas near "hot spots." Therefore, although some effects may be possible, significant impacts to the plant community from COPCs in soil are unlikely. Similar to soil invertebrates, only 1 out of 37 soil samples for molybdenum exceeded the soil criterion, suggesting that COPCs in the Project study areas do not pose an unacceptable risk to the terrestrial plant community.

3.2.5.8 Aquatic Plants

Risks to aquatic plants exposed to COPCs in surface water were calculated by comparing the 95th percentile of the COPC concentrations in surface water samples to the LCV benchmark (**Table 3.2-15**). The ER for copper and zinc exceeded 1.0, and the ERs for the remaining COPCs were noted to be below 1.0.

Table 3.2-15: Risk Estimates for Aquatic Plants

COPC	Exposure Estimate (mgL)	TRV (mg/L)	Exposure Ratio
Aluminum	0.42	0.46	0.91
Arsenic	0.0014	0.048	0.03
Cadmium	0.000081	0.002	0.04
Chromium	0.0015	0.40	0.004
Copper	0.0015	0.001	**1.5**
Lead	0.00071	0.5	0.0014
Vanadium	0.0014	0.08	0.02
Zinc	0.040	0.03	**1.3**

Notes: **Bold** and underlined results = exceedances; COPC = Chemical of Potential Concern; TRV = Toxicological Reference Value

Similar to aquatic invertebrates, concentrations at the majority of sampling locations were below levels capable of causing adverse effects for most COPCs. In all likelihood, adverse effects from elevated concentrations of COPCs would not be observed across most of the study areas of the Project. Therefore, although some effects may be possible, significant impacts to the aquatic plant community from COPCs in surface water are unlikely.

3.2.5.9 Qualitative Interpretation of Risk Hazards

Qualitative comparisons of the estimated exposures and selected TRVs for mammals, birds, amphibians, fish, soil and aquatic invertebrates, and terrestrial and aquatic plants are discussed in detail in Section 1.4.7. The detailed exposure ratio calculations for the ecological receptors and their environmental exposure pathways are further illustrated in **Appendix 4**.

Current ERs in association with molybdenum exposure within the study areas of the Project are noted to be above 1.0 for the grizzly bear, caribou, and snowshoe hare, and below 1.0 for the marten and short-tailed shrew. The main driver of risk for the mammals is likely due to the high background concentrations of molybdenum in the soil within the study areas of the Project. ERs for arsenic and zinc are below 1.0, indicating that risks to the health of all mammals are not expected.

Current ERs in association with zinc exposure within the study areas of the Project are noted to be above 1.0 for the olive-sided flycatcher and ring-necked duck, and below 1.0 for the red-tailed hawk and Pacific loon. The main driver of risk for the birds is likely due to the high background concentrations of zinc in the surface water within the study areas of the Project. ERs for the remaining COPCs are below 1.0 for birds, indicating that risks to the health of all birds are not expected.

ERs for zinc for fish are above 1.0, while the remaining COPCs' ERs are below 1.0. For soil invertebrates and terrestrial plants, ERs for both arsenic and molybdenum are noted to be above 1.0. ERs for aquatic invertebrates are above 1.0 for copper, while the remaining

COPC ERs are below 1.0. Finally, the ERs for aquatic plants are above 1.0 for copper and zinc, while the ERs for the remaining COPCs are below 1.0.

A summary of the calculated exposure ratios associated with COPCs within the study areas of the Project for mammals and aquatic plants are provided in **Table 3.2-9** and **Table 3.2-15,** respectively.

3.2.6 Uncertainty Analysis

Uncertainty in risk assessment is introduced by the necessary use of assumptions concerning various aspects or characteristics of the system that cannot be measured accurately. Incomplete understanding of environmental processes is inherent in any SLERA. Uncertainty is acknowledged, documented, and primarily addressed by the use of conservative assumptions that ensure risk is overestimated rather than underestimated. Uncertainty associated with certain aspects of the SLERA (e.g., exposure assessment) was addressed within the appropriate sections of the SLERA. In this section, various sources of uncertainty associated with the current ecological risk assessment are discussed.

Regardless of the level of sampling effort expended in characterizing COPC concentrations at a site, some inherent uncertainty always remains with respect to actual levels of chemicals in various environmental media.

3.2.6.1 Problem Formulation

Uncertainty is recognized when regarding the true extent of the concentration of COPCs across the site, both temporally and spatially. Because the soil conditions were not expected to be physically uniform (and may be locally variable), no sampling program will completely eliminate this uncertainty. Risks will either be overestimated or underestimated.

3.2.6.2 Exposure Assessment

Uncertainty in the exposure assessment was related primarily to assumptions regarding the presence of VCs. As the regional area is characterized according to the CCME guideline primarily as residential/parkland, use of the Project area by ecological receptors may be infrequent. Conservative assumptions were made to ensure any ecological receptors that might use the Project area were provided sufficient protection. Uncertainties may occur in the assessment when using statistical or upper-bound parameters (i.e., 95^{th} percentile) as the representative concentrations. This may result in overestimation of risk, depending on the underlying statistical distribution of the concentrations. Uncertainties may also occur in circumstances where data were below the MDL, resulting in the use of half of the detection limit as a surrogate value. Actual data below the MDL data was unknown, and this may contribute to an overestimation or underestimation of risk.

3.2.6.3 Toxicity Assessment

Because of the inherent uncertainty in predicting toxicological responses from literature studies rather than directly measuring toxicity at the site, there is some uncertainty associated with TRVs. In most cases, TRVs were assumed to be conservative (i.e., no toxicity is anticipated if site concentrations are below TRVs). This was because most reference values were based on the most sensitive species tested, or a similar low effect level (e.g., 10^{th} or 25^{th} percentile of species sensitivity distribution), and the toxicity tests they were based on are typically conducted under conditions that maximize toxicity (i.e., the use of soluble metal salts). Uncertainties may occur when using the established TRVs for each chemical associated with the assessment of the Project. This was taken into consideration when test subjects exposed to COPCs in a controlled environment resulted in similar behaviour and effects as those species exposed to COPCs in the actual environment.

3.2.6.4 Risk Characterization

For the most part, the ERs generated in the risk characterization phase of the SLERA should be considered quite conservative. ERs greater than 1.0 do not necessarily mean a toxicological effect is occurring. There was greater inherent uncertainty associated with results of screening-level assessments than with higher-tier assessments, because results were based primarily on modelled or estimated concentrations and TRVs derived from literature studies, rather than direct measurements of exposure and effects. At the Project, no direct measurements of exposure were made, and no toxicity studies were performed. In many cases, toxicity at a site is considerably diminished compared to effects predicted from laboratory studies, for a variety of reasons. Higher-tier assessments incorporate site-specific toxicity data in a lines-of-evidence approach, which can reduce the level of uncertainty in this phase of the assessment.

3.2.7 Ecological Risk Assessment Summary and Conclusions

This report has presented a baseline SLERA of potential adverse effects from COPCs identified in association with soil, surface water, sediments, and food within the study areas of the Project. The SLERA used both historic and current sampling data, and was consistent with the methodology required by BC MELP (1998) and CCME (1996 and 1997a) for conducting screening-level ecological risk assessments at sites in Canada.

The findings of the SLERA are as follows:

- Maximum baseline concentrations for arsenic and molybdenum exceed soil criteria for mammals. Additionally, maximum baseline concentrations for arsenic and zinc exceed surface water criteria for mammals. Following risk assessment modelling, exposure ratios for molybdenum were noted to be above 1.0 for the grizzly bear, caribou, and hare, while the remaining ERs were below 1.0. It should be noted that

ERs greater than 1.0 do not indicate adverse effects are certain. The main driver of risk for the mammals is likely the high background concentrations of molybdenum in the soil within the study areas of the Project, and the particularly conservative TRVs used in the SLERA;

- For birds, maximum baseline concentrations for arsenic, molybdenum, and zinc exceed their respective soil and surface water criteria. Furthermore, maximum baseline concentrations for arsenic, cadmium, chromium, copper, lead, mercury, and zinc exceed their respective sediment criteria. Following risk assessment modelling, exposure ratios for zinc are noted to be greater than 1.0 for the olive-sided flycatcher and ring-necked duck. It should be noted that ERs greater than 1.0 do not indicate adverse effects are certain. The main driver of risk for the birds is believed to be the high background concentrations of zinc in surface water and the overly conservative TRVs used in the SLERA. The ERs for the remaining COPCs are below 1.0;
- As previously discussed in this SLERA, given the paucity of toxicity data for amphibian exposure to metals, amphibians were assessed qualitatively instead of quantitatively. Amphibians near the Project are not expected to be exposed continuously to the maximum or 95th percentile (i.e., conservative exposure) of baseline concentrations of arsenic and molybdenum in soil. Available toxicological literature on amphibians focuses mainly on organic compounds (pesticides, fertilizers) affecting early life stages (eggs and tadpoles). It should be noted that baseline background conditions within the study areas of the Project are not influenced by human activity. During the environmental survey, no visual observations indicated that amphibians were adversely affected by their environment. Given that the metals assessed are not 100% bioavailable, and in the absence of any acceptable TRVs, it is not possible to conclude that unacceptable health risks from arsenic and molybdenum in soil are expected for this receptor;
- For freshwater aquatic organisms, maximum baseline concentrations exceed criteria for aluminum, arsenic, cadmium, chromium, copper, lead, vanadium, and zinc. Exposure ratios are noted to be greater than 1.0 for zinc in fish and aquatic plants, and greater than 1.0 for copper in aquatic invertebrates and aquatic plants. It should be noted that ERs greater than 1.0 do not indicate adverse effects are certain. The main driver of risk is believed to be the high background concentrations of copper and zinc in surface water, and their conservative TRVs. The ERs for the remaining COPCs are below 1.0 for freshwater aquatic organisms; and
- For terrestrial plants and soil invertebrates, the maximum baseline concentrations for arsenic and molybdenum exceed soil criteria. The ERs for both COPCs are noted to be above 1.0 for both receptors. The main driver of risks is believed to be the high background concentrations of both arsenic and molybdenum in soil. However, as discussed previously, an ER greater than 1.0 does not indicate adverse effects are certain.

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ANNEXES

Annex 1
Sampling Data

Table 1-1: Soil Analytical Results for Metals, July 2012 Sampling Program

Elements	MDL	Sample ID	BW-35A-LFH-Metals	BW-35A-LFH-Metals	BW-35A-TS-Metals	BW-35A-LFH	BW-35A-Ah	BW-35A-Bm	BW-35A-Bm	BW-117A-LFH	BW-117A-Bt	BW-117A-Bt	BW-221A-LFH	BW-221A-Ahgj	BW-97A-LFH-Metals	BW-97A-LFH
		Area														
		Unit														
Antimony	0.5	µg/g (ppm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	---	---	< 0.5	---	---	< 0.5	< 0.5	< 0.5	---
Arsenic	0.5	µg/g (ppm)	2.5	2.5	5.2	2.2	4.8	---	---	1.8	---	---	15.5	45	1.5	---
Barium	1	µg/g (ppm)	130	131	35	136	32	---	---	106	---	---	101	123	127	---
Beryllium	0.1	µg/g (ppm)	1.4	1.4	0.6	1.2	0.6	---	---	0.1	---	---	0.4	0.9	< 0.1	---
Boron (Hot W	0.1	µg/g (ppm)	*< 0.4	*< 0.4	< 0.1	*< 0.4	< 0.1	---	---	*< 0.4	---	---	*< 0.4	< 0.1	*< 0.4	---
Cadmium	0.1	µg/g (ppm)	0.6	0.6	0.2	0.7	0.2	---	---	0.2	---	---	2	0.8	0.2	---
Chromium	0.5	µg/g (ppm)	2.4	2.4	9.4	3.2	10.4	---	---	1.9	---	---	5.8	11.9	3.1	---
Cobalt	0.5	µg/g (ppm)	1.5	1.5	4.3	1.6	5	---	---	1.3	---	---	4.2	6.3	0.8	---
Copper	0.1	µg/g (ppm)	7.4	7.2	8	9.2	9	---	---	5.5	---	---	9.3	9.3	3.9	---
Lead	0.5	µg/g (ppm)	12.8	12.8	9.9	9.3	7.1	---	---	11.9	---	---	13.5	20.5	12.1	---
Mercury	0.5	µg/g (ppm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	---	---	< 0.5	---	---	< 0.5	< 0.5	< 0.5	---
Molybdenum	0.5	µg/g (ppm)	1	1	0.9	0.8	0.9	---	---	0.6	---	---	1.6	2.8	0.8	---
Nickel	0.5	µg/g (ppm)	3.8	3.8	6.6	4.2	7.5	---	---	2.4	---	---	7.5	10.8	2.7	---
Selenium	0.5	µg/g (ppm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	---	---	< 0.5	---	---	< 0.5	< 0.5	< 0.5	---
Silver	0.1	µg/g (ppm)	0.4	0.4	0.2	0.2	0.2	---	---	0.7	---	---	< 0.1	< 0.1	< 0.1	---
Thallium	0.5	µg/g (ppm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	---	---	< 0.5	---	---	< 0.5	< 0.5	< 0.5	---
Tin	0.5	µg/g (ppm)	5.7	5.6	3.6	< 0.5	1.4	---	---	7.8	---	---	8.6	11.8	10.9	---
Vanadium	0.2	µg/g (ppm)	4.4	4.4	25.7	6	29.8	---	---	4.7	---	---	14.5	33.2	5.5	---
Zinc	0.5	µg/g (ppm)	31.6	31.3	35	38.7	38.3	---	---	44.1	---	---	114	84.4	24.6	---

Elements	MDL	Sample ID	BW-97A-Ae	BW-97A-Bm	BW-97A-C	BW12-A-Bm	BW-24A-LFH	BW-24A-Ae	BW-24A-Bf	BW-20A-LFH	BW-20A-Ah	SC2-LF	SC2-Ae	SC2-Bm	BW-97A-7S-Metals	BW-97A-BC	BW-117A-LFH-Metals	BW-117A-Ae	BW-117A-C
		Area																	
		Unit																	
Antimony	0.5	µg/g (ppm)	< 0.5	---	---	---	< 0.5	< 0.5	---	< 0.5	< 0.5	< 0.5	< 0.5	---	< 0.5	---	< 0.5	< 0.5	---
Arsenic	0.5	µg/g (ppm)	1.5	---	---	---	1	0.7	---	1.6	14.3	1.2	2.7	---	4.3	---	1.7	5.6	---
Barium	1	µg/g (ppm)	32	---	---	---	70	16	---	92	119	31	48	---	72	---	121	31	---
Beryllium	0.1	µg/g (ppm)	< 0.1	---	---	---	< 0.1	< 0.1	---	0.5	1.2	< 0.1	0.2	---	0.3	---	0.1	< 0.1	---
Boron (Hot W	0.1	µg/g (ppm)	< 0.1	---	---	---	*< 0.4	< 0.1	---	*< 0.4	< 0.1	*< 0.4	< 0.1	---	< 0.1	---	*< 0.4	< 0.1	---
Cadmium	0.1	µg/g (ppm)	< 0.1	---	---	---	0.1	< 0.1	---	0.3	0.4	0.3	< 0.1	---	0.1	---	0.1	< 0.1	---
Chromium	0.5	µg/g (ppm)	8.9	---	---	---	< 0.5	1.9	---	< 0.5	19.1	0.6	11.2	---	14.8	---	1.6	7.7	---
Cobalt	0.5	µg/g (ppm)	2	---	---	---	< 0.5	< 0.5	---	1.7	9.6	< 0.5	4.7	---	4.9	---	1.1	2.3	---
Copper	0.1	µg/g (ppm)	3.2	---	---	---	5.4	1.6	---	5.4	16.1	4.7	6.2	---	6.9	---	5.3	3.4	---
Lead	0.5	µg/g (ppm)	14.2	---	---	---	4.8	5.4	---	9.2	12.4	6.8	8.1	---	12.5	---	9.8	15.3	---
Mercury	0.5	µg/g (ppm)	< 0.5	---	---	---	< 0.5	< 0.5	---	< 0.5	< 0.5	< 0.5	< 0.5	---	< 0.5	---	< 0.5	< 0.5	---
Molybdenum	0.5	µg/g (ppm)	< 0.5	---	---	---	< 0.5	< 0.5	---	0.5	3.1	0.7	0.6	---	1	---	0.5	0.6	---
Nickel	0.5	µg/g (ppm)	3.2	---	---	---	1.4	0.6	---	1.7	11.9	1.2	7.8	---	9.5	---	2.2	3.6	---
Selenium	0.5	µg/g (ppm)	< 0.5	---	---	---	< 0.5	< 0.5	---	< 0.5	< 0.5	< 0.5	< 0.5	---	< 0.5	---	< 0.5	< 0.5	---
Silver	0.1	µg/g (ppm)	< 0.1	---	---	---	0.3	0.1	---	0.5	< 0.1	0.4	< 0.1	---	0.1	---	0.5	< 0.1	---
Thallium	0.5	µg/g (ppm)	< 0.5	---	---	---	< 0.5	< 0.5	---	< 0.5	< 0.5	< 0.5	< 0.5	---	< 0.5	---	< 0.5	< 0.5	---
Tin	0.5	µg/g (ppm)	7.6	---	---	---	< 0.5	< 0.5	---	11.2	2.7	6.7	2.9	---	1.8	---	5.4	3.1	---
Vanadium	0.2	µg/g (ppm)	24.1	---	---	---	0.9	6.9	---	1.6	72.4	1.1	36.2	---	49.1	---	3.6	28.1	---
Zinc	0.5	µg/g (ppm)	25.2	---	---	---	48.3	5.6	---	26.6	81	69.2	33.1	---	66.1	---	44.5	24.4	---

Table 1-2: Soil Analytical Results for Metals, July 2012 Sampling Program (from Vegetation)

Elements	MDL	Area / Sample ID / Unit	G-011	G-011	G-015	G-016	G-035	G-036	G-038	G-053	G-054	G-056	G-057	G-058	G-060	G-067 Ah	G-067 B	G-068	G-082	G-084
Antimony	0.5	µg/g (ppm)	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	0.25	0.25	0.25	0.25	0.25
Arsenic	0.5	µg/g (ppm)	3.2	3	2.4	4.9	8.1	1.00	1.10	1.50	6.4	80.8	1.1	7.6	1.9	14.9	2.6	2.5	2.4	1.8
Barium	1	µg/g (ppm)	66	66	49	67	119	46.00	44.00	9.00	97	30	5	136	81	152	81	25	41	47
Beryllium	0.1	µg/g (ppm)	0.2	0.2	0.2	0.4	1.2	0.05	0.05	0.20	0.6	0.2	0.05	0.6	0.6	1.7	0.4	0.3	0.2	0.2
Boron (Hot W	0.1	µg/g (ppm)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cadmium	0.1	µg/g (ppm)	0.05	0.05	0.05	0.2	0.4	0.05	0.05	0.20	1.8	1.5	0.05	0.6	0.4	0.7	0.2	0.1	0.05	0.05
Chromium	0.5	µg/g (ppm)	16.8	16.8	9.6	12.5	27.4	0.25	0.80	0.90	3.4	2.7	0.25	6.1	4.4	24.8	12.2	3	11	1.5
Cobalt	0.5	µg/g (ppm)	8.7	8.6	4.9	7.1	2.7	0.60	0.90	0.60	1.6	2.5	0.25	15.7	1.3	4.6	3.6	0.6	4.9	1.1
Copper	0.1	µg/g (ppm)	8.1	8.1	5.9	8.1	26.9	3.40	4.70	7.20	17.2	22	1.7	16.1	22.7	34.1	6.2	11	7.5	16.1
Lead	0.5	µg/g (ppm)	15.6	15.5	14.3	28.2	17.9	1.40	2.50	2.90	15.1	7.5	0.5	18.6	7.8	29.6	16.8	4	14	3
Mercury	0.5	µg/g (ppm)	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	0.25	0.25	0.25	0.25	0.25
Molybdenum	0.5	µg/g (ppm)	1	1	0.8	1.2	4	0.90	1.50	1.30	2.7	14.8	5.7	1.6	0.8	4.9	0.8	0.5	0.25	0.9
Nickel	0.5	µg/g (ppm)	15.7	15.5	7.3	9.7	6.9	1.20	1.10	1.70	5.5	0.9	0.25	4.5	3.5	9.7	5.4	2.4	6.6	1.8
Selenium	0.5	µg/g (ppm)	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	0.25	0.25	0.25	0.25	0.25
Silver	0.1	µg/g (ppm)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Thallium	0.5	µg/g (ppm)	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	0.25	0.25	0.25	0.25	0.25
Tin	0.5	µg/g (ppm)	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	0.25	0.25	0.25	0.25	0.25
Vanadium	0.2	µg/g (ppm)	46.2	46.5	29	37.6	32.2	1.00	1.70	3.40	8	40.2	0.7	56.5	6.2	39.8	21.4	6.3	31.5	9.2
Zinc	0.5	µg/g (ppm)	35.1	34.6	39	78.8	17.7	6.90	8.90	5.80	42.4	5.5	2.2	36.7	9.5	86.8	42.8	9.3	25.4	4.7

Table 1-3: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	BW177		C1			C4			WLD	CW100		
		Sample ID	~LIMS:EC-63959	~LIMS:EC-64543	~LIMS:EC-61903	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-61903	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63883	~LIMS:EC-63634	~LIMS:EC-63808	~LIMS:EC-64031
		Unit												
Aluminum (Al)	---	mg/L	0.264	0.020	0.045	0.124	0.017	0.051	0.076	0.042	0.173	0.988	1.000	1.120
Antimony (Sb)	0.00005	mg/L	0.00016	0.00008	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00008	0.00009	0.00007
Arsenic (As)	0.0001	mg/L	0.0283	0.0294	0.0006	0.0004	0.0003	0.0002	0.0001	<0.0001	<0.0001	0.0130	0.0123	0.0115
Barium (Ba)	---	mg/L	0.00274	0.00075	0.00132	0.00226	0.00164	0.00979	0.00718	0.01170	0.00991	0.01080	0.00844	0.00952
Beryllium (Be)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0024	0.0026	0.0023
Boron (B)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Cadmium (Cd	0.000015	mg/L	0.000023	<0.000015	0.000019	<0.000015	<0.000015	0.000062	<0.000015	<0.000015	<0.000015	0.005270	0.005030	0.004820
Calcium (Ca)	---	mg/L	23.3	24.0	4.0	5.1	19.0	7.2	5.8	8.7	9.8	11.8	12.7	12.8
Chromium (C	0.0003	mg/L	<0.0003	<0.0003	<0.0003	<0.0003	0.0004	<0.0003	<0.0003	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	0.00002	mg/L	0.00011	<0.00002	<0.00002	<0.00002	0.00006	0.00009	0.00008	0.00020	0.00021	0.00277	0.00273	0.00264
Copper (Cu)	0.0001	mg/L	0.0020	<0.0001	0.0001	0.0002	0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0006	<0.0001	0.0003
Iron (Fe)	---	mg/L	0.2810	0.0208	0.2240	0.1050	0.1150	4.6300	1.0000	1.6300	1.2700	17.0000	18.1000	16.7000
Lead (Pb)	0.00005	mg/L	0.00034	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00009	0.00014	<0.00005	0.00018
Lithium (Li)	0.001	mg/L	0.008	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006	0.006	0.006
Magnesium (M	0.5	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	4.06	2.78	4.72	4.90	1.69	1.74	1.60
Manganese (M	---	mg/L	0.03940	0.02131	0.00763	0.01020	0.02610	0.05270	0.06700	0.16400	0.20000	4.74000	4.51000	4.68000
Mercury (Hg)	0.000005	mg/L	<0.000005	<0.000005	<0.000008	<0.000005	<0.000005	0.000020	<0.000005	<0.000005	0.000009	<0.000005	0.000007	<0.000005
Molybdenum (	---	mg/L	0.00751	0.00752	0.00010	0.00017	0.00030	0.00035	0.00025	0.00056	0.00029	0.00018	0.00020	0.00020
Nickel (Ni)	0.00005	mg/L	0.00031	<0.00005	<0.00005	<0.00005	0.00006	<0.00005	0.00013	0.00009	0.00041	0.00293	0.00296	0.00317
Phosphorus (	0.02	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	0.08	0.04	0.14	0.10	0.05	0.05	0.04
Potassium (K)	0.5	mg/L	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.1	3.4	3.2
Selenium (Se)	0.0006	mg/L	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	mg/L	6.44	5.90	3.10	2.79	4.19	5.54	6.99	6.77	6.67	10.90	11.10	10.60
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	mg/L	8.9	9.4	0.8	<0.5	1.4	2.6	2.3	3.4	3.4	1.3	1.4	1.3
Strontium (Sr)	---	mg/L	0.196000	0.199600	0.021500	0.029700	0.066300	0.078500	0.057500	0.089400	0.093600	0.023500	0.022200	0.022400
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	0.0090	0.0005	0.0008	0.0005	<0.0002	0.0013	0.0013	0.0009	0.0026	0.0044	0.0002	0.0042
Uranium (U)	0.00005	mg/L	0.00015	0.00016	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00076	0.00057	0.00063
Vanadium (V)	0.0001	mg/L	0.0002	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	---	mg/L	0.0046	0.0010	0.0008	0.0016	0.0055	0.0016	0.0058	0.0033	0.0023	4.2300	3.6800	4.0100

Elements	CW100		CW100-D	W12	W13	W15	W16	W19	W Duplicate	W2		W4
	~LIMS:EC-64256	~LIMS:EC-64411	~LIMS:L1227776	~LIMS:EC-61903	~LIMS:EC-61903	~LIMS:EC-61903	~LIMS:EC-61903	~LIMS:EC-61903	~LIMS:EC-61903	~LIMS:EC-61903		~LIMS:EC-61903
Aluminum (Al)	3.160	1.875	---	0.273	0.211	0.093	0.028	0.066	0.177	0.183	0.182	0.046
Antimony (Sb)	0.00035	0.00009	---	<0.00005	<0.00005	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	0.0183	0.0135	---	0.0002	0.0001	0.0007	<0.0001	0.0002	0.0005	0.0004	0.0005	0.0002
Barium (Ba)	0.01610	0.01444	---	0.01090	0.01780	0.00547	0.02800	0.02370	0.00631	0.00574	0.00569	0.00278
Beryllium (Be)	0.0021	0.0025	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	<0.001	<0.001	---	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd	0.004680	0.004798	---	0.000024	0.000017	<0.000015	0.000019	0.000354	<0.000015	0.000034	0.000035	<0.000015
Calcium (Ca)	11.8	14.0	---	4.4	5.1	9.1	24.3	4.4	1.6	1.5	1.5	4.2
Chromium (C	0.0012	<0.0003	---	<0.0003	<0.0003	0.0006	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	0.00301	0.00284	---	0.00007	0.00003	0.00014	0.00019	0.00016	0.00014	0.00013	0.00013	<0.00002
Copper (Cu)	0.0051	0.0192	---	0.0009	0.0004	0.0006	0.0003	0.0014	0.0003	0.0003	0.0003	0.0001
Iron (Fe)	26.2000	17.9300	---	0.3860	0.1480	0.2630	0.3570	0.3250	0.1600	0.1660	0.1650	0.0325
Lead (Pb)	0.00323	0.00162	---	<0.00005	<0.00005	<0.00005	0.00014	0.00012	<0.00005	<0.00005	<0.00005	<0.00005
Lithium (Li)	0.006	0.006	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	1.61	1.74	---	0.97	1.07	2.12	5.71	2.10	<0.50	<0.50	<0.50	0.63
Manganese (M	4.35000	4.23100	---	0.00946	0.00267	0.07310	0.45200	0.05330	0.02460	0.02100	0.02090	0.00251
Mercury (Hg)	<0.000005	<0.000005	---	<0.000008	<0.000008	<0.000008	<0.000008	0.000013	<0.000008	<0.000008	<0.000008	<0.000008
Molybdenum (	0.00067	0.00046	---	<0.00005	<0.00005	0.00031	0.00015	0.00011	<0.00005	0.00005	0.00006	0.00006
Nickel (Ni)	0.00355	0.00311	---	<0.00005	<0.00005	<0.00005	<0.00005	0.00062	0.00032	0.00029	0.00028	<0.00005
Phosphorus (	0.19	0.09	---	<0.02	<0.02	0.05	0.12	0.67	<0.02	<0.02	<0.02	<0.02
Potassium (K)	3.1	3.4	---	<0.5	<0.5	<0.5	0.9	0.9	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	11.90	11.40	---	3.69	4.05	7.07	5.75	7.86	2.29	2.33	2.35	3.16
Silver (Ag)	0.00007	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	1.3	1.4	---	1.8	1.7	2.8	4.4	3.4	1.3	1.2	1.2	1.8
Strontium (Sr)	0.024600	0.025350	---	0.035200	0.046000	0.062300	0.174000	0.031800	0.014600	0.012700	0.012700	0.039700
Thallium (Tl)	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	0.0613	0.0267	---	0.0040	0.0016	0.0025	0.0009	0.0018	0.0006	0.0006	0.0006	0.0002
Uranium (U)	0.00232	0.00101	---	<0.00005	<0.00005	0.00013	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Vanadium (V)	0.0024	0.0006	---	0.0004	<0.0001	0.0010	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	4.6700	3.3100	---	0.0030	0.0011	0.0025	0.0010	0.0071	0.0009	0.0010	0.0010	0.0010

Elements	W8	WL12		WL13		WL15		WL15-D	WL16		WL19		WL19-D	WL2	
	~LIMS:EC-61903	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:L1176558	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:L1205184	~LIMS:EC-63521	
Aluminum (Al)	0.212	0.417	0.285	0.194	0.171	0.034	0.307	---	0.028	0.004	0.036	0.077	---	0.175	0.171
Antimony (Sb)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	0.00012	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005
Arsenic (As)	0.0002	0.0002	0.0001	0.0002	<0.0001	0.0012	0.0029	---	0.0001	0.0001	0.0001	0.0002	---	0.0007	0.0008
Barium (Ba)	0.02540	0.01430	0.01960	0.00749	0.00989	0.00853	0.01320	---	0.01190	0.01130	0.00094	0.01750	---	0.00476	0.00480
Beryllium (Be)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001
Boron (B)	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001
Cadmium (Cd	0.000088	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.000028	---	<0.000015	<0.000015	<0.000015	<0.000015	---	<0.000015	<0.000015
Calcium (Ca)	3.2	3.0	3.6	3.9	5.4	9.7	13.1	---	16.8	22.8	4.2	6.5	---	3.7	3.8
Chromium (C	<0.0003	0.0004	0.0007	<0.0003	0.0006	0.0005	0.0040	---	<0.0003	0.0003	<0.0003	0.0006	---	<0.0003	<0.0003
Cobalt (Co)	0.00015	0.00009	0.00007	0.00002	0.00003	0.00006	0.00114	---	<0.00002	0.00005	0.00015	0.00045	---	0.00004	0.00004
Copper (Cu)	0.0005	0.0001	0.0002	0.0003	0.0002	0.0005	0.0011	---	<0.0001	0.0001	<0.0001	<0.0001	---	0.0005	0.0005
Iron (Fe)	0.4220	0.2150	0.1440	0.0623	0.0859	0.1650	3.1900	---	0.2510	0.1260	0.1500	0.5150	---	0.2440	0.2450
Lead (Pb)	0.00011	0.00008	<0.00005	0.00048	<0.00005	<0.00005	0.00013	---	<0.00005	<0.00005	0.00019	0.00014	---	<0.00005	<0.00005
Lithium (Li)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001
Magnesium (M	0.66	0.75	0.92	0.77	1.13	2.22	2.13	---	3.42	4.26	2.11	2.10	---	0.65	0.63
Manganese (M	0.03060	0.01970	0.01670	0.00037	0.00975	0.02590	0.12600	---	0.25800	0.06790	0.09050	0.23700	---	0.01260	0.01240
Mercury (Hg)	0.000012	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000017	---	<0.000005	<0.000005	<0.000005	0.000012	---	<0.000005	<0.000005
Molybdenum (	0.00016	<0.00005	<0.00005	<0.00005	<0.00005	0.00126	0.00020	---	0.00006	0.00006	<0.00005	0.00011	---	0.00008	0.00007
Nickel (Ni)	0.00021	0.00036	0.00035	0.00016	0.00020	0.00022	0.00175	---	0.00013	0.00017	0.00040	0.00100	---	0.00077	0.00073
Phosphorus (	0.12	<0.02	<0.02	<0.02	<0.02	0.08	0.17	---	0.03	<0.02	0.19	0.43	---	<0.02	<0.02
Potassium (K)	<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
Selenium (Se)	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006
Silicon	5.10	2.57	1.72	4.47	4.61	7.83	8.28	---	5.73	5.94	6.13	6.80	---	4.41	4.35
Silver (Ag)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005
Sodium (Na)	1.6	1.8	2.0	1.5	1.8	3.0	2.8	---	3.2	3.9	2.8	3.4	---	1.6	1.6
Strontium (Sr)	0.038900	0.039700	0.046200	0.029700	0.044900	0.073200	0.079500	---	0.091800	0.118000	0.016700	0.041000	---	0.025100	0.025400
Thallium (Tl)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005
Tin (Sn)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001
Titanium (Ti)	0.0025	0.0012	0.0007	0.0012	0.0009	0.0009	0.0040	---	0.0004	<0.0002	0.0006	0.0016	---	0.0017	0.0019
Uranium (U)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00007	0.00026	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005
Vanadium (V)	<0.0001	0.0002	<0.0001	0.0003	<0.0001	0.0013	0.0039	---	<0.0001	<0.0001	<0.0001	<0.0001	---	0.0002	0.0001
Zinc (Zn)	0.0049	0.0173	0.0052	0.0009	0.0023	0.0031	0.0070	---	0.0013	0.0023	0.0035	0.0048	---	0.0015	0.0015

Table 1-4: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WL2		WL DUPLICATE	WL Duplicate	WL23		WL24		WL28		WL33	
		Sample ID	~LIMS:EC-63883		~LIMS:L1176558	~LIMS:EC-63521	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63521	~LIMS:EC-63883
		Unit												
Aluminum (Al)	---	mg/L	0.185	0.181	---	0.243	0.270	0.253	0.062	0.071	0.247	0.182	0.013	<0.002
Antimony (Sb)	0.00005	mg/L	<0.00005	<0.00005	---	0.00012	0.00013	<0.00005	0.00008	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	0.0001	mg/L	0.0010	0.0010	---	0.0015	0.0014	0.0018	0.0005	0.0005	0.0009	0.0010	0.0001	<0.0001
Barium (Ba)	---	mg/L	0.00430	0.00443	---	0.00448	0.00450	0.00364	0.00374	0.00543	0.01110	0.01090	0.00169	0.00389
Beryllium (Be)	0.0001	mg/L	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	0.001	mg/L	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd	0.000015	mg/L	<0.000015	<0.000015	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Calcium (Ca)	---	mg/L	4.6	4.6	---	6.1	6.0	5.1	5.6	7.8	4.7	5.4	5.8	4.8
Chromium (Cr	0.0003	mg/L	0.0005	0.0005	---	<0.0003	<0.0003	0.0005	<0.0003	0.0006	<0.0003	0.0005	0.0005	0.0003
Cobalt (Co)	0.00002	mg/L	0.00007	0.00007	---	0.00008	0.00009	0.00023	0.00002	0.00007	0.00004	0.00007	0.00004	<0.00002
Copper (Cu)	0.0001	mg/L	0.0004	0.0004	---	0.0004	0.0004	0.0002	0.0001	0.0002	0.0004	0.0004	<0.0001	<0.0001
Iron (Fe)	---	mg/L	0.3270	0.3160	---	0.2460	0.2510	0.4160	0.1200	0.2320	0.3970	0.7170	0.0726	0.0104
Lead (Pb)	0.00005	mg/L	<0.00005	<0.00005	---	<0.00005	<0.00005	0.00008	<0.00005	<0.00005	<0.00005	0.00009	<0.00005	<0.00005
Lithium (Li)	0.001	mg/L	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	0.5	mg/L	0.83	0.83	---	1.00	0.99	0.72	1.15	1.81	0.85	0.99	1.83	1.77
Manganese (M	---	mg/L	0.02320	0.02330	---	0.06150	0.06190	0.07860	0.00934	0.02620	0.06010	0.02720	0.00462	0.00098
Mercury (Hg)	0.000005	mg/L	<0.000005	<0.000005	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000010	<0.000005	<0.000005
Molybdenum (	---	mg/L	0.00012	0.00012	---	0.00011	0.00019	<0.00005	0.00026	0.00036	0.00011	0.00012	0.00017	0.00005
Nickel (Ni)	0.00005	mg/L	0.00079	0.00080	---	0.00035	0.00038	0.00042	0.00013	0.00015	0.00034	0.00042	<0.00005	<0.00005
Phosphorus (	0.02	mg/L	0.02	0.02	---	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	0.03
Potassium (K)	0.5	mg/L	<0.5	<0.5	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5
Selenium (Se)	0.0006	mg/L	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	mg/L	5.14	5.14	---	5.70	5.45	5.20	6.30	7.15	4.45	4.48	1.11	2.95
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	mg/L	2.0	2.0	---	2.3	2.3	1.8	2.2	2.8	1.5	1.7	2.2	2.2
Strontium (Sr)	---	mg/L	0.029700	0.031100	---	0.041200	0.040600	0.038600	0.043400	0.058800	0.044400	0.050200	0.039700	0.034300
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	0.0020	0.0021	---	0.0059	0.0052	0.0015	0.0011	0.0016	0.0026	0.0018	<0.0002	<0.0002
Uranium (U)	0.00005	mg/L	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	0.00005	0.00006	0.00011	0.00007	<0.00005	<0.00005
Vanadium (V)	0.0001	mg/L	0.0002	0.0002	---	0.0003	0.0003	0.0002	0.0003	0.0003	0.0003	0.0001	<0.0001	<0.0001
Zinc (Zn)	---	mg/L	0.0023	0.0023	---	0.0369	0.0393	0.0548	0.0011	0.0025	0.0028	0.0038	0.0034	0.0028

Elements	WL4		WL8		WQ1									
Sample ID	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-63521	~LIMS:EC-63883	~LIMS:EC-62129	~LIMS:EC-62363	~LIMS:EC-63191		~LIMS:L1151662		~LIMS:EC-63237		~LIMS:L1154508	
Aluminum (Al)	0.076	0.036	0.074	0.170	0.175	0.266	0.612	0.613	---	---	0.458	0.463	0.328	0.323
Antimony (Sb)	<0.00005	<0.00005	<0.00005	0.00010	<0.00005	0.00005	0.00009	0.00006	---	---	0.00008	0.00008	<0.00005	<0.00005
Arsenic (As)	0.0003	0.0003	0.0002	0.0001	0.0004	0.0006	0.0007	0.0007	---	---	0.0005	0.0005	0.0004	0.0004
Barium (Ba)	0.00265	0.00262	0.01610	0.02250	0.00279	0.00397	0.00823	0.00836	---	---	0.00542	0.00542	0.00384	0.00386
Beryllium (Be)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	<0.001	<0.001	<0.001	<0.001	0.009	0.004	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd	<0.000015	<0.000015	<0.000015	0.000033	<0.000015	<0.000015	0.000035	0.000025	---	---	<0.000015	<0.000015	0.000050	0.000051
Calcium (Ca)	3.6	4.6	4.6	6.8	2.3	2.3	2.9	2.9	---	---	2.6	2.7	2.1	2.1
Chromium (Cr	<0.0003	0.0004	<0.0003	0.0006	<0.0003	0.0003	0.0004	0.0003	---	---	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	<0.00002	<0.00002	0.00002	0.00011	0.00003	0.00006	0.00003	0.00004	---	---	0.00003	0.00004	0.00058	0.00053
Copper (Cu)	<0.0001	0.0008	<0.0001	0.0001	0.0002	0.0023	0.0013	0.0016	---	---	0.0004	0.0004	0.0003	0.0003
Iron (Fe)	0.0419	0.0254	0.0936	0.2520	0.1540	0.2940	0.4750	0.4780	---	---	0.2940	0.2980	0.2110	0.2110
Lead (Pb)	<0.00005	<0.00005	<0.00005	0.00011	<0.00005	0.00017	0.00045	0.00047	---	---	0.00006	0.00006	0.00009	0.00010
Lithium (Li)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001
Magnesium (M	0.55	0.72	0.64	0.74	<0.50	0.56	0.69	0.69	---	---	0.59	0.60	<0.50	<0.50
Manganese (M	0.00303	0.00163	0.00486	0.02790	0.01170	0.01930	0.01900	0.01920	---	---	0.01150	0.01170	0.01110	0.01110
Mercury (Hg)	<0.000005	<0.000005	<0.000005	0.000011	<0.000008	<0.000008	<0.000005	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	0.00008	0.00007	<0.00005	0.00018	0.00016	0.00025	0.00005	0.00006	---	---	0.00006	0.00006	0.00007	0.00006
Nickel (Ni)	0.00006	0.00011	0.00006	0.00026	0.00013	0.00026	0.00042	0.00037	---	---	0.00022	0.00022	<0.00005	<0.00005
Phosphorus (	<0.02	<0.02	<0.02	0.09	<0.02	<0.02	0.02	<0.02	---	---	<0.02	<0.02	<0.02	<0.02
Potassium (K)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	---	---	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	3.45	3.16	4.30	3.39	5.79	5.73	4.54	4.43	---	---	4.52	4.43	4.03	4.04
Silver (Ag)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	1.8	2.0	1.3	1.8	1.8	2.0	1.8	1.8	---	---	1.7	1.7	1.5	1.5
Strontium (Sr)	0.035500	0.041000	0.047800	0.062600	0.018700	0.020200	0.026700	0.026700	---	---	0.023900	0.024100	0.019500	0.019600
Thallium (Tl)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	0.0005	<0.0002	0.0007	0.0019	0.0025	0.0095	0.0111	0.0112	---	---	0.0078	0.0081	0.0048	0.0049
Uranium (U)	<0.00005	<0.00005	<0.00005	<0.00005	0.00012	0.00015	0.00015	0.00015	---	---	0.00013	0.00013	0.00018	0.00018
Vanadium (V)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0006	0.0006	---	---	0.0003	0.0003	0.0003	0.0003
Zinc (Zn)	0.0010	0.0024	0.0020	0.0088	0.0012	0.0036	0.0094	0.0098	---	---	0.0047	0.0048	0.0068	0.0067

Elements	WQ1												
Sample ID	~LIMS:EC-63357	~LIMS:L1161703	~LIMS:L1165411	~LIMS:EC-63411		~LIMS:EC-63577		~LIMS:EC-63753		~LIMS:EC-63959		~LIMS:EC-64183	~LIMS:EC-64399
Aluminum (Al)	0.421	---	---	0.310	0.349	0.286	0.274	0.708	0.700	0.131	0.131	0.166	0.120
Antimony (Sb)	<0.00005	---	---	<0.00005	<0.00005	0.00005	<0.00005	0.00013	0.00014	0.00009	0.00008	<0.00005	0.00013
Arsenic (As)	0.0003	---	---	0.0004	0.0003	0.0005	0.0005	0.0016	0.0015	0.0008	0.0007	0.0008	0.0005
Barium (Ba)	0.00383	---	---	0.00298	0.00302	0.00320	0.00323	0.00876	0.00886	0.00305	0.00313	0.00373	0.00323
Beryllium (Be)	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	0.003	0.003	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd	<0.000015	---	---	<0.000015	<0.000015	<0.000015	<0.000015	0.000062	0.000064	0.000016	0.000016	0.000023	<0.000015
Calcium (Ca)	1.5	---	---	1.7	1.6	2.1	2.0	3.5	3.4	3.0	2.9	3.3	2.9
Chromium (Cr	<0.0003	---	---	<0.0003	<0.0003	<0.0003	<0.0003	0.0009	0.0010	<0.0003	<0.0003	0.0003	0.0003
Cobalt (Co)	0.00003	---	---	<0.00002	<0.00002	<0.00002	<0.00002	0.00010	0.00010	0.00004	0.00004	0.00006	0.00004
Copper (Cu)	0.0015	---	---	<0.0001	<0.0001	0.0013	0.0013	0.0002	0.0002	0.0002	0.0002	0.0002	<0.0001
Iron (Fe)	0.2810	---	---	0.1590	0.1600	0.1710	0.1720	0.8140	0.8170	0.2020	0.2050	0.2800	0.1810
Lead (Pb)	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	0.00021	0.00021	<0.00005	<0.00005	<0.00005	<0.00005
Lithium (Li)	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	<0.50	---	---	<0.50	<0.50	<0.50	<0.50	0.82	0.87	0.65	0.64	0.66	0.66
Manganese (M	0.00770	---	---	0.00501	0.00500	0.00850	0.00851	0.02110	0.02140	0.01380	0.01380	0.01780	0.01160
Mercury (Hg)	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	0.00005	---	---	0.00037	0.00019	0.00034	0.00025	0.00033	0.00033	0.00024	0.00024	0.00025	0.00014
Nickel (Ni)	0.00024	---	---	0.00034	0.00023	0.00024	0.00023	0.00068	0.00066	0.00033	0.00033	0.00022	0.00021
Phosphorus (	<0.02	---	---	<0.02	<0.02	<0.02	<0.02	0.05	0.05	<0.02	<0.02	<0.02	<0.02
Potassium (K)	<0.5	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	4.28	---	---	4.38	4.28	6.20	5.91	6.93	7.03	6.66	6.27	5.84	6.75
Silver (Ag)	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	1.3	---	---	1.2	1.2	1.8	1.8	3.6	3.6	2.4	2.4	2.5	2.3
Strontium (Sr)	0.015100	---	---	0.016000	0.014900	0.019900	0.019200	0.034000	0.034300	0.027100	0.026900	0.030200	0.024720
Thallium (Tl)	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	0.0092	---	---	0.0047	0.0046	0.0062	0.0063	0.0173	0.0172	0.0017	0.0016	0.0029	0.0014
Uranium (U)	0.00016	---	---	0.00026	0.00019	0.00014	0.00012	0.00020	0.00020	0.00009	0.00008	0.00010	0.00008
Vanadium (V)	0.0003	---	---	0.0003	0.0003	0.0004	0.0003	0.0010	0.0011	0.0002	0.0002	0.0002	<0.0001
Zinc (Zn)	0.0032	---	---	0.0042	0.0040	0.0031	0.0030	0.0104	0.0104	0.0042	0.0043	0.0057	0.0039

Table 1-5: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ1			WQ1-D			WQ10	L997208-4	WQ10				
		Sample ID	~LIMS:EC-64399	~LIMS:EC-64543		~LIMS:L1018027	~LIMS:L1061327	~LIMS:L1165411			~LIMS:EC-60612	~LIMS:L990525	~LIMS:EC-60740	~LIMS:L1007174	~LIMS:L1009554
		Unit													
Aluminum (Al)	---	mg/L	0.119	0.121	0.120	---	---	---	---	---	0.015	---	0.014	---	---
Antimony (Sb)	0.00005	mg/L	0.00012	<0.00005	<0.00005	---	---	---	---	---	<0.00005	---	<0.00005	---	---
Arsenic (As)	0.0001	mg/L	0.0005	0.0006	0.0006	---	---	---	---	---	0.0003	---	<0.0002	---	---
Barium (Ba)	---	mg/L	0.00320	0.00304	0.00288	---	---	---	---	---	0.00725	---	0.00755	---	---
Beryllium (Be)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	---	---	---	---	<0.0001	---	<0.0001	---	---
Boron (B)	0.001	mg/L	<0.001	<0.001	<0.001	---	---	---	---	---	<0.001	---	<0.001	---	---
Cadmium (Cd	0.000015	mg/L	<0.000015	<0.000015	<0.000015	---	---	---	---	---	<0.000015	---	<0.000015	---	---
Calcium (Ca)	---	mg/L	2.8	3.0	3.1	---	---	---	---	---	14.3	---	14.6	---	---
Chromium (C	0.0003	mg/L	0.0003	<0.0003	<0.0003	---	---	---	---	---	<0.0005	---	<0.0005	---	---
Cobalt (Co)	0.00002	mg/L	0.00003	0.00005	0.00005	---	---	---	---	---	<0.00005	---	<0.00005	---	---
Copper (Cu)	0.0001	mg/L	<0.0001	0.0002	0.0002	---	---	---	---	---	<0.0001	---	<0.0001	---	---
Iron (Fe)	---	mg/L	0.1814	0.2259	0.2284	---	---	---	---	---	0.0239	---	0.0242	---	---
Lead (Pb)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	---	---	---	<0.00005	---	<0.00005	---	---
Lithium (Li)	0.001	mg/L	<0.001	<0.001	<0.001	---	---	---	---	---	<0.005	---	<0.005	---	---
Magnesium (	0.5	mg/L	0.66	0.76	0.77	---	---	---	---	---	2.76	---	2.90	---	---
Manganese (	---	mg/L	0.01146	0.02055	0.02040	---	---	---	---	---	0.00153	---	0.00151	---	---
Mercury (Hg)	0.000005	mg/L	<0.000005	<0.000005	<0.000005	---	---	---	---	---	0	---	<0.000008	---	---
Molybdenum (	---	mg/L	0.00012	0.00020	0.00018	---	---	---	---	---	0.00088	---	0.00095	---	---
Nickel (Ni)	0.00005	mg/L	0.00019	0.00019	0.00018	---	---	---	---	---	0.00011	---	0.00013	---	---
Phosphorus (	0.02	mg/L	<0.02	<0.02	<0.02	---	---	---	---	---	<0.02	---	<0.02	---	---
Potassium (K)	0.5	mg/L	<0.5	<0.5	<0.5	---	---	---	---	---	<0.5	---	<0.5	---	---
Selenium (Se)	0.0006	mg/L	<0.0006	<0.0006	<0.0006	---	---	---	---	---	<0.0006	---	<0.0006	---	---
Silicon	---	mg/L	6.25	6.47	6.29	---	---	---	---	---	6.23	---	6.36	---	---
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	---	---	---	<0.00005	---	<0.00005	---	---
Sodium (Na)	---	mg/L	2.3	2.3	2.4	---	---	---	---	---	3.2	---	3.4	---	---
Strontium (Sr)	---	mg/L	0.024550	0.026840	0.026750	---	---	---	---	---	0.096500	---	0.101000	---	---
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	---	---	---	<0.00005	---	<0.00005	---	---
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	---	---	---	---	<0.0001	---	<0.0001	---	---
Titanium (Ti)	---	mg/L	0.0015	0.0013	0.0013	---	---	---	---	---	0.0004	---	0.0005	---	---
Uranium (U)	0.00005	mg/L	0.00008	0.00008	0.00008	---	---	---	---	---	0.00029	---	0.00031	---	---
Vanadium (V)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	---	---	---	---	<0.0001	---	<0.0001	---	---
Zinc (Zn)	---	mg/L	0.0038	0.0049	0.0048	---	---	---	---	---	0.0028	---	0.0020	---	---

Elements	WQ10												
	~LIMS:L1018027	~LIMS:L1014653	~LIMS:L1033953	~LIMS:L1046189	~LIMS:L1061327	~LIMS:EC-62129		~LIMS:L1085601	~LIMS:EC-62363	~LIMS:EC-62544	~LIMS:EC-62667	~LIMS:L1105609	~LIMS:EC-62773
Aluminum (Al)	---	---	---	---	---	0.058	---	---	0.040	0.028	0.038	---	0.010
Antimony (Sb)	---	---	---	---	---	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005
Arsenic (As)	---	---	---	---	---	0.0004	---	---	0.0005	0.0004	0.0004	---	0.0005
Barium (Ba)	---	---	---	---	---	0.00569	---	---	0.00646	0.00724	0.00787	---	0.00762
Beryllium (Be)	---	---	---	---	---	<0.0001	---	---	<0.0001	<0.0001	<0.0001	---	<0.0001
Boron (B)	---	---	---	---	---	0.004	---	---	<0.001	0.001	0.001	---	<0.001
Cadmium (Cd	---	---	---	---	---	<0.000015	---	---	<0.000015	<0.000015	<0.000015	---	<0.000015
Calcium (Ca)	---	---	---	---	---	8.8	---	---	9.8	12.0	13.3	---	13.9
Chromium (C	---	---	---	---	---	<0.0003	---	---	<0.0003	<0.0003	<0.0003	---	<0.0003
Cobalt (Co)	---	---	---	---	---	<0.00002	---	---	<0.00002	<0.00002	<0.00002	---	<0.00002
Copper (Cu)	---	---	---	---	---	<0.0001	---	---	0.0003	0.0002	<0.0001	---	<0.0001
Iron (Fe)	---	---	---	---	---	0.0578	---	---	0.0536	0.0373	0.0483	---	0.0202
Lead (Pb)	---	---	---	---	---	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005
Lithium (Li)	---	---	---	---	---	<0.001	---	---	<0.001	<0.001	<0.001	---	<0.001
Magnesium (	---	---	---	---	---	1.71	---	---	1.97	2.46	2.60	---	2.71
Manganese (	---	---	---	---	---	0.00279	---	---	0.00299	0.00253	0.00353	---	<0.00005
Mercury (Hg)	---	---	---	---	---	<0.000008	---	---	<0.000008	<0.000008	<0.000008	---	<0.000008
Molybdenum (	---	---	---	---	---	0.00043	---	---	0.00058	0.00070	0.00073	---	0.00080
Nickel (Ni)	---	---	---	---	---	<0.00005	---	---	0.00013	<0.00005	<0.00005	---	0.00007
Phosphorus (	---	---	---	---	---	<0.02	---	---	<0.02	<0.02	<0.02	---	<0.02
Potassium (K)	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	<0.5	---	<0.5
Selenium (Se)	---	---	---	---	---	<0.0006	---	---	<0.0006	<0.0006	<0.0006	---	<0.0006
Silicon	---	---	---	---	---	6.05	---	---	6.06	6.61	7.56	---	6.38
Silver (Ag)	---	---	---	---	---	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005
Sodium (Na)	---	---	---	---	---	2.4	---	---	2.6	3.0	3.1	---	3.1
Strontium (Sr)	---	---	---	---	---	0.057400	---	---	0.067200	0.080700	0.088600	---	0.092500
Thallium (Tl)	---	---	---	---	---	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005
Tin (Sn)	---	---	---	---	---	<0.0001	---	---	<0.0001	<0.0001	<0.0001	---	<0.0001
Titanium (Ti)	---	---	---	---	---	0.0007	---	---	0.0008	0.0005	0.0017	---	0.0004
Uranium (U)	---	---	---	---	---	0.00012	---	---	0.00016	0.00019	0.00024	---	0.00028
Vanadium (V)	---	---	---	---	---	0.0001	---	---	0.0003	0.0002	0.0002	---	0.0002
Zinc (Zn)	---	---	---	---	---	<0.0005	---	---	0.0016	<0.0005	0.0010	---	<0.0005

Elements	WQ10												
	~LIMS:L1124156	~LIMS:EC-62887	~LIMS:EC-63034	~LIMS:EC-63189	~LIMS:L1150853	~LIMS:L1154508	~LIMS:EC-63271	~LIMS:EC-63357	~LIMS:L1165411	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959
Aluminum (Al)	---	0.009	0.117	0.315	0.335	---	0.247	0.291	---	0.205	0.074	0.078	0.029
Antimony (Sb)	---	<0.00005	<0.00005	<0.00005	<0.00005	---	0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	---	0.0004	0.0006	0.0005	0.0004	---	0.0004	0.0003	---	0.0004	0.0004	0.0006	0.0005
Barium (Ba)	---	0.00771	0.00823	0.00732	0.00640	---	0.00517	0.00592	---	0.00537	0.00592	0.00731	0.00786
Beryllium (Be)	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	---	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001	---	<0.001	<0.001	0.001	<0.001
Cadmium (Cd	---	<0.000015	<0.000015	0.000016	<0.000015	---	<0.000015	<0.000015	---	<0.000015	<0.000015	<0.000015	<0.000015
Calcium (Ca)	---	14.6	13.1	4.4	4.1	---	3.6	3.8	---	3.8	7.0	9.3	13.3
Chromium (C	---	<0.0003	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	---	0.0005	<0.0003	<0.0003	<0.0003
Cobalt (Co)	---	<0.00002	<0.00002	0.00008	0.00002	---	<0.00002	0.00003	---	<0.00002	<0.00002	<0.00002	<0.00002
Copper (Cu)	---	<0.0001	<0.0001	0.0004	0.0004	---	0.0006	0.0004	---	<0.0001	0.0002	<0.0001	0.0002
Iron (Fe)	---	0.0171	0.1190	0.2730	0.2190	---	0.1440	0.2150	---	0.1370	0.0721	0.1020	0.0734
Lead (Pb)	---	<0.00005	0.00007	0.00012	0.00008	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	0.00013
Lithium (Li)	---	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001
Magnesium (	---	2.91	2.64	0.82	0.82	---	0.71	0.58	---	0.68	1.33	1.85	2.46
Manganese (	---	0.00150	0.00366	0.01730	0.00836	---	0.00450	0.01080	---	0.00520	0.00413	0.00513	0.00481
Mercury (Hg)	---	<0.000008	<0.000008	<0.000005	<0.000005	---	<0.000005	<0.000005	---	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	---	0.00088	0.00070	0.00014	0.00016	---	0.00015	0.00019	---	0.00024	0.00043	0.00053	0.00074
Nickel (Ni)	---	<0.00005	0.00012	0.00038	0.00029	---	<0.00005	0.00025	---	<0.00005	0.00013	0.00022	0.00012
Phosphorus (	---	<0.02	<0.02	<0.02	<0.02	---	<0.02	<0.02	---	<0.02	<0.02	<0.02	<0.02
Potassium (K)	---	<0.5	0.5	<0.5	<0.5	---	<0.5	<0.5	---	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	---	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	7.81	6.48	4.67	4.45	---	4.49	4.65	---	4.79	6.43	6.56	6.64
Silver (Ag)	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	3.3	3.1	1.7	1.6	---	1.7	1.5	---	1.7	2.4	2.9	3.0
Strontium (Sr)	---	0.094400	0.076100	0.034100	0.032700	---	0.029100	0.031700	---	0.028600	0.052100	0.071000	0.085900
Thallium (Tl)	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	0.0002	0.0027	0.0053	0.0058	---	0.0037	0.0060	---	0.0029	0.0011	0.0012	0.0004
Uranium (U)	---	0.00030	0.00021	0.00015	0.00013	---	0.00015	0.00019	---	0.00017	0.00011	0.00015	0.00020
Vanadium (V)	---	<0.0001	0.0004	0.0004	0.0003	---	0.0002	0.0002	---	0.0003	0.0003	0.0003	0.0002
Zinc (Zn)	---	0.0013	<0.0005	0.0040	0.0029	---	0.0027	0.0022	---	0.0035	0.0009	0.0019	<0.0005

Table 1-6: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area:	WQ10	WQ10	WQ11	L997208-5	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11
		Sample ID:	~LIMS:EC-64183	~LIMS:EC-64399			~LIMS:EC-60612	~LIMS:L990525	~LIMS:EC-60740	~LIMS:L1007174	~LIMS:L1009554	~LIMS:L1014653	~LIMS:L1018027	~LIMS:L1033697	~LIMS:L1046189	~LIMS:L1061327
		Unit														
Aluminum (Al)	---	mg/L	0.022	0.031	---	---	0.094	---	0.098	---	---	---	---	---	---	---
Antimony (Sb	0.00005	mg/L	<0.00005	<0.00005	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---
Arsenic (As)	0.0001	mg/L	0.0005	0.0004	---	---	<0.0002	---	<0.0002	---	---	---	---	---	---	---
Barium (Ba)	---	mg/L	0.00767	0.00727	---	---	0.01140	---	0.00917	---	---	---	---	---	---	---
Beryllium (Be)	0.0001	mg/L	<0.0001	<0.0001	---	---	<0.0001	---	<0.0001	---	---	---	---	---	---	---
Boron (B)	0.001	mg/L	<0.001	<0.001	---	---	<0.001	---	0.001	---	---	---	---	---	---	---
Cadmium (Cd	0.000015	mg/L	<0.000015	<0.000015	---	---	<0.000015	---	<0.000015	---	---	---	---	---	---	---
Calcium (Ca)	---	mg/L	13.4	12.0	---	---	21.3	---	17.0	---	---	---	---	---	---	---
Chromium (C	0.0003	mg/L	0.0004	0.0004	---	---	<0.0005	---	<0.0005	---	---	---	---	---	---	---
Cobalt (Co)	0.00002	mg/L	<0.00002	<0.00002	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---
Copper (Cu)	0.0001	mg/L	<0.0001	<0.0001	---	---	0.0007	---	0.0005	---	---	---	---	---	---	---
Iron (Fe)	---	mg/L	0.0791	0.0594	---	---	0.0474	---	0.0684	---	---	---	---	---	---	---
Lead (Pb)	0.00005	mg/L	<0.00005	0.00019	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---
Lithium (Li)	0.001	mg/L	<0.001	<0.001	---	---	<0.005	---	<0.005	---	---	---	---	---	---	---
Magnesium (M	0.5	mg/L	2.61	2.61	---	---	4.11	---	3.12	---	---	---	---	---	---	---
Manganese (M	---	mg/L	0.00298	0.00265	---	---	0.00181	---	0.00350	---	---	---	---	---	---	---
Mercury (Hg)	0.000005	mg/L	<0.000005	<0.000005	---	---	<0.000008	---	<0.000008	---	---	---	---	---	---	---
Molybdenum (	---	mg/L	0.00078	0.00066	---	---	0.00035	---	0.00039	---	---	---	---	---	---	---
Nickel (Ni)	0.00005	mg/L	<0.00005	0.00011	---	---	0.00027	---	0.00015	---	---	---	---	---	---	---
Phosphorus (	0.02	mg/L	<0.02	<0.02	---	---	<0.02	---	<0.02	---	---	---	---	---	---	---
Potassium (K)	0.5	mg/L	<0.5	<0.5	---	---	0.5	---	<0.5	---	---	---	---	---	---	---
Selenium (Se)	0.0006	mg/L	<0.0006	<0.0006	---	---	<0.0006	---	<0.0006	---	---	---	---	---	---	---
Silicon	---	mg/L	6.07	6.72	---	---	6.26	---	6.14	---	---	---	---	---	---	---
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---
Sodium (Na)	---	mg/L	3.6	3.2	---	---	3.5	---	3.3	---	---	---	---	---	---	---
Strontium (Sr)	---	mg/L	0.089400	0.078820	---	---	0.120000	---	0.095700	---	---	---	---	---	---	---
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	---	---	<0.0001	---	<0.0001	---	---	---	---	---	---	---
Titanium (Ti)	---	mg/L	0.0004	0.0006	---	---	0.0021	---	0.0017	---	---	---	---	---	---	---
Uranium (U)	0.00005	mg/L	0.00022	0.00020	---	---	0.00035	---	0.00022	---	---	---	---	---	---	---
Vanadium (V)	0.0001	mg/L	0.0002	<0.0001	---	---	<0.0001	---	<0.0001	---	---	---	---	---	---	---
Zinc (Zn)	---	mg/L	0.0025	0.0023	---	---	0.0058	---	0.0016	---	---	---	---	---	---	---

Elements	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11
Sample ID	~LIMS:EC-62129	~LIMS:EC-62363	~LIMS:EC-62544	~LIMS:L1148378	~LIMS:EC-63189	~LIMS:L1150853	~LIMS:L1154508	~LIMS:EC-63357	~LIMS:L1161703	~LIMS:L1165411
Aluminum (Al)	0.208	0.140	0.131	---	0.418	0.544	0.434	0.346	---	---
Antimony (Sb	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Arsenic (As)	<0.0001	0.0001	<0.0001	---	0.0001	0.0001	0.0001	<0.0001	---	---
Barium (Ba)	0.00752	0.00820	0.01040	---	0.00713	0.00681	0.00573	0.00578	---	---
Beryllium (Be)	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---	---
Boron (B)	0.004	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	---	---
Cadmium (Cd	<0.000015	<0.000015	<0.000015	---	<0.000015	<0.000015	0.000069	<0.000015	---	---
Calcium (Ca)	10.7	11.6	15.4	---	5.2	4.6	3.9	5.0	---	---
Chromium (C	<0.0003	<0.0003	<0.0003	---	0.0003	0.0004	<0.0003	0.0004	---	---
Cobalt (Co)	0.00003	0.00003	0.00002	---	0.00007	0.00004	0.00002	0.00003	---	---
Copper (Cu)	0.0003	0.0003	0.0044	---	0.0008	0.0091	0.0008	0.0006	---	---
Iron (Fe)	0.1060	0.0791	0.0628	---	0.2570	0.2650	0.2050	0.1550	---	---
Lead (Pb)	<0.00005	<0.00005	<0.00005	---	0.00006	0.00043	<0.00005	<0.00005	---	---
Lithium (Li)	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	---	---
Magnesium (M	2.09	2.41	3.21	---	0.98	0.90	0.78	0.93	---	---
Manganese (M	0.00219	0.00164	0.00168	---	0.00428	0.00366	0.00281	0.00188	---	---
Mercury (Hg)	<0.000008	<0.000008	<0.000008	---	<0.000005	<0.000005	<0.000005	<0.000005	---	---
Molybdenum (	0.00013	0.00023	0.00027	---	<0.00005	0.00006	0.00005	0.00009	---	---
Nickel (Ni)	0.00009	0.00015	0.00012	---	0.00035	0.00023	<0.00005	0.00024	---	---
Phosphorus (	<0.02	<0.02	<0.02	---	<0.02	<0.02	<0.02	<0.02	---	---
Potassium (K)	<0.5	<0.5	0.5	---	<0.5	<0.5	<0.5	<0.5	---	---
Selenium (Se)	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	---	---
Silicon	6.63	6.31	7.08	---	4.85	4.95	4.92	5.81	---	---
Silver (Ag)	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Sodium (Na)	2.5	2.6	3.1	---	1.8	1.7	1.6	1.8	---	---
Strontium (Sr)	0.062400	0.071500	0.093100	---	0.035300	0.032400	0.028600	0.035800	---	---
Thallium (Tl)	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Tin (Sn)	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---	---
Titanium (Ti)	0.0030	0.0027	0.0021	---	0.0051	0.0063	0.0050	0.0031	---	---
Uranium (U)	0.00012	0.00012	0.00014	---	0.00016	0.00015	0.00016	0.00013	---	---
Vanadium (V)	0.0003	0.0003	0.0002	---	0.0006	0.0005	0.0005	0.0004	---	---
Zinc (Zn)	<0.0005	0.0014	<0.0005	---	0.0018	0.0070	0.0024	0.0011	---	---

Elements	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11	WQ11-D	L997208-6	WQ Duplicate	WQ12	WQ12	WQ12	WQ12	WQ12	WQ12
Sample ID	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:L1095727		~LIMS:EC-62887	~LIMS:EC-60740	~LIMS:L1007174	~LIMS:L1009554	~LIMS:L1014653	~LIMS:L1018027	~LIMS:L1033697
Aluminum (Al)	0.355	0.185	0.207	0.074	0.042	0.090	---	---	0.057	0.040	---	---	---	---	---
Antimony (Sb	<0.00005	0.00008	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	---	---	---	---	---
Arsenic (As)	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	---	---	0.0002	<0.0002	---	---	---	---	---
Barium (Ba)	0.00612	0.00788	0.00824	0.00987	0.01180	0.00993	---	---	0.00649	0.00612	---	---	---	---	---
Beryllium (Be)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	---	---	---	---	---
Boron (B)	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	---	---	---	---	---
Cadmium (Cd	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	---	<0.000015	<0.000015	---	---	---	---	---
Calcium (Ca)	5.6	9.0	9.7	15.9	20.3	15.0	---	---	7.3	7.7	---	---	---	---	---
Chromium (C	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0004	---	---	<0.0003	<0.0005	---	---	---	---	---
Cobalt (Co)	0.00002	<0.00002	0.00003	<0.00002	<0.00002	0.00003	---	---	0.00006	<0.00005	---	---	---	---	---
Copper (Cu)	0.0003	0.0004	<0.0001	0.0001	<0.0001	<0.0001	---	---	<0.0001	0.0004	---	---	---	---	---
Iron (Fe)	0.1490	0.0887	0.0966	0.0258	0.0094	0.0502	---	---	0.2880	0.1580	---	---	---	---	---
Lead (Pb)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	---	---	---	---	---
Lithium (Li)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	<0.005	---	---	---	---	---
Magnesium (M	1.03	1.71	1.89	3.08	3.91	3.25	---	---	1.27	1.35	---	---	---	---	---
Manganese (M	0.00208	0.00203	0.00226	0.00086	<0.00005	0.00134	---	---	0.04240	0.01070	---	---	---	---	---
Mercury (Hg)	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	---	---	<0.000008	<0.000008	---	---	---	---	---
Molybdenum (	0.00007	0.00019	0.00017	0.00026	0.00038	0.00026	---	---	0.00064	0.00062	---	---	---	---	---
Nickel (Ni)	0.00024	0.00025	0.00020	0.00014	<0.00005	0.00016	---	---	0.00010	<0.00010	---	---	---	---	---
Phosphorus (	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	---	---	<0.02	<0.02	---	---	---	---	---
Potassium (K)	<0.5	<0.5	0.5	0.6	0.6	0.5	---	---	<0.5	<0.5	---	---	---	---	---
Selenium (Se)	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	---	---	---	---	---
Silicon	5.62	6.66	7.54	6.97	6.06	6.30	---	---	3.81	3.07	---	---	---	---	---
Silver (Ag)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	---	---	---	---	---
Sodium (Na)	1.8	2.5	2.7	3.2	3.9	3.2	---	---	2.0	2.2	---	---	---	---	---
Strontium (Sr)	0.037700	0.059900	0.066400	0.092700	0.119000	0.087970	---	---	0.058200	0.060500	---	---	---	---	---
Thallium (Tl)	<0.00005	0.00011	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	---	---	---	---	---
Tin (Sn)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	---	---	---	---	---
Titanium (Ti)	0.0038	0.0024	0.0028	0.0008	0.0005	0.0019	---	---	0.0015	0.0009	---	---	---	---	---
Uranium (U)	0.00015	0.00016	0.00013	0.00014	0.00026	0.00015	---	---	0.00019	0.00014	---	---	---	---	---
Vanadium (V)	0.0005	0.0005	0.0004	0.0002	0.0002	<0.0001	---	---	<0.0001	<0.0001	---	---	---	---	---
Zinc (Zn)	0.0028	<0.0005	0.0024	<0.0005	0.0021	0.0009	---	---	0.0025	0.0026	---	---	---	---	---

Table 1-7: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ12																	
		Sample ID	~LIMS:L104 6189	~LIMS:L106 1327	~LIMS:EC-62129	~LIMS:EC-62363		~LIMS:EC-62544	~LIMS:EC-62667	~LIMS:L110 5609	~LIMS:EC-62773	~LIMS:L112 4156	~LIMS:EC-62887	~LIMS:EC-63034	~LIMS:EC-63189	~LIMS:L115 0853	~LIMS:L115 4508	~LIMS:EC-63357	~LIMS:L116 1703	~LIMS:L116 5411
		Unit																		
Aluminum (Al	---	mg/L	---	---	0.085	0.073	0.073	0.112	0.072	---	0.068	---	0.141	0.413	0.252	0.202	0.146	0.107	---	---
Antimony (Sb	0.00005	mg/L	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Arsenic (As)	0.0001	mg/L	---	---	0.0001	0.0002	0.0002	0.0002	0.0002	---	0.0002	---	0.0003	0.0005	0.0002	0.0001	0.0001	0.0001	---	---
Barium (Ba)	---	mg/L	---	---	0.00563	0.00553	0.00557	0.00717	0.00604	---	0.00661	---	0.00864	0.01070	0.00738	0.00580	0.00551	0.00528	---	---
Beryllium (Be	0.0001	mg/L	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---
Boron (B)	0.001	mg/L	---	---	0.004	<0.001	<0.001	<0.001	<0.001	---	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---
Cadmium (Cd	0.000015	mg/L	---	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	<0.000015	---	0.000017	<0.000015	0.000027	<0.000015	0.000044	<0.000015	---	---
Calcium (Ca)	---	mg/L	---	---	6.3	6.0	6.0	7.3	7.2	---	7.3	---	7.4	7.0	4.6	4.4	4.6	4.9	---	---
Chromium (C	0.0003	mg/L	---	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	---	<0.0003	---	0.0005	<0.0003	<0.0003	<0.0003	<0.0003	0.0007	---	---
Cobalt (Co)	0.00002	mg/L	---	---	0.00003	0.00003	0.00003	0.00005	0.00003	---	0.00005	---	0.00018	0.00012	0.00006	<0.00002	<0.00002	0.00002	---	---
Copper (Cu)	0.0001	mg/L	---	---	0.0001	0.0002	0.0002	0.0002	<0.0001	---	0.0005	---	<0.0001	0.0001	0.0004	0.0007	0.0004	0.0002	---	---
Iron (Fe)	---	mg/L	---	---	0.1190	0.1400	0.1400	0.2410	0.1920	---	0.2970	---	0.6280	0.5560	0.2220	0.1510	0.1130	0.1210	---	---
Lead (Pb)	0.00005	mg/L	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	---	0.00006	0.00018	0.00009	<0.00005	<0.00005	<0.00005	---	---
Lithium (Li)	0.001	mg/L	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	---	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---
Magnesium (M	0.5	mg/L	---	---	1.02	1.01	1.01	1.26	1.24	---	1.27	---	1.31	1.30	0.71	0.71	0.78	0.79	---	---
Manganese (M	---	mg/L	---	---	0.01030	0.01260	0.01270	0.03620	0.01430	---	0.04010	---	0.14400	0.02770	0.01530	0.00794	0.00651	0.01040	---	---
Mercury (Hg)	0.000005	mg/L	---	---	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	---	<0.000008	---	<0.000008	<0.000008	<0.000005	<0.000005	<0.000005	<0.000005	---	---
Molybdenum (	---	mg/L	---	---	0.00037	0.00045	0.00047	0.00058	0.00056	---	0.00056	---	0.00069	0.00036	0.00015	0.00023	0.00026	0.00034	---	---
Nickel (Ni)	0.00005	mg/L	---	---	<0.00005	0.00011	0.00011	<0.00005	<0.00005	---	0.00009	---	0.00017	0.00028	0.00022	0.00006	<0.00005	0.00011	---	---
Phosphorus (	0.02	mg/L	---	---	<0.02	<0.02	<0.02	<0.02	<0.02	---	<0.02	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	---	---
Potassium (K	0.5	mg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	---	<0.5	---	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	---	---
Selenium (Se	0.0006	mg/L	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---
Silicon	---	mg/L	---	---	4.11	3.67	3.67	4.22	4.10	---	3.72	---	3.94	4.95	3.80	3.54	3.62	3.70	---	---
Silver (Ag)	0.00005	mg/L	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Sodium (Na)	---	mg/L	---	---	1.8	1.8	1.8	2.1	2.0	---	2.0	---	2.1	1.9	1.4	1.4	1.5	1.5	---	---
Strontium (Sr	---	mg/L	---	---	0.046600	0.047600	0.048100	0.057300	0.056600	---	0.057900	---	0.058200	0.049100	0.037700	0.035400	0.038100	0.040700	---	---
Thallium (Tl)	0.00005	mg/L	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Tin (Sn)	0.0001	mg/L	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---
Titanium (Ti)	---	mg/L	---	---	0.0015	0.0016	0.0015	0.0024	0.0012	---	0.0018	---	0.0039	0.0112	0.0055	0.0030	0.0024	0.0014	---	---
Uranium (U)	0.00005	mg/L	---	---	0.00016	0.00016	0.00016	0.00018	0.00018	---	0.00016	---	0.00024	0.00015	0.00022	0.00019	0.00019	0.00018	---	---
Vanadium (V)	0.0001	mg/L	---	---	<0.0001	0.0001	0.0001	<0.0001	<0.0001	---	0.0001	---	0.0002	0.0007	0.0003	0.0001	0.0001	<0.0001	---	---
Zinc (Zn)	---	mg/L	---	---	<0.0005	0.0015	0.0016	<0.0005	0.0021	---	0.0012	---	0.0041	0.0006	0.0015	0.0030	0.0120	0.0011	---	---

Elements	WQ12						WQ12-D	L997208-7	WQ Duplicate		WQ13										
	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:L122 4463		~LIMS:EC-63357	~LIMS:L116 1703	~LIMS:L110 5609	~LIMS:EC-60740	~LIMS:L100 7174	~LIMS:L100 9554	~LIMS:L101 4653	~LIMS:L101 8027	~LIMS:L103 3697	~LIMS:L104 6189	~LIMS:L106 1327	~LIMS:EC-62129	~LIMS:EC-62363
Aluminum (Al	0.110	0.065	0.069	0.061	0.048	0.042	---	---	0.061	---	---	0.056	---	---	---	---	---	---	---	0.020	0.049
Antimony (Sb	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	---	---	<0.00005	---	---	---	---	---	---	---	<0.00005	<0.00005
Arsenic (As)	0.0002	0.0003	0.0003	0.0002	0.0002	0.0001	---	---	0.0006	---	---	<0.0002	---	---	---	---	---	---	---	0.0006	0.0006
Barium (Ba)	0.00572	0.00621	0.00772	0.00827	0.00894	0.00630	---	---	0.00697	---	---	0.00926	---	---	---	---	---	---	---	0.00803	0.00771
Beryllium (Be	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	---	---	<0.0001	---	---	---	---	---	---	---	<0.0001	<0.0001
Boron (B)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	---	---	0.001	---	---	---	---	---	---	---	0.004	0.001
Cadmium (Cd	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	---	<0.000015	---	---	<0.000015	---	---	---	---	---	---	---	<0.000015	<0.000015
Calcium (Ca)	5.0	6.1	7.5	8.4	9.0	7.3	---	---	15.7	---	---	22.9	---	---	---	---	---	---	---	19.3	19.3
Chromium (C	0.0004	0.0004	<0.0003	<0.0003	<0.0003	<0.0003	---	---	<0.0003	---	---	<0.0005	---	---	---	---	---	---	---	<0.0003	<0.0003
Cobalt (Co)	<0.00002	<0.00002	0.00002	0.00003	0.00003	0.00003	---	---	0.00003	---	---	0.00006	---	---	---	---	---	---	---	0.00004	0.00005
Copper (Cu)	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	---	---	0.0003	---	---	0.0003	---	---	---	---	---	---	---	0.0002	0.0003
Iron (Fe)	0.1190	0.1390	0.2910	0.3520	0.5340	0.2017	---	---	0.1360	---	---	0.3230	---	---	---	---	---	---	---	0.2600	0.2330
Lead (Pb)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	---	---	<0.00005	---	---	---	---	---	---	---	<0.00005	<0.00005
Lithium (Li)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	---	---	<0.005	---	---	---	---	---	---	---	<0.001	<0.001
Magnesium (M	0.79	1.00	1.27	1.44	1.57	1.29	---	---	3.93	---	---	5.14	---	---	---	---	---	---	---	4.13	4.45
Manganese (M	0.01150	0.01030	0.01310	0.02000	0.01000	0.01297	---	---	0.02090	---	---	0.05280	---	---	---	---	---	---	---	0.03820	0.03960
Mercury (Hg)	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	---	---	<0.000005	---	---	<0.000008	---	---	---	---	---	---	---	<0.000008	<0.000008
Molybdenum (	0.00038	0.00055	0.00069	0.00051	0.00053	0.00045	---	---	0.00046	---	---	0.00070	---	---	---	---	---	---	---	0.00056	0.00055
Nickel (Ni)	0.00008	0.00010	0.00014	0.00015	0.00005	0.00012	---	---	0.00029	---	---	0.00030	---	---	---	---	---	---	---	0.00016	0.00033
Phosphorus (	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	---	---	<0.02	---	---	0.02	---	---	---	---	---	---	---	<0.02	<0.02
Potassium (K	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	---	---	0.7	---	---	1.0	---	---	---	---	---	---	---	0.7	0.7
Selenium (Se	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	<0.0006	---	---	<0.0006	---	---	---	---	---	---	---	<0.0006	<0.0006
Silicon	3.46	3.99	3.74	3.99	6.95	3.82	---	---	4.78	---	---	5.29	---	---	---	---	---	---	---	5.36	4.87
Silver (Ag)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	---	---	<0.00005	---	---	---	---	---	---	---	<0.00005	<0.00005
Sodium (Na)	1.5	1.8	2.1	2.2	2.6	2.1	---	---	3.3	---	---	3.8	---	---	---	---	---	---	---	3.2	3.3
Strontium (Sr	0.041700	0.049300	0.064400	0.064500	0.069600	0.054590	---	---	0.084200	---	---	0.118000	---	---	---	---	---	---	---	0.092700	0.096000
Thallium (Tl)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	---	---	<0.00005	---	---	---	---	---	---	---	<0.00005	<0.00005
Tin (Sn)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	---	---	<0.0001	---	---	---	---	---	---	---	<0.0001	<0.0001
Titanium (Ti)	0.0016	0.0011	0.0013	0.0016	0.0012	0.0010	---	---	0.0020	---	---	0.0028	---	---	---	---	---	---	---	0.0008	0.0025
Uranium (U)	0.00020	0.00014	0.00014	0.00010	0.00009	0.00011	---	---	0.00008	---	---	0.00018	---	---	---	---	---	---	---	0.00009	0.00010
Vanadium (V)	0.0002	0.0002	0.0003	0.0002	0.0002	<0.0001	---	---	0.0002	---	---	<0.0001	---	---	---	---	---	---	---	0.0002	0.0003
Zinc (Zn)	0.0039	0.0011	0.0042	<0.0005	0.0024	0.0012	---	---	<0.0005	---	---	0.0012	---	---	---	---	---	---	---	<0.0005	<0.0005

Table 1-8: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ13																	
		Sample ID	~LIMS:EC-62562	~LIMS:EC-62667	~LIMS:EC-62773	~LIMS:L1124156	~LIMS:EC-62887	~LIMS:EC-63034	~LIMS:EC-63189	~LIMS:L1150853	~LIMS:L1154508	~LIMS:EC-63357	~LIMS:L1161703	~LIMS:L1165411	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399
		Unit																		
Aluminum (Al	---	mg/L	0.021	0.061	0.019	---	0.038	0.114	0.142	0.187	0.085	0.032	---	---	0.063	0.021	0.010	0.031	0.012	0.022
Antimony (Sb	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	0.0001	mg/L	0.0006	0.0006	0.0006	---	0.0006	0.0006	0.0006	0.0005	0.0005	0.0004	---	---	0.0005	0.0006	0.0006	0.0005	0.0005	0.0004
Barium (Ba)	---	mg/L	0.00795	0.00898	0.00750	---	0.00800	0.01010	0.00875	0.00814	0.00721	0.09200	---	---	0.00730	0.00714	0.00752	0.00747	0.00842	0.00853
Beryllium (Be	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	0.001	mg/L	0.001	0.002	<0.001	---	0.001	<0.001	<0.001	<0.001	<0.001	0.009	---	---	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Cadmium (Cd	0.000015	mg/L	<0.000015	<0.000015	<0.000015	---	<0.000015	<0.000015	<0.000015	<0.000015	0.000059	<0.000015	---	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Calcium (Ca)	---	mg/L	20.6	23.2	21.4	---	21.7	18.9	15.9	15.2	14.3	15.7	---	---	16.4	18.5	20.2	20.8	22.0	20.0
Chromium (C	0.0003	mg/L	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	---	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0003
Cobalt (Co)	0.00002	mg/L	0.00003	0.00004	<0.00002	---	0.00004	0.00009	0.00008	0.00004	<0.00002	0.00002	---	---	<0.00002	<0.00002	0.00004	0.00004	0.00003	0.00004
Copper (Cu)	0.0001	mg/L	0.0004	<0.0001	0.0004	---	<0.0001	0.0002	0.0004	0.0003	0.0003	0.0023	---	---	<0.0001	0.0003	<0.0001	0.0002	0.0001	<0.0001
Iron (Fe)	---	mg/L	0.1750	0.1810	0.1640	---	0.2120	0.3520	0.2490	0.2610	0.1500	0.0685	---	---	0.1410	0.1390	0.1710	0.2050	0.2280	0.2207
Lead (Pb)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	0.00007	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	0.00028	<0.00005	<0.00005	<0.00005
Lithium (Li)	0.001	mg/L	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	0.5	mg/L	4.71	4.98	4.74	---	5.59	4.44	3.43	3.55	3.80	3.54	---	---	3.70	4.08	4.45	4.51	4.62	4.72
Manganese (M	---	mg/L	0.03400	0.03150	0.02520	---	0.03070	0.05900	0.08570	0.02760	0.02580	0.01170	---	---	0.02520	0.02560	0.03540	0.03120	0.03660	0.04550
Mercury (Hg)	0.000005	mg/L	<0.000008	<0.000008	<0.000008	---	<0.000008	<0.000008	<0.000005	<0.000005	<0.000005	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	---	mg/L	0.00060	0.00061	0.00059	---	0.00062	0.00056	0.00045	0.00048	0.00043	0.00047	---	---	0.00051	0.00057	0.00064	0.00063	0.00066	0.00052
Nickel (Ni)	0.00005	mg/L	0.00024	0.00022	0.00022	---	0.00032	0.00033	0.00041	0.00022	<0.00005	0.00026	---	---	0.00029	0.00021	0.00025	0.00033	0.00014	0.00026
Phosphorus (	0.02	mg/L	<0.02	<0.02	<0.02	---	0.02	0.03	0.02	0.02	<0.02	<0.02	---	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Potassium (K	0.5	mg/L	0.8	0.9	0.8	---	1.0	1.4	0.7	0.7	0.7	0.6	---	---	0.7	0.7	0.8	0.8	0.8	0.8
Selenium (Se	0.0006	mg/L	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	mg/L	5.25	6.50	5.48	---	6.11	5.48	4.99	4.60	4.82	4.95	---	---	4.32	4.64	4.17	4.09	4.24	5.94
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	mg/L	3.5	3.8	3.5	---	4.2	3.2	3.0	2.9	3.2	3.1	---	---	2.9	3.3	3.6	3.4	3.9	3.5
Strontium (Sr	---	mg/L	0.102000	0.114000	0.106000	---	0.106000	0.086900	0.087700	0.079600	0.076500	0.083400	---	---	0.087300	0.093600	0.105000	0.099700	0.107000	0.098600
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	0.0011	0.0025	0.0012	---	0.0020	0.0055	0.0044	0.0074	0.0022	0.0006	---	---	0.0022	0.0006	0.0005	0.0015	0.0006	0.0011
Uranium (U)	0.00005	mg/L	0.00011	0.00012	0.00011	---	0.00014	0.00014	0.00011	0.00009	0.00009	0.00008	---	---	0.00009	0.00008	0.00010	0.00010	0.00011	0.00011
Vanadium (V)	0.0001	mg/L	0.0003	0.0003	0.0002	---	0.0002	0.0006	0.0005	0.0005	0.0004	0.0001	---	---	0.0003	0.0004	0.0003	0.0002	0.0002	<0.0001
Zinc (Zn)	---	mg/L	<0.0005	0.0012	<0.0005	---	0.0007	<0.0005	0.0011	<0.0005	0.0012	0.0389	---	---	0.0022	<0.0005	0.0582	<0.0005	0.0027	0.0011

Elements	WQ13-D	Duplicate	FIELD DUP	WQ DUPLICATE					WQ14												
Sample ID	~LIMS:L1148378	~LIMS:EC-64183	~LIMS:L1033953	~LIMS:L1033697	~LIMS:L1085601		~LIMS:EC-62667	~LIMS:L1105609	~LIMS:L1009554	~LIMS:L1009554	~LIMS:L1014653	~LIMS:L1018027	~LIMS:L1033697	~LIMS:L1046189		~LIMS:L1061327	~LIMS:EC-62129		~LIMS:EC-62363	~LIMS:EC-62562	~LIMS:EC-62667
Aluminum (Al	---	0.019	---	---	0.008	---	0.051	---	---	---	---	---	---	---	---	---	0.022	---	0.012	0.023	0.044
Antimony (Sb	---	<0.00005	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	<0.00005	<0.00005
Arsenic (As)	---	0.0002	---	---	0.0002	---	0.0005	---	---	---	---	---	---	---	---	---	0.0001	---	0.0002	0.0002	0.0002
Barium (Ba)	---	0.01180	---	---	0.01100	---	0.00821	---	---	---	---	---	---	---	---	---	0.01040	---	0.01120	0.01510	0.01530
Beryllium (Be	---	<0.0001	---	---	<0.0001	---	<0.0001	---	---	---	---	---	---	---	---	---	<0.0001	---	<0.0001	<0.0001	<0.0001
Boron (B)	---	<0.001	---	---	0.001	---	0.001	---	---	---	---	---	---	---	---	---	0.003	---	0.001	0.002	0.002
Cadmium (Cd	---	<0.000015	---	---	<0.000015	---	<0.000015	---	---	---	---	---	---	---	---	---	<0.000015	---	<0.000015	0.000019	<0.000015
Calcium (Ca)	---	28.3	---	---	25.4	---	21.9	---	---	---	---	---	---	---	---	---	24.6	---	25.4	30.8	31.2
Chromium (C	---	<0.0003	---	---	<0.0003	---	<0.0003	---	---	---	---	---	---	---	---	---	<0.0003	---	<0.0003	<0.0003	<0.0003
Cobalt (Co)	---	0.00003	---	---	0.00003	---	0.00004	---	---	---	---	---	---	---	---	---	0.00003	---	0.00003	0.00004	0.00005
Copper (Cu)	---	0.0001	---	---	<0.0001	---	0.0001	---	---	---	---	---	---	---	---	---	<0.0001	---	<0.0001	0.0002	<0.0001
Iron (Fe)	---	0.2240	---	---	0.2000	---	0.1570	---	---	---	---	---	---	---	---	---	0.2590	---	0.2170	0.3160	0.4780
Lead (Pb)	---	<0.00005	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	<0.00005	<0.00005
Lithium (Li)	---	<0.001	---	---	<0.001	---	<0.001	---	---	---	---	---	---	---	---	---	<0.001	---	<0.001	<0.001	<0.001
Magnesium (M	---	6.29	---	---	5.57	---	4.74	---	---	---	---	---	---	---	---	---	5.15	---	5.42	6.42	6.30
Manganese (M	---	0.01470	---	---	0.02270	---	0.02280	---	---	---	---	---	---	---	---	---	0.04100	---	0.02410	0.07720	0.09680
Mercury (Hg)	---	<0.000005	---	---	<0.000008	---	<0.000008	---	---	---	---	---	---	---	---	---	<0.000008	---	<0.000008	<0.000008	<0.000008
Molybdenum (	---	0.00052	---	---	0.00053	---	0.00061	---	---	---	---	---	---	---	---	---	0.00045	---	0.00052	0.00063	0.00069
Nickel (Ni)	---	0.00007	---	---	0.00016	---	0.00021	---	---	---	---	---	---	---	---	---	0.00007	---	0.00016	0.00022	0.00015
Phosphorus (	---	<0.02	---	---	<0.02	---	<0.02	---	---	---	---	---	---	---	---	---	<0.02	---	<0.02	<0.02	<0.02
Potassium (K	---	1.2	---	---	0.8	---	0.9	---	---	---	---	---	---	---	---	---	0.7	---	0.8	1.0	1.0
Selenium (Se	---	<0.0006	---	---	<0.0006	---	<0.0006	---	---	---	---	---	---	---	---	---	<0.0006	---	<0.0006	<0.0006	<0.0006
Silicon	---	6.52	---	---	6.65	---	6.13	---	---	---	---	---	---	---	---	---	6.53	---	6.78	7.60	8.73
Silver (Ag)	---	<0.00005	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	4.8	---	---	4.2	---	3.6	---	---	---	---	---	---	---	---	---	3.9	---	4.1	4.5	4.4
Strontium (Sr	---	0.131000	---	---	0.118000	---	0.108000	---	---	---	---	---	---	---	---	---	0.109000	---	0.118000	0.139000	0.145000
Thallium (Tl)	---	<0.00005	---	---	<0.00005	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	<0.00005	<0.00005
Tin (Sn)	---	<0.0001	---	---	<0.0001	---	<0.0001	---	---	---	---	---	---	---	---	---	<0.0001	---	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	0.0006	---	---	0.0005	---	0.0023	---	---	---	---	---	---	---	---	---	0.0005	---	0.0006	0.0008	0.0013
Uranium (U)	---	0.00014	---	---	0.00015	---	0.00012	---	---	---	---	---	---	---	---	---	0.00013	---	0.00014	0.00024	0.00030
Vanadium (V)	---	<0.0001	---	---	0.0001	---	0.0003	---	---	---	---	---	---	---	---	---	<0.0001	---	0.0001	0.0002	0.0002
Zinc (Zn)	---	<0.0005	---	---	0.0006	---	0.0058	---	---	---	---	---	---	---	---	---	<0.0005	---	0.0014	0.0051	0.0142

Table 1-9: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ14																
		Sample ID	~LIMS:L110 5609	~LIMS:L113 6681	~LIMS:EC-63034	~LIMS:EC-63191	~LIMS:L115 1662	~LIMS:EC-63237	~LIMS:L115 4508	~LIMS:EC-63357	~LIMS:L116 1703	~LIMS:L116 5411	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:EC-64543
		Unit																	
Aluminum (Al)	---	mg/L	---	---	0.056	0.034	---	0.035	0.028	0.016	---	---	0.042	0.020	0.012	0.012	0.016	0.006	0.030
Antimony (Sb)	0.00005	mg/L	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	0.0001	mg/L	---	---	0.0003	0.0002	---	0.0002	0.0002	0.0002	---	---	0.0003	0.0004	0.0005	0.0002	0.0002	<0.0001	0.0003
Barium (Ba)	---	mg/L	---	---	0.01320	0.00920	---	0.00771	0.00775	0.00980	---	---	0.01940	0.01380	0.01390	0.01210	0.01180	0.01310	0.02102
Beryllium (Be)	0.0001	mg/L	---	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	0.001	mg/L	---	---	<0.001	<0.001	---	<0.001	<0.001	<0.001	---	---	0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002
Cadmium (Cd	0.000015	mg/L	---	---	<0.000015	<0.000015	---	<0.000015	<0.000015	<0.000015	---	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.000082
Calcium (Ca)	---	mg/L	---	---	22.3	15.0	---	14.0	13.4	17.1	---	---	18.6	25.9	28.6	28.6	28.7	29.0	34.0
Chromium (Cr	0.0003	mg/L	---	---	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	---	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0008
Cobalt (Co)	0.00002	mg/L	---	---	0.00006	<0.00002	---	<0.00002	<0.00002	<0.00002	---	---	<0.00002	<0.00002	0.00002	<0.00002	0.00002	0.00002	0.00005
Copper (Cu)	0.0001	mg/L	---	---	<0.0001	0.0182	---	0.0002	0.0003	0.0003	---	---	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001
Iron (Fe)	---	mg/L	---	---	0.5060	0.1680	---	0.1440	0.1310	0.1700	---	---	0.2580	0.3360	0.4470	0.2290	0.2060	0.1999	0.3535
Lead (Pb)	0.00005	mg/L	---	---	<0.00005	0.00069	---	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Lithium (Li)	0.001	mg/L	---	---	<0.001	<0.001	---	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	0.5	mg/L	---	---	4.83	3.29	---	3.02	2.97	3.43	---	---	3.84	5.06	5.67	6.05	5.80	6.52	8.47
Manganese (M	---	mg/L	---	---	0.08780	0.00796	---	0.00447	0.00393	0.01010	---	---	0.01870	0.02060	0.01600	0.00834	0.01200	0.02370	0.05161
Mercury (Hg)	0.000005	mg/L	---	---	<0.000008	<0.000005	---	<0.000005	<0.000005	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	---	mg/L	---	---	0.00058	0.00053	---	0.00047	0.00043	0.00046	---	---	0.00050	0.00072	0.00072	0.00056	0.00052	0.00043	0.00071
Nickel (Ni)	0.00005	mg/L	---	---	0.00023	0.00034	---	<0.00005	<0.00005	0.00025	---	---	0.00022	0.00024	0.00026	0.00020	0.00008	0.00018	0.00100
Phosphorus (	0.02	mg/L	---	---	0.03	<0.02	---	<0.02	<0.02	<0.02	---	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
Potassium (K)	0.5	mg/L	---	---	2.0	0.8	---	0.6	0.6	0.5	---	---	<0.5	<0.5	0.6	0.6	1.0	1.0	1.7
Selenium (Se)	0.0006	mg/L	---	---	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	mg/L	---	---	5.61	5.30	---	5.55	5.52	6.27	---	---	5.88	6.83	7.67	6.98	6.41	8.66	8.16
Silver (Ag)	0.00005	mg/L	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	mg/L	---	---	3.3	3.0	---	2.8	2.7	3.0	---	---	3.2	3.9	4.3	4.4	4.7	4.7	6.1
Strontium (Sr)	---	mg/L	---	---	0.091700	0.076000	---	0.070300	0.070100	0.091100	---	---	0.099100	0.132000	0.149000	0.135000	0.133000	0.132000	0.153400
Thallium (Tl)	0.00005	mg/L	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	---	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	---	---	0.0015	0.0006	---	0.0008	0.0006	0.0005	---	---	0.0012	0.0008	0.0006	0.0004	0.0006	0.0004	0.0012
Uranium (U)	0.00005	mg/L	---	---	0.00021	0.00005	---	<0.00005	<0.00005	<0.00005	---	---	0.00007	0.00009	0.00014	0.00013	0.00013	0.00015	0.00027
Vanadium (V)	0.0001	mg/L	---	---	0.0004	0.0001	---	0.0001	0.0001	<0.0001	---	---	0.0003	0.0003	0.0003	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	---	mg/L	---	---	<0.0005	0.0134	---	0.0015	0.0011	0.0009	---	---	0.0015	0.0005	0.0013	<0.0005	0.0022	0.0011	0.0416

Elements	WQ14-D					WQ15			WQ16			WQ Duplicate	
	~LIMS:L110 5609	~LIMS:L113 6681	~LIMS:L115 4508	~LIMS:L119 4631	~LIMS:L122 4463	~LIMS:EC-64032	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:EC-64032	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:EC-63411	~LIMS:EC-63959
Aluminum (Al)	---	---	---	---	---	0.072	0.062	0.022	0.048	0.025	0.006	0.194	0.029
Antimony (Sb)	---	---	---	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	<0.00005	<0.00005
Arsenic (As)	---	---	---	---	---	0.0002	0.0002	0.0001	0.0004	0.0003	0.0003	0.0005	0.0004
Barium (Ba)	---	---	---	---	---	0.01060	0.01010	0.00837	0.00492	0.00365	0.00366	0.00342	0.00692
Beryllium (Be)	---	---	---	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	---	---	---	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd	---	---	---	---	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Calcium (Ca)	---	---	---	---	---	8.0	8.0	7.8	5.8	5.6	6.2	3.2	8.0
Chromium (Cr	---	---	---	---	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	---	---	---	---	---	0.00003	0.00003	<0.00002	0.00005	0.00003	<0.00002	<0.00002	0.00006
Copper (Cu)	---	---	---	---	---	<0.0001	0.0011	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	0.0011
Iron (Fe)	---	---	---	---	---	0.1830	0.1220	0.0691	0.1190	0.0743	0.0141	0.0930	0.0934
Lead (Pb)	---	---	---	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00040	<0.00005	<0.00005
Lithium (Li)	---	---	---	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	---	---	---	---	---	1.14	1.16	1.16	1.16	1.14	1.24	0.77	2.28
Manganese (M	---	---	---	---	---	0.04050	0.02170	0.03351	0.02670	0.01100	0.00525	0.00379	0.01390
Mercury (Hg)	---	---	---	---	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	---	---	---	---	---	0.00057	0.00050	0.00060	0.00063	0.00052	0.00072	0.00059	0.00170
Nickel (Ni)	---	---	---	---	---	0.00016	<0.00005	0.00009	0.00014	<0.00005	<0.00005	0.00024	0.00023
Phosphorus (	---	---	---	---	---	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02
Potassium (K)	---	---	---	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium (Se)	---	---	---	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	---	---	---	---	0.96	1.08	2.22	1.10	0.86	1.52	4.44	6.43
Silver (Ag)	---	---	---	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	---	---	---	---	1.9	2.1	1.9	2.0	2.3	2.0	1.6	3.0
Strontium (Sr)	---	---	---	---	---	0.077300	0.077000	0.072650	0.040400	0.038700	0.041320	0.021700	0.051000
Thallium (Tl)	---	---	---	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	---	---	---	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	---	---	---	---	0.0010	0.0009	0.0004	0.0010	0.0004	<0.0002	0.0014	0.0004
Uranium (U)	---	---	---	---	---	0.00016	0.00015	0.00014	0.00020	0.00020	0.00022	0.00019	0.00007
Vanadium (V)	---	---	---	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0002
Zinc (Zn)	---	---	---	---	---	0.0019	0.0041	0.0010	0.0040	0.0028	0.0017	0.0019	0.0026

Elements	WQ17						WQ18		
	~LIMS:EC-62544	~LIMS:L112 4156	~LIMS:EC-62887	~LIMS:EC-63412	~LIMS:L116 5410	~LIMS:EC-63959	~LIMS:EC-62544	~LIMS:L112 4156	~LIMS:EC-62887
Aluminum (Al)	0.032	---	0.015	0.217	---	0.031	0.010	---	0.009
Antimony (Sb)	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005
Arsenic (As)	0.0003	---	0.0004	0.0006	---	0.0004	0.0004	---	0.0004
Barium (Ba)	0.00676	---	0.00750	0.00337	---	0.00631	0.00581	---	0.00641
Beryllium (Be)	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001
Boron (B)	<0.001	---	<0.001	<0.001	---	<0.001	0.002	---	0.002
Cadmium (Cd	<0.000015	---	<0.000015	<0.000015	---	<0.000015	<0.000015	---	<0.000015
Calcium (Ca)	8.3	---	10.0	3.7	---	8.0	13.5	---	15.6
Chromium (Cr	<0.0003	---	<0.0003	<0.0003	---	<0.0003	<0.0003	---	0.0004
Cobalt (Co)	0.00004	---	0.00003	0.00003	---	0.00006	0.00003	---	0.00003
Copper (Cu)	0.0006	---	0.0002	0.0007	---	0.0005	0.0009	---	<0.0001
Iron (Fe)	0.0733	---	0.0615	0.0934	---	0.0962	0.1520	---	0.1870
Lead (Pb)	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005
Lithium (Li)	<0.001	---	<0.001	<0.001	---	<0.001	<0.001	---	0.001
Magnesium (M	2.47	---	2.93	0.87	---	2.26	8.48	---	9.52
Manganese (M	0.00878	---	0.00759	0.00335	---	0.01370	0.00458	---	0.00576
Mercury (Hg)	<0.000008	---	<0.000008	<0.000005	---	<0.000005	<0.000008	---	<0.000008
Molybdenum (	0.00194	---	0.00252	0.00057	---	0.00191	0.00068	---	0.00076
Nickel (Ni)	0.00009	---	0.00013	0.00025	---	0.00025	0.00046	---	0.00045
Phosphorus (	<0.02	---	<0.02	<0.02	---	<0.02	0.04	---	0.05
Potassium (K)	<0.5	---	<0.5	<0.5	---	<0.5	2.4	---	2.6
Selenium (Se)	<0.0006	---	<0.0006	<0.0006	---	<0.0006	<0.0006	---	<0.0006
Silicon	6.38	---	7.12	4.40	---	6.15	11.20	---	15.00
Silver (Ag)	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005
Sodium (Na)	3.1	---	3.6	1.9	---	3.0	5.6	---	6.6
Strontium (Sr)	0.054200	---	0.061800	0.022900	---	0.052400	0.063200	---	0.069700
Thallium (Tl)	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005
Tin (Sn)	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001
Titanium (Ti)	0.0004	---	0.0003	0.0014	---	0.0004	0.0008	---	0.0009
Uranium (U)	0.00008	---	0.00010	0.00016	---	0.00007	0.00011	---	0.00014
Vanadium (V)	0.0001	---	<0.0001	0.0002	---	0.0002	0.0011	---	0.0013
Zinc (Zn)	<0.0005	---	0.0016	0.0036	---	0.0010	0.0017	---	0.0049

Table 1-10: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area / Sample ID / Unit	WQ18 ~LIMS:EC-63412	WQ18 ~LIMS:EC-63959	WQ19 ~LIMS:EC-63412	WQ19 ~LIMS:L1165410		WQ19 ~LIMS:EC-63959	WQ19 ~LIMS:EC-64543	WQ20-Epi ~LIMS:EC-63456		WQ20-Epi ~LIMS:EC-63925	
Aluminum (Al	---	mg/L	0.079	0.015	0.008	---	---	0.009	<0.002	0.004	0.004	0.002	0.002
Antimony (Sb	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	<0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	0.0001	mg/L	0.0004	0.0005	0.0004	---	---	0.0005	0.0004	0.0003	0.0003	0.0003	0.0003
Barium (Ba)	---	mg/L	0.00489	0.00467	0.00924	---	---	0.00911	0.00875	0.00846	0.00825	0.00951	0.00987
Beryllium (Be	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	0.001	mg/L	0.001	0.001	0.001	---	---	0.002	0.001	0.007	0.005	<0.001	<0.001
Cadmium (Cd	0.000015	mg/L	<0.000015	<0.000015	<0.000015	---	---	<0.000015	<0.000015	<0.000015	<0.000015	0.000023	0.000032
Calcium (Ca)	---	mg/L	9.4	13.4	28.8	---	---	34.6	35.0	19.5	19.1	20.7	21.5
Chromium (C	0.0003	mg/L	<0.0003	<0.0003	<0.0003	---	---	<0.0003	<0.0003	<0.0003	<0.0003	0.0004	0.0004
Cobalt (Co)	0.00002	mg/L	0.00004	0.00005	<0.00002	---	---	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Copper (Cu)	0.0001	mg/L	0.0001	0.0001	<0.0001	---	---	0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0003
Iron (Fe)	---	mg/L	0.2910	0.1460	0.0209	---	---	0.0241	0.0189	0.0169	0.0168	0.0598	0.0609
Lead (Pb)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	0.00009	0.00009
Lithium (Li)	0.001	mg/L	<0.001	0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	0.5	mg/L	5.68	7.77	3.61	---	---	4.47	4.87	5.24	5.21	5.61	5.71
Manganese (M	---	mg/L	0.02350	0.00852	0.00136	---	---	0.00224	0.00109	0.02170	0.02140	0.10200	0.10400
Mercury (Hg)	0.000005	mg/L	<0.000005	<0.000005	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	---	mg/L	0.00054	0.00078	0.00069	---	---	0.00075	0.00063	0.00122	0.00109	0.00070	0.00069
Nickel (Ni)	0.00005	mg/L	0.00063	0.00045	<0.00005	---	---	<0.00005	0.00007	0.00042	0.00041	0.00014	0.00014
Phosphorus (	0.02	mg/L	0.04	0.05	<0.02	---	---	<0.02	<0.02	<0.02	<0.02	0.03	0.03
Potassium (K	0.5	mg/L	1.7	2.1	0.5	---	---	0.7	0.7	0.7	0.7	1.0	1.0
Selenium (Se	0.0006	mg/L	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	mg/L	8.89	10.40	5.37	---	---	6.53	6.87	5.64	6.01	7.80	7.46
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	mg/L	4.3	5.2	2.7	---	---	2.8	3.0	3.4	3.2	3.3	3.3
Strontium (Sr	---	mg/L	0.047900	0.059900	0.123000	---	---	0.124000	0.120100	0.103000	0.101000	0.108000	0.111000
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	0.0040	0.0009	0.0003	---	---	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Uranium (U)	0.00005	mg/L	0.00006	0.00011	0.00026	---	---	0.00350	0.00030	<0.00005	<0.00005	<0.00005	<0.00005
Vanadium (V)	0.0001	mg/L	0.0013	0.0015	0.0008	---	---	0.0008	0.0003	0.0001	<0.0001	0.0001	0.0001
Zinc (Zn)	---	mg/L	0.0020	0.0006	0.0024	---	---	0.0006	0.0021	0.0014	0.0013	0.0036	0.0035

Elements	WQ20-Hypo ~LIMS:EC-63456	WQ20-Hypo ~LIMS:EC-63925	WQ20-Meta ~LIMS:EC-63456	WQ20-Meta ~LIMS:EC-63925	WQ21-Epi ~LIMS:EC-63456	WQ21-Epi ~LIMS:EC-63925	WQ21-Hypo ~LIMS:EC-63456	WQ21-Hypo ~LIMS:EC-63925	WQ21-HYPO-D ~LIMS:L1208861	WQ21-Meta ~LIMS:EC-63456	WQ21-Meta ~LIMS:EC-63925	WQ22-Epi ~LIMS:EC-63456	WQ22-Epi ~LIMS:EC-63925	WQ22-EPI~(12-6891)-D ~LIMS:L1169894
Aluminum (Al	0.235	0.007	0.006	<0.002	0.012	0.004	0.019	0.004	---	0.013	0.003	0.015	0.007	---
Antimony (Sb	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---
Arsenic (As)	0.0005	0.0004	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	---	0.0004	0.0004	0.0002	0.0003	---
Barium (Ba)	0.01340	0.00992	0.00993	0.00942	0.00594	0.00614	0.00614	0.00600	---	0.00599	0.00641	0.00634	0.00772	---
Beryllium (Be	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---
Boron (B)	0.004	<0.001	0.004	<0.001	0.003	<0.001	0.002	<0.001	---	0.003	<0.001	0.003	<0.001	---
Cadmium (Cd	<0.000015	0.000042	<0.000015	0.000017	<0.000015	0.000028	<0.000015	0.000023	---	<0.000015	0.000025	<0.000015	0.000031	---
Calcium (Ca)	20.0	21.9	22.2	20.5	18.7	20.8	19.1	20.5	---	19.0	21.6	11.4	12.7	---
Chromium (C	<0.0003	<0.0003	<0.0003	0.0003	<0.0003	0.0003	<0.0003	0.0004	---	<0.0003	0.0003	<0.0003	<0.0003	---
Cobalt (Co)	0.00013	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	---	<0.00002	<0.00002	<0.00002	0.00002	---
Copper (Cu)	0.0028	0.0005	0.0015	0.0005	0.0002	0.0003	0.0008	0.0004	---	0.0005	0.0005	0.0004	0.0001	---
Iron (Fe)	0.4600	0.0606	0.0197	0.0570	0.0270	0.0160	0.0314	0.0403	---	0.0341	0.0179	0.0981	0.1640	---
Lead (Pb)	0.00111	0.00054	0.01080	0.00028	<0.00005	<0.00005	0.00095	0.00031	---	<0.00005	0.00030	<0.00005	0.00011	---
Lithium (Li)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	---
Magnesium (M	5.37	5.61	5.16	5.48	4.48	4.75	4.66	4.69	---	4.50	4.64	3.00	3.27	---
Manganese (M	0.09320	0.10300	0.02680	0.09980	0.00584	0.00340	0.00698	0.06160	---	0.00598	0.00483	0.00781	0.03370	---
Mercury (Hg)	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	---	<0.000005	<0.000005	<0.000005	<0.000005	---
Molybdenum (	0.00083	0.00071	0.00096	0.00066	0.00061	0.00054	0.00053	0.00051	---	0.00056	0.00060	0.00032	0.00031	---
Nickel (Ni)	0.00061	0.00012	0.00018	0.00013	0.00022	0.00022	0.00027	0.00021	---	0.00025	0.00021	0.00011	0.00012	---
Phosphorus (	0.10	0.03	<0.02	0.03	<0.02	<0.02	<0.02	0.03	---	<0.02	<0.02	<0.02	<0.02	---
Potassium (K	0.8	1.0	0.7	0.9	0.7	0.8	0.8	0.9	---	0.7	0.8	0.9	1.1	---
Selenium (Se	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	---
Silicon	6.30	7.89	5.69	7.74	3.58	3.25	4.68	5.97	---	3.82	4.10	3.49	5.11	---
Silver (Ag)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---
Sodium (Na)	3.2	3.2	3.2	3.1	3.4	3.4	3.5	3.4	---	3.4	3.3	2.9	3.0	---
Strontium (Sr	0.106000	0.114000	0.118000	0.107000	0.095500	0.103000	0.098300	0.102000	---	0.097300	0.108000	0.066900	0.072500	---
Thallium (Tl)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---
Tin (Sn)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---
Titanium (Ti)	0.0135	<0.0002	0.0006	<0.0002	0.0003	<0.0002	0.0005	<0.0002	---	0.0004	<0.0002	0.0002	<0.0002	---
Uranium (U)	0.00006	<0.00005	<0.00005	<0.00005	0.00008	0.00009	0.00008	0.00008	---	0.00008	0.00010	<0.00005	<0.00005	---
Vanadium (V)	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	<0.0001	---	0.0001	0.0001	0.0001	0.0001	---
Zinc (Zn)	0.0061	0.0112	0.0053	0.0046	0.0011	0.0034	0.0034	0.0047	---	0.0014	0.0033	0.0044	0.0056	---

Elements	WQ22-Hypo ~LIMS:EC-63456	WQ22-Hypo ~LIMS:EC-63925	WQ22-META ~LIMS:L1208861	WQ23-Epi ~LIMS:EC-63456	WQ23-Epi ~LIMS:EC-63925	WQ23-Hypo ~LIMS:EC-63456	WQ23-Hypo ~LIMS:EC-63925	WQ23-Meta ~LIMS:EC-63456	WQ23-Meta ~LIMS:EC-63925	WQ Duplicate ~LIMS:EC-63925	WQ24-Epi ~LIMS:EC-63456	WQ24-Epi ~LIMS:EC-63925	WQ24-Hypo ~LIMS:EC-63456	WQ24-Hypo ~LIMS:EC-63925
Aluminum (Al	0.030	0.015	---	0.018	0.014	0.006	0.005	0.006	0.007	0.008	0.019	0.012	0.032	0.012
Antimony (Sb	<0.00005	<0.00005	---	<0.00005	0.00007	<0.00005	0.00007	<0.00005	0.00006	<0.00005	<0.00005	0.00007	<0.00005	0.00007
Arsenic (As)	0.0003	0.0003	---	0.0006	0.0008	0.0008	0.0008	0.0005	0.0004	0.0002	0.0004	0.0004	0.0004	0.0004
Barium (Ba)	0.00944	0.00773	---	0.00257	0.00223	0.00419	0.00493	0.00342	0.00392	0.00768	0.00291	0.00282	0.00308	0.00278
Beryllium (Be	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	0.003	<0.001	---	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd	<0.000015	0.000026	---	<0.000015	0.000028	<0.000015	0.000025	<0.000015	0.000022	0.000022	<0.000015	0.000079	<0.000015	0.000022
Calcium (Ca)	12.0	12.8	---	5.5	6.1	7.1	7.7	6.8	7.6	12.9	5.3	5.7	5.3	5.7
Chromium (C	0.0004	<0.0003	---	0.0003	0.0004	<0.0003	0.0003	<0.0003	0.0003	<0.0003	0.0003	<0.0003	0.0003	0.0003
Cobalt (Co)	<0.00002	<0.00002	---	<0.00002	0.00004	<0.00002	0.00003	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Copper (Cu)	0.0003	0.0004	---	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0002	0.0002	<0.0001	0.0003	0.0001	0.0003
Iron (Fe)	0.4960	0.1840	---	0.0146	0.0170	0.1760	0.2330	0.0341	0.0435	0.1660	0.0411	0.0213	0.0586	0.0210
Lead (Pb)	0.00048	0.00018	---	<0.00005	<0.00005	<0.00005	0.00011	<0.00005	0.00007	0.00006	<0.00005	<0.00005	<0.00005	0.00010
Lithium (Li)	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	3.00	3.28	---	0.92	1.12	1.34	1.41	1.26	1.38	3.31	1.01	1.17	1.02	1.16
Manganese (M	0.14500	0.03560	---	0.00283	0.00374	0.05260	0.13100	0.00624	0.00986	0.03410	0.00308	0.00518	0.00674	0.00595
Mercury (Hg)	<0.000005	<0.000005	---	<0.000005	<0.000005	<0.000005	0.000007	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.000007
Molybdenum (	0.00028	0.00030	---	0.00059	0.00075	0.00069	0.00084	0.00068	0.00075	0.00032	0.00080	0.00089	0.00074	0.00089
Nickel (Ni)	0.00010	0.00012	---	<0.00005	0.00125	<0.00005	<0.00005	<0.00005	<0.00005	0.00010	<0.00005	<0.00005	<0.00005	<0.00005
Phosphorus (	0.02	<0.02	---	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Potassium (K	0.9	1.1	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
Selenium (Se	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	4.72	5.14	---	4.18	4.07	4.99	5.31	4.20	4.45	5.19	2.00	1.83	1.79	1.72
Silver (Ag)	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	2.9	3.0	---	2.0	2.0	2.5	2.2	2.8	2.2	3.0	1.8	1.7	1.8	1.7
Strontium (Sr	0.070300	0.073400	---	0.040000	0.044000	0.051600	0.055400	0.048300	0.053300	0.073100	0.038700	0.042100	0.039100	0.042100
Thallium (Tl)	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	0.0007	0.0003	---	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002	0.0004	<0.0002	0.0003	<0.0002
Uranium (U)	<0.00005	<0.00005	---	0.00015	0.00014	0.00009	0.00009	0.00009	0.00008	<0.00005	0.00030	0.00030	0.00030	0.00029
Vanadium (V)	0.0002	0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	0.0028	0.0050	---	0.0008	0.0028	0.0020	0.0049	0.0025	0.0044	0.0009	0.0019	0.0029	0.0015	0.0046

Table 1-11: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ24-META	WQ-DUPLICATE	WQ25-Epi	WQ25-Hypo	WQ3														
		Sample ID	~LIMS:L1208861	~LIMS:L1208861	~LIMS:EC-63925	~LIMS:EC-63925	~LIMS:L1007174	~LIMS:L1009554	~LIMS:L1018027	~LIMS:L1014653		~LIMS:L1033697	~LIMS:L1046189	~LIMS:L1061327	~LIMS:EC-62129	~LIMS:L1085601	~LIMS:EC-62363	~LIMS:EC-62544		~LIMS:EC-62667	
		Unit																			
Aluminum (Al)	---	mg/L	---	---	0.028	0.026	---	---	---	---	---	---	---	---	0.034	---	0.026	0.033	0.035	0.043	0.043
Antimony (Sb)	0.00005	mg/L	---	---	<0.00005	<0.00005	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	0.00007	0.00007	<0.00005	<0.00005
Arsenic (As)	0.0001	mg/L	---	---	0.0001	0.0002	---	---	---	---	---	---	---	---	0.0009	---	0.0011	0.0011	0.0010	0.0011	0.0011
Barium (Ba)	---	mg/L	---	---	0.00833	0.00808	---	---	---	---	---	---	---	---	0.00466	---	0.00513	0.00481	0.00477	0.00531	0.00529
Beryllium (Be)	0.0001	mg/L	---	---	<0.0001	<0.0001	---	---	---	---	---	---	---	---	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	0.001	mg/L	---	---	<0.001	<0.001	---	---	---	---	---	---	---	---	0.008	---	0.003	0.003	0.003	0.003	0.002
Cadmium (Cd	0.000015	mg/L	---	---	0.000052	0.000082	---	---	---	---	---	---	---	---	<0.000015	---	<0.000015	<0.000015	<0.000015	0.000032	0.000036
Calcium (Ca)	---	mg/L	---	---	7.0	7.0	---	---	---	---	---	---	---	---	11.9	---	12.4	12.7	12.8	12.7	12.8
Chromium (C	0.0003	mg/L	---	---	<0.0003	<0.0003	---	---	---	---	---	---	---	---	0.0006	---	0.0008	0.0009	0.0009	0.0009	0.0009
Cobalt (Co)	0.00002	mg/L	---	---	<0.00002	<0.00002	---	---	---	---	---	---	---	---	0.00002	---	0.00002	<0.00002	<0.00002	0.00002	0.00002
Copper (Cu)	0.0001	mg/L	---	---	0.0002	0.0002	---	---	---	---	---	---	---	---	<0.0001	---	0.0002	0.0002	0.0002	0.0073	0.0074
Iron (Fe)	---	mg/L	---	---	0.0829	0.0822	---	---	---	---	---	---	---	---	0.0898	---	0.0852	0.0817	0.0811	0.0944	0.0948
Lead (Pb)	0.00005	mg/L	---	---	<0.00005	0.00008	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	<0.00005	<0.00005	0.00084	0.00084
Lithium (Li)	0.001	mg/L	---	---	<0.001	<0.001	---	---	---	---	---	---	---	---	<0.001	---	<0.001	<0.001	<0.001	0.001	0.001
Magnesium (M	0.5	mg/L	---	---	1.04	1.04	---	---	---	---	---	---	---	---	2.75	---	2.80	3.12	3.10	3.00	3.03
Manganese (M	---	mg/L	---	---	0.01020	0.01020	---	---	---	---	---	---	---	---	0.00634	---	0.00677	0.00587	0.00581	0.00655	0.00660
Mercury (Hg)	0.000005	mg/L	---	---	<0.000005	0.000005	---	---	---	---	---	---	---	---	0.000009	---	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Molybdenum (	---	mg/L	---	---	0.00071	0.00072	---	---	---	---	---	---	---	---	0.00062	---	0.00078	0.00081	0.00080	0.00078	0.00076
Nickel (Ni)	0.00005	mg/L	---	---	0.00007	0.00006	---	---	---	---	---	---	---	---	<0.00005	---	0.00007	<0.00005	<0.00005	0.00008	0.00008
Phosphorus (	0.02	mg/L	---	---	<0.02	<0.02	---	---	---	---	---	---	---	---	0.04	---	0.04	0.04	0.04	0.04	0.04
Potassium (K)	0.5	mg/L	---	---	<0.5	<0.5	---	---	---	---	---	---	---	---	0.5	---	<0.5	0.5	0.5	0.6	0.6
Selenium (Se)	0.0006	mg/L	---	---	<0.0006	<0.0006	---	---	---	---	---	---	---	---	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	mg/L	---	---	2.52	2.47	---	---	---	---	---	---	---	---	8.28	---	8.10	8.77	8.79	10.50	10.80
Silver (Ag)	0.00005	mg/L	---	---	<0.00005	<0.00005	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	mg/L	---	---	1.6	1.6	---	---	---	---	---	---	---	---	3.4	---	3.4	3.6	3.6	3.6	3.6
Strontium (Sr)	---	mg/L	---	---	0.075500	0.075800	---	---	---	---	---	---	---	---	0.073400	---	0.082300	0.084100	0.083600	0.086600	0.086600
Thallium (Tl)	0.00005	mg/L	---	---	<0.00005	<0.00005	---	---	---	---	---	---	---	---	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	---	---	<0.0001	<0.0001	---	---	---	---	---	---	---	---	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	---	---	0.0003	<0.0002	---	---	---	---	---	---	---	---	0.0008	---	0.0012	0.0018	0.0016	0.0013	0.0014
Uranium (U)	0.00005	mg/L	---	---	0.00014	0.00013	---	---	---	---	---	---	---	---	0.00015	---	0.00017	0.00018	0.00018	0.00018	0.00018
Vanadium (V)	0.0001	mg/L	---	---	<0.0001	<0.0001	---	---	---	---	---	---	---	---	0.0012	---	0.0014	0.0014	0.0014	0.0016	0.0016
Zinc (Zn)	---	mg/L	---	---	0.0034	0.0057	---	---	---	---	---	---	---	---	<0.0005	---	0.0016	0.0006	0.0005	0.0124	0.0126

Elements	WQ3																			
	~LIMS:L1105609	~LIMS:EC-62773		~LIMS:L1124156		~LIMS:EC-62887		~LIMS:EC-63034		~LIMS:EC-63189		~LIMS:L1150853		~LIMS:L1154508	~LIMS:EC-63271	~LIMS:EC-63357	~LIMS:L1165411	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753
Aluminum (Al)	---	0.157	0.163	---	---	0.021	0.022	0.028	0.029	0.221	0.211	0.247	0.247	---	0.115	0.086	---	0.085	0.056	0.033
Antimony (Sb)	---	<0.00005	<0.00005	---	---	<0.00005	<0.00005	0.00007	0.00006	<0.00005	0.00006	0.00005	0.00006	---	0.00005	0.00006	---	<0.00005	0.00006	<0.00005
Arsenic (As)	---	0.0013	0.0014	---	---	0.0011	0.0011	0.0011	0.0012	0.0006	0.0007	0.0006	0.0006	---	0.0004	0.0005	---	0.0006	0.0009	0.0011
Barium (Ba)	---	0.00618	0.00651	---	---	0.00477	0.00533	0.00512	0.00506	0.00708	0.00727	0.00506	0.00510	---	0.00361	0.00442	---	0.00414	0.00484	0.00500
Beryllium (Be)	---	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001
Boron (B)	---	<0.001	<0.001	---	---	0.003	0.002	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	---	<0.001	<0.001	---	<0.001	<0.001	0.003
Cadmium (Cd	---	<0.000015	<0.000015	---	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	<0.000015	<0.000015	---	<0.000015	<0.000015	<0.000015
Calcium (Ca)	---	13.1	13.0	---	---	13.3	13.6	13.6	13.5	7.1	7.2	6.1	6.1	---	5.6	6.9	---	7.7	10.3	11.8
Chromium (C	---	0.0012	0.0013	---	---	0.0009	0.0009	0.0008	0.0008	0.0007	0.0006	0.0006	0.0006	---	0.0003	0.0006	---	0.0009	0.0006	0.0006
Cobalt (Co)	---	0.00006	0.00006	---	---	<0.00002	<0.00002	<0.00002	<0.00002	0.00009	0.00010	0.00006	0.00006	---	0.00045	0.00003	---	<0.00002	<0.00002	0.00002
Copper (Cu)	---	0.0001	0.0002	---	---	<0.0001	<0.0001	<0.0001	<0.0001	0.0005	0.0005	0.0005	0.0005	---	0.0003	0.0004	---	<0.0001	0.0003	<0.0001
Iron (Fe)	---	0.2830	0.2860	---	---	0.0615	0.0604	0.0788	0.0800	0.3210	0.3220	0.3200	0.3200	---	0.1530	0.1270	---	0.1290	0.1140	0.1090
Lead (Pb)	---	0.00007	0.00007	---	---	<0.00005	<0.00005	<0.00005	<0.00005	0.00017	0.00016	0.00010	0.00011	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005
Lithium (Li)	---	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001	---	<0.001	<0.001	<0.001
Magnesium (M	---	3.03	3.07	---	---	3.22	3.19	3.25	3.29	1.58	1.59	1.47	1.48	---	1.41	1.58	---	1.76	2.41	2.75
Manganese (M	---	0.02080	0.02220	---	---	0.00438	0.00433	0.00444	0.00452	0.01450	0.01480	0.01230	0.01220	---	0.00384	0.00623	---	0.00689	0.00744	0.00825
Mercury (Hg)	---	<0.000008	<0.000008	---	---	<0.000008	<0.000008	<0.000008	<0.000008	<0.000005	<0.000005	<0.000005	<0.000005	---	<0.000005	<0.000005	---	<0.000005	<0.000005	<0.000005
Molybdenum (	---	0.00083	0.00083	---	---	0.00088	0.00100	0.00070	0.00070	0.00029	0.00025	0.00029	0.00029	---	0.00028	0.00028	---	0.00037	0.00065	0.00067
Nickel (Ni)	---	0.00010	0.00012	---	---	<0.00005	<0.00005	0.00006	0.00005	0.00029	0.00031	0.00007	0.00008	---	<0.00005	0.00019	---	0.00280	0.00009	0.00010
Phosphorus (	---	0.06	0.06	---	---	0.04	0.04	0.05	0.05	0.04	0.04	0.04	0.04	---	<0.02	0.20	---	0.02	0.03	0.04
Potassium (K)	---	0.6	0.6	---	---	0.6	0.6	0.7	0.7	0.5	0.5	<0.5	<0.5	---	<0.5	<0.5	---	<0.5	<0.5	0.6
Selenium (Se)	---	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006
Silicon	---	8.61	8.59	---	---	9.62	9.75	8.78	8.64	6.06	5.91	5.54	5.45	---	5.88	7.37	---	6.73	8.25	8.91
Silver (Ag)	---	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	3.5	3.6	---	---	3.8	3.8	3.7	3.8	2.4	2.3	2.1	2.1	---	2.1	2.4	---	2.5	3.2	3.7
Strontium (Sr)	---	0.086500	0.086900	---	---	0.086000	0.097200	0.076900	0.077200	0.050700	0.050900	0.041800	0.041800	---	0.039300	0.049500	---	0.051900	0.069800	0.083300
Thallium (Tl)	---	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005
Tin (Sn)	---	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	0.0055	0.0057	---	---	0.0007	0.0007	0.0007	0.0006	0.0058	0.0058	0.0068	0.0067	---	0.0021	0.0016	---	0.0017	0.0015	0.0008
Uranium (U)	---	0.00027	0.00027	---	---	0.00021	0.00023	0.00017	0.00017	0.00018	0.00018	0.00017	0.00017	---	0.00011	0.00009	---	0.00010	0.00010	0.00016
Vanadium (V)	---	0.0022	0.0023	---	---	0.0016	0.0016	0.0018	0.0018	0.0014	0.0014	0.0012	0.0012	---	0.0008	0.0009	---	0.0011	0.0014	0.0014
Zinc (Zn)	---	<0.0005	<0.0005	---	---	0.0016	0.0016	<0.0005	<0.0005	0.0027	0.0027	0.0095	0.0092	---	0.0016	0.0009	---	0.0030	0.0007	0.0015

Table 1-12: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area / Sample ID / Unit	WQ3 ~LIMS:EC-63959	WQ3 ~LIMS:EC-64183	WQ3 ~LIMS:EC-64183	WQ3 ~LIMS:EC-64399	WQ3-D ~LIMS:EC-64543	WQ3-D ~LIMS:L1018027	WQ Duplicate ~LIMS:L1150853
Aluminum (Al	---	mg/L	0.049	0.031	0.032	0.031	0.019	---	---
Antimony (Sb	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Arsenic (As)	0.0001	mg/L	0.0011	0.0011	0.0011	0.0011	0.0005	---	---
Barium (Ba)	---	mg/L	0.00502	0.00481	0.00485	0.00505	0.00736	---	---
Beryllium (Be	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---
Boron (B)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	---	---
Cadmium (Cd	0.000015	mg/L	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	---
Calcium (Ca)	---	mg/L	13.0	12.8	13.0	12.0	22.0	---	---
Chromium (C	0.0003	mg/L	0.0009	0.0009	0.0009	0.0010	<0.0003	---	---
Cobalt (Co)	0.00002	mg/L	0.00003	0.00002	0.00002	0.00002	0.00004	---	---
Copper (Cu)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---
Iron (Fe)	---	mg/L	0.1160	0.0889	0.0916	0.0854	0.1915	---	---
Lead (Pb)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	0.00007	<0.00005	---	---
Lithium (Li)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	---	---
Magnesium (M	0.5	mg/L	2.93	3.02	3.02	3.18	5.11	---	---
Manganese (M	---	mg/L	0.00870	0.00697	0.00716	0.00653	0.03729	---	---
Mercury (Hg)	0.000005	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	---	---
Molybdenum (	---	mg/L	0.00082	0.00081	0.00081	0.00071	0.00076	---	---
Nickel (Ni)	0.00005	mg/L	0.00014	<0.00005	<0.00005	<0.00005	0.00020	---	---
Phosphorus (	0.02	mg/L	0.05	0.04	0.04	0.05	0.02	---	---
Potassium (K	0.5	mg/L	0.6	0.6	0.6	0.5	0.9	---	---
Selenium (Se	0.0006	mg/L	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---
Silicon	---	mg/L	8.54	8.28	8.05	8.93	5.16	---	---
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Sodium (Na)	---	mg/L	3.6	4.2	3.9	3.8	3.7	---	---
Strontium (Sr	---	mg/L	0.081300	0.083700	0.084700	0.079760	0.103400	---	---
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---
Titanium (Ti)	---	mg/L	0.0014	0.0012	0.0010	0.0010	0.0007	---	---
Uranium (U)	0.00005	mg/L	0.00020	0.00019	0.00019	0.00018	0.00012	---	---
Vanadium (V)	0.0001	mg/L	0.0017	0.0016	0.0016	0.0010	<0.0001	---	---
Zinc (Zn)	---	mg/L	<0.0005	0.0027	0.0026	0.0029	0.0011	---	---

Elements	WQ4 ~LIMS:EC-63191	WQ4 ~LIMS:L1007174	WQ4 ~LIMS:L1009554	WQ4 ~LIMS:L1014653	WQ4 ~LIMS:L1018027	WQ4 ~LIMS:L1033697	WQ4 ~LIMS:L1046189	WQ4 ~LIMS:L1061327	WQ4 ~LIMS:EC-62129	WQ4 ~LIMS:EC-62363	WQ4 ~LIMS:EC-63191	WQ4 ~LIMS:L1151662
Aluminum (Al	0.899	---	---	---	---	---	---	---	0.074	0.206	0.885	---
Antimony (Sb	0.00021	---	---	---	---	---	---	---	0.00008	0.00008	0.00020	---
Arsenic (As)	0.0023	---	---	---	---	---	---	---	0.0009	0.0019	0.0023	---
Barium (Ba)	0.01080	---	---	---	---	---	---	---	0.00200	0.00310	0.00839	---
Beryllium (Be	<0.0001	---	---	---	---	---	---	---	<0.0001	<0.0001	<0.0001	---
Boron (B)	<0.001	---	---	---	---	---	---	---	0.007	0.001	<0.001	---
Cadmium (Cd	0.000072	---	---	---	---	---	---	---	0.000022	0.000098	0.000080	---
Calcium (Ca)	5.9	---	---	---	---	---	---	---	6.6	5.9	6.0	---
Chromium (C	0.0008	---	---	---	---	---	---	---	<0.0003	<0.0003	0.0007	---
Cobalt (Co)	0.00006	---	---	---	---	---	---	---	<0.00002	0.00010	0.00005	---
Copper (Cu)	0.0006	---	---	---	---	---	---	---	0.0001	0.0003	0.0031	---
Iron (Fe)	0.7360	---	---	---	---	---	---	---	0.0451	0.1840	0.7210	---
Lead (Pb)	0.00092	---	---	---	---	---	---	---	<0.00005	0.00020	0.00093	---
Lithium (Li)	<0.001	---	---	---	---	---	---	---	<0.001	<0.001	<0.001	---
Magnesium (M	1.20	---	---	---	---	---	---	---	1.04	1.01	1.18	---
Manganese (M	0.03340	---	---	---	---	---	---	---	0.01160	0.06990	0.03380	---
Mercury (Hg)	<0.000005	---	---	---	---	---	---	---	<0.000008	<0.000008	<0.000005	---
Molybdenum (	<0.00005	---	---	---	---	---	---	---	0.00006	0.00009	<0.00005	---
Nickel (Ni)	0.00035	---	---	---	---	---	---	---	0.00010	0.00026	0.00044	---
Phosphorus (	0.03	---	---	---	---	---	---	---	<0.02	<0.02	0.03	---
Potassium (K	0.7	---	---	---	---	---	---	---	<0.5	<0.5	0.7	---
Selenium (Se	<0.0006	---	---	---	---	---	---	---	<0.0006	<0.0006	<0.0006	---
Silicon	5.42	---	---	---	---	---	---	---	5.51	5.28	5.45	---
Silver (Ag)	<0.00005	---	---	---	---	---	---	---	<0.00005	<0.00005	<0.00005	---
Sodium (Na)	2.1	---	---	---	---	---	---	---	1.8	1.6	2.1	---
Strontium (Sr	0.036200	---	---	---	---	---	---	---	0.035500	0.033100	0.036300	---
Thallium (Tl)	<0.00005	---	---	---	---	---	---	---	<0.00005	<0.00005	<0.00005	---
Tin (Sn)	<0.0001	---	---	---	---	---	---	---	<0.0001	<0.0001	<0.0001	---
Titanium (Ti)	0.0357	---	---	---	---	---	---	---	0.0009	0.0034	0.0347	---
Uranium (U)	0.00007	---	---	---	---	---	---	---	<0.00005	0.00005	0.00007	---
Vanadium (V)	0.0016	---	---	---	---	---	---	---	<0.0001	<0.0001	0.0015	---
Zinc (Zn)	0.0596	---	---	---	---	---	---	---	0.0250	0.0381	0.0592	---

Elements	WQ4 ~LIMS:EC-63237	WQ4 ~LIMS:L1154508	WQ4 ~LIMS:EC-63357	WQ4 ~LIMS:L1161703	WQ4 ~LIMS:L1165411	WQ4 ~LIMS:EC-63411	WQ4 ~LIMS:EC-63577	WQ4 ~LIMS:EC-63753	WQ4 ~LIMS:EC-63959	WQ4 ~LIMS:EC-64183	WQ4 ~LIMS:EC-64399
Aluminum (Al	0.644	0.306	0.154	---	---	0.126	0.156	0.126	0.053	1.190	0.094
Antimony (Sb	0.00017	0.00014	0.00015	---	---	0.00010	0.00015	0.00014	0.00014	0.00041	0.00025
Arsenic (As)	0.0023	0.0014	0.0013	---	---	0.0012	0.0015	0.0015	0.0012	0.0069	0.0011
Barium (Ba)	0.00572	0.00298	0.00256	---	---	0.00228	0.00323	0.00329	0.00232	0.01380	0.00384
Beryllium (Be	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Cadmium (Cd	0.000087	0.000049	0.000022	---	---	0.000034	0.000048	0.000045	0.000019	0.000247	0.000106
Calcium (Ca)	5.5	4.6	5.2	---	---	5.0	6.7	7.9	8.0	11.1	11.0
Chromium (C	<0.0003	<0.0003	<0.0003	---	---	<0.0003	<0.0003	<0.0003	<0.0003	0.0008	0.0003
Cobalt (Co)	0.00008	0.00039	<0.00002	---	---	<0.00002	<0.00002	0.00004	0.00003	0.00019	0.00003
Copper (Cu)	0.0006	0.0002	0.0011	---	---	<0.0001	0.0005	<0.0001	0.0002	0.0015	<0.0001
Iron (Fe)	0.4650	0.1860	0.0787	---	---	0.0538	0.0957	0.0823	0.0469	0.8990	0.1276
Lead (Pb)	0.00064	0.00013	<0.00005	---	---	<0.00005	<0.00005	0.00012	<0.00005	0.00341	0.00012
Lithium (Li)	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	0.94	0.82	0.82	---	---	0.79	1.01	1.25	1.27	1.81	2.05
Manganese (M	0.04560	0.00538	0.00360	---	---	0.00135	0.01970	0.03240	0.04000	0.10700	0.02068
Mercury (Hg)	<0.000005	<0.000005	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005	0.000014	<0.000005
Molybdenum (	<0.00005	<0.00005	<0.00005	---	---	0.00006	0.00013	0.00019	0.00020	0.00016	0.00009
Nickel (Ni)	0.00026	<0.00005	0.00032	---	---	0.00028	0.00031	0.00029	0.00024	0.00051	0.00043
Phosphorus (	0.02	<0.02	<0.02	---	---	<0.02	<0.02	<0.02	<0.02	0.05	<0.02
Potassium (K	<0.5	<0.5	<0.5	---	---	<0.5	<0.5	<0.5	<0.5	0.8	0.6
Selenium (Se	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	4.70	4.60	5.20	---	---	4.99	6.58	6.55	5.73	7.61	6.01
Silver (Ag)	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	0.00009	<0.00005
Sodium (Na)	2.0	1.8	1.9	---	---	1.8	2.1	2.4	2.2	3.2	4.9
Strontium (Sr	0.032600	0.027800	0.032900	---	---	0.030100	0.040500	0.049700	0.045600	0.063700	0.059690
Thallium (Tl)	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	0.0109	0.0054	0.0011	---	---	0.0009	0.0035	0.0027	0.0008	0.0289	0.0016
Uranium (U)	0.00007	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	0.00018	<0.00005
Vanadium (V)	0.0005	0.0002	<0.0001	---	---	0.0001	0.0002	0.0001	<0.0001	0.0001	<0.0001
Zinc (Zn)	0.0562	0.0452	0.0493	---	---	0.0468	0.0345	0.0307	0.0253	0.0746	0.0411

Elements	WQ5 ~LIMS:EC-64543	WQ5 ~LIMS:EC-62129	WQ5 ~LIMS:L1085601	WQ5 ~LIMS:EC-62363	WQ5 ~LIMS:EC-62544	WQ5 ~LIMS:EC-63189	WQ5 ~LIMS:L1150853	WQ5 ~LIMS:L1154508	WQ5 ~LIMS:EC-63271
Aluminum (Al	0.416	0.074	---	0.067	0.100	0.336	0.313	---	0.199
Antimony (Sb	0.00027	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005
Arsenic (As)	0.0042	0.0004	---	0.0004	0.0003	0.0004	0.0003	---	0.0003
Barium (Ba)	0.00856	0.00376	---	0.00386	0.00509	0.00601	0.00381	---	0.00273
Beryllium (Be	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001
Boron (B)	<0.001	0.007	---	0.001	0.002	<0.001	<0.001	---	<0.001
Cadmium (Cd	0.001284	<0.000015	---	<0.000015	0.000031	0.000019	<0.000015	---	<0.000015
Calcium (Ca)	17.0	6.5	---	6.5	8.5	3.4	3.0	---	2.6
Chromium (C	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	---	<0.0003
Cobalt (Co)	0.00025	0.00003	---	0.00003	0.00005	0.00012	0.00004	---	0.00040
Copper (Cu)	0.0003	0.0002	---	0.0002	0.0005	0.0006	0.0004	---	0.0002
Iron (Fe)	0.5596	0.1150	---	0.1340	0.2180	0.3300	0.2250	---	0.1180
Lead (Pb)	0.00099	<0.00005	---	<0.00005	0.00011	0.00014	0.00005	---	<0.00005
Lithium (Li)	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	---	<0.001
Magnesium (M	2.95	1.80	---	1.90	2.50	0.94	0.82	---	0.74
Manganese (M	0.18178	0.00483	---	0.00689	0.01990	0.02120	0.00895	---	0.00239
Mercury (Hg)	<0.000005	<0.000008	---	<0.000008	<0.000008	<0.000005	<0.000005	---	<0.000005
Molybdenum (	0.00021	0.00016	---	0.00021	0.00021	0.00008	0.00010	---	0.00013
Nickel (Ni)	0.00060	0.00010	---	0.00020	0.00023	0.00038	0.00019	---	<0.00005
Phosphorus (	0.03	<0.02	---	<0.02	<0.02	<0.02	<0.02	---	<0.02
Potassium (K	0.7	<0.5	---	<0.5	<0.5	<0.5	<0.5	---	<0.5
Selenium (Se	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006
Silicon	5.22	5.38	---	5.31	6.70	4.46	4.12	---	4.19
Silver (Ag)	0.00006	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005
Sodium (Na)	5.6	2.5	---	2.5	2.9	1.7	1.6	---	1.5
Strontium (Sr	0.083630	0.040400	---	0.042100	0.053300	0.023200	0.020600	---	0.018700
Thallium (Tl)	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005
Tin (Sn)	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001
Titanium (Ti)	0.0066	0.0009	---	0.0010	0.0017	0.0077	0.0058	---	0.0018
Uranium (U)	0.00017	0.00005	---	0.00005	0.00005	0.00012	0.00010	---	0.00008
Vanadium (V)	0.0007	0.0002	---	0.0002	0.0002	0.0006	0.0003	---	0.0002
Zinc (Zn)	0.0882	<0.0005	---	0.0014	0.0014	0.0016	0.0035	---	0.0020

Table 1-13: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ5								WQ5~12-16752-D	11~5502-D	WQ6																								WQ6-D	WQDUPLICATE	L997208-1	L997208-10	WQ Duplicate
		Sample ID	~LIMS:EC-63357	~LIMS:L1165411	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:L1238081	~LIMS:L1007174	~LIMS:L1007174	~LIMS:L1009554	~LIMS:L1014653	~LIMS:L1018027	~LIMS:L1033697	~LIMS:L1046189	~LIMS:L1061327	~LIMS:EC-62129	~LIMS:EC-62363	~LIMS:EC-63034	~LIMS:EC-63191	~LIMS:L1151662	~LIMS:EC-63237	~LIMS:L1154508	~LIMS:EC-63357	~LIMS:L1161703	~LIMS:L1165411	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:EC-64543	~LIMS:L1085601	~LIMS:L1046189			~LIMS:L1061327
		Unit																																							
Aluminum (Al)	---	mg/L	0.173	---	0.167	0.083	0.057	0.052	0.038	0.068	---	---	---	---	---	---	---	---	---	0.064	0.062	0.252	0.388	---	0.262	0.184	0.110	---	---	0.104	0.059	0.070	0.044	0.050	0.052	0.044	---	---	---	---	---
Antimony (Sb)	0.00005	mg/L	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	0.00005	<0.00005	---	<0.00005	0.00006	0.00006	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---
Arsenic (As)	0.0001	mg/L	0.0003	---	0.0004	0.0003	0.0004	0.0003	0.0003	0.0003	---	---	---	---	---	---	---	---	---	0.0005	0.0006	0.0009	0.0007	---	0.0005	0.0007	0.0007	---	---	0.0008	0.0008	0.0007	0.0005	0.0005	0.0004	0.0005	---	---	---	---	---
Barium (Ba)	---	mg/L	0.00294	---	0.00284	0.00387	0.00380	0.00426	0.00506	0.00433	---	---	---	---	---	---	---	---	---	0.00516	0.00573	0.00929	0.00983	---	0.00648	0.00510	0.00426	---	---	0.00395	0.00480	0.00597	0.00565	0.00575	0.00643	0.00564	---	---	---	---	---
Beryllium (Be)	0.0001	mg/L	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---	---	---	---	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---
Boron (B)	0.001	mg/L	<0.001	---	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	---	---	---	---	---	---	---	---	---	0.006	0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---	---
Cadmium (Cd	0.000015	mg/L	<0.000015	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	0.000025	---	---	---	---	---	---	---	---	---	<0.000015	<0.000015	0.000027	<0.000015	---	<0.000015	<0.000015	<0.000015	---	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	---	---	---	---
Calcium (Ca)	---	mg/L	3.2	---	3.4	5.0	5.7	7.2	8.9	7.5	---	---	---	---	---	---	---	---	---	5.7	5.7	7.2	4.2	---	3.9	3.6	3.5	---	---	3.6	4.8	5.6	6.4	6.6	6.7	7.6	---	---	---	---	---
Chromium (C	0.0003	mg/L	<0.0003	---	0.0005	0.0005	<0.0003	<0.0003	<0.0003	0.0003	---	---	---	---	---	---	---	---	---	<0.0003	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	---	---	<0.0003	0.0003	<0.0003	<0.0003	0.0005	0.0004	<0.0003	---	---	---	---	---
Cobalt (Co)	0.00002	mg/L	0.00003	---	<0.00002	<0.00002	<0.00002	0.00003	0.00003	0.00003	---	---	---	---	---	---	---	---	---	<0.00002	0.00003	0.00010	0.00002	---	<0.00002	<0.00002	<0.00002	---	---	<0.00002	<0.00002	0.00002	0.00002	0.00003	0.00002	0.00003	---	---	---	---	---
Copper (Cu)	0.0001	mg/L	0.0003	---	<0.0001	0.0004	<0.0001	0.0001	<0.0001	<0.0001	---	---	---	---	---	---	---	---	---	0.0001	0.0004	0.0004	0.0005	---	0.0004	0.0003	0.0005	---	---	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---
Iron (Fe)	---	mg/L	0.1010	---	0.0977	0.1080	0.1050	0.1260	0.1220	0.1434	---	---	---	---	---	---	---	---	---	0.0877	0.1130	0.4350	0.3320	---	0.1770	0.1220	0.0855	---	---	0.0754	0.0888	0.1200	0.1060	0.1180	0.0924	0.1576	---	---	---	---	---
Lead (Pb)	0.00005	mg/L	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	0.00017	0.00012	---	0.00009	<0.00005	<0.00005	---	---	<0.00005	<0.00005	0.00024	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---
Lithium (Li)	0.001	mg/L	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---	---	---	---	---	---	<0.001	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---	---
Magnesium (M	0.5	mg/L	0.85	---	0.87	1.35	1.64	2.06	2.55	2.27	---	---	---	---	---	---	---	---	---	0.90	0.99	1.26	0.72	---	0.66	0.63	0.54	---	---	0.56	0.78	0.95	1.12	1.17	1.20	1.40	---	---	---	---	---
Manganese (M	---	mg/L	0.00394	---	0.00371	0.00460	0.00454	0.00525	0.00519	0.29650	---	---	---	---	---	---	---	---	---	0.00631	0.00768	0.03420	0.01920	---	0.00723	0.00624	0.00604	---	---	0.00485	0.00639	0.00828	0.00766	0.00731	0.00661	0.01475	---	---	---	---	---
Mercury (Hg)	0.000005	mg/L	<0.000005	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	---	---	---	---	---	---	---	---	---	<0.000008	<0.000008	<0.000008	<0.000005	---	<0.000005	<0.000005	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005	0.000005	<0.000005	<0.000005	---	---	---	---	---
Molybdenum (	---	mg/L	0.00006	---	0.00009	0.00019	0.00022	0.00037	0.00026	0.00016	---	---	---	---	---	---	---	---	---	0.00041	0.00046	0.00045	0.00024	---	0.00020	0.00022	0.00030	---	---	0.00030	0.00050	0.00047	0.00053	0.00045	0.00039	0.00048	---	---	---	---	---
Nickel (Ni)	0.00005	mg/L	0.00021	---	0.00019	0.00016	0.00016	0.00016	0.00010	0.00031	---	---	---	---	---	---	---	---	---	0.00009	0.00018	0.00032	0.00037	---	0.00018	<0.00005	0.00029	---	---	<0.00005	0.00015	0.00044	0.00017	0.00008	0.00011	0.00010	---	---	---	---	---
Phosphorus (	0.02	mg/L	<0.02	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	---	---	---	---	---	---	---	---	---	<0.02	<0.02	<0.02	<0.02	---	<0.02	<0.02	<0.02	---	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	---	---	---	---	---
Potassium (K)	0.5	mg/L	<0.5	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	---	---	---	---	---	---	---	---	---	<0.5	<0.5	0.6	<0.5	---	<0.5	<0.5	<0.5	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	---	---	---	---	---
Selenium (Se)	0.0006	mg/L	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	---	---	---	---	---	---	---	<0.0006	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	---	---	---
Silicon	---	mg/L	4.71	---	4.31	5.31	5.56	5.98	5.89	5.59	---	---	---	---	---	---	---	---	---	5.65	5.36	5.86	4.35	---	4.53	4.56	4.92	---	---	4.69	5.45	5.87	5.90	5.53	6.10	6.00	---	---	---	---	---
Silver (Ag)	0.00005	mg/L	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---
Sodium (Na)	---	mg/L	1.7	---	1.8	2.3	2.5	2.7	3.3	2.7	---	---	---	---	---	---	---	---	---	2.1	2.1	2.5	1.5	---	1.5	1.6	1.6	---	---	1.6	2.0	2.2	2.3	2.6	2.5	2.8	---	---	---	---	---
Strontium (Sr)	---	mg/L	0.023800	---	0.023500	0.036400	0.043000	0.047800	0.058400	0.045960	---	---	---	---	---	---	---	---	---	0.041200	0.044900	0.051200	0.033600	---	0.031400	0.028900	0.028600	---	---	0.027100	0.037800	0.046800	0.048900	0.051100	0.050130	0.052290	---	---	---	---	---
Thallium (Tl)	0.00005	mg/L	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---
Tin (Sn)	0.0001	mg/L	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---	---	---	---	---	<0.0001	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---
Titanium (Ti)	---	mg/L	0.0013	---	0.0012	0.0012	0.0008	0.0009	0.0008	0.0012	---	---	---	---	---	---	---	---	---	0.0010	0.0012	0.0063	0.0061	---	0.0038	0.0023	0.0013	---	---	0.0012	0.0009	0.0012	0.0009	0.0011	0.0009	0.0006	---	---	---	---	---
Uranium (U)	0.00005	mg/L	0.00006	---	0.00007	<0.00005	<0.00005	0.00005	<0.00005	<0.00005	---	---	---	---	---	---	---	---	---	0.00011	0.00009	0.00012	0.00021	---	0.00017	0.00019	0.00023	---	---	0.00022	0.00011	0.00011	0.00009	0.00009	0.00009	0.00009	---	---	---	---	---
Vanadium (V)	0.0001	mg/L	0.0002	---	0.0003	0.0004	0.0003	0.0003	0.0002	<0.0001	---	---	---	---	---	---	---	---	---	<0.0001	<0.0001	0.0004	0.0004	---	0.0002	0.0001	<0.0001	---	---	0.0002	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---
Zinc (Zn)	---	mg/L	0.0013	---	0.0027	0.0014	0.0030	0.0016	0.0025	0.0018	---	---	---	---	---	---	---	---	---	<0.0005	0.0018	0.0023	0.0030	---	0.0028	0.0023	0.0016	---	---	0.0025	0.0011	0.0052	0.0007	0.0024	0.0014	0.0021	---	---	---	---	---

Table 1-14: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ Duplicate											WQ7									
		Sample ID	~LIMS:EC-62129	~LIMS:EC-62562	~LIMS:EC-62773	~LIMS:L1124156	~LIMS:L1136681	~LIMS:EC-63034	~LIMS:EC-63271	~LIMS:EC-63577	~LIMS:EC-63753		~LIMS:EC-64399	~LIMS:L1105609	~LIMS:EC-60740		~LIMS:L1007174	~LIMS:L1009554	~LIMS:L1014653	~LIMS:L1018027	~LIMS:L1033697	~LIMS:L1046189	~LIMS:L1061327
		Unit																					
Aluminum (Al)	---	mg/L	0.030	0.052	0.023	---	---	0.094	0.291	0.052	---	0.040	0.021	---	0.011	0.012	---	---	---	---	---	---	---
Antimony (Sb)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	---	---	---	---	---	---
Arsenic (As)	0.0001	mg/L	0.0004	0.0005	0.0004	---	---	0.0004	0.0005	0.0005	---	0.0006	0.0003	---	<0.0002	<0.0002	---	---	---	---	---	---	---
Barium (Ba)	---	mg/L	0.00671	0.00923	0.01100	---	---	0.01020	0.00701	0.00719	---	0.00804	0.00887	---	0.00882	0.00898	---	---	---	---	---	---	---
Beryllium (Be)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	---	---	---	---	---	---	---
Boron (B)	0.001	mg/L	0.003	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	---	0.001	<0.001	---	0.001	0.001	---	---	---	---	---	---	---
Cadmium (Cd	0.000015	mg/L	<0.000015	0.000052	<0.000015	---	---	0.000092	0.000018	<0.000015	---	<0.000015	<0.000015	---	<0.000015	<0.000015	---	---	---	---	---	---	---
Calcium (Ca)	---	mg/L	12.3	14.5	17.2	---	---	15.1	4.8	9.6	---	11.6	15.0	---	17.2	17.4	---	---	---	---	---	---	---
Chromium (C	0.0003	mg/L	<0.0003	<0.0003	<0.0003	---	---	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	---	<0.0005	<0.0005	---	---	---	---	---	---	---
Cobalt (Co)	0.00002	mg/L	0.00003	0.00006	0.00002	---	---	0.00006	0.00007	<0.00002	---	0.00004	0.00004	---	<0.00005	<0.00005	---	---	---	---	---	---	---
Copper (Cu)	0.0001	mg/L	0.0001	0.0004	0.0002	---	---	0.0003	0.0004	0.0003	---	<0.0001	<0.0001	---	0.0002	0.0002	---	---	---	---	---	---	---
Iron (Fe)	---	mg/L	0.1380	0.1710	0.1090	---	---	0.2230	0.3270	0.1190	---	0.1940	0.1127	---	0.1720	0.1720	---	---	---	---	---	---	---
Lead (Pb)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	0.00074	0.00006	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	---	---	---	---	---	---
Lithium (Li)	0.001	mg/L	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	---	<0.001	<0.001	---	<0.005	<0.005	---	---	---	---	---	---	---
Magnesium (M	0.5	mg/L	2.77	3.38	3.71	---	---	3.85	1.13	2.11	---	2.61	3.71	---	4.07	4.05	---	---	---	---	---	---	---
Manganese (M	---	mg/L	0.01640	0.02510	0.01910	---	---	0.01720	0.02090	0.01460	---	0.02190	0.02334	---	0.02650	0.02640	---	---	---	---	---	---	---
Mercury (Hg)	0.000005	mg/L	<0.000008	<0.000008	<0.000008	---	---	<0.000008	<0.000005	<0.000005	---	<0.000005	<0.000005	---	<0.000008	<0.000008	---	---	---	---	---	---	---
Molybdenum (	---	mg/L	0.00048	0.00066	0.00079	---	---	0.00063	0.00018	0.00052	---	0.00094	0.00060	---	0.00087	0.00086	---	---	---	---	---	---	---
Nickel (Ni)	0.00005	mg/L	0.00016	0.00024	0.00016	---	---	0.00029	0.00025	0.00021	---	0.00023	0.00018	---	0.00015	0.00013	---	---	---	---	---	---	---
Phosphorus (	0.02	mg/L	<0.02	<0.02	<0.02	---	---	0.03	<0.02	<0.02	---	<0.02	<0.02	---	<0.02	<0.02	---	---	---	---	---	---	---
Potassium (K)	0.5	mg/L	<0.5	<0.5	0.6	---	---	1.6	<0.5	<0.5	---	0.6	0.5	---	0.6	0.6	---	---	---	---	---	---	---
Selenium (Se)	0.0006	mg/L	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	---	<0.0006	<0.0006	---	---	---	---	---	---	---
Silicon	---	mg/L	6.30	6.47	6.51	---	---	5.57	4.65	6.54	---	6.91	6.77	---	6.66	6.95	---	---	---	---	---	---	---
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	---	---	---	---	---	---
Sodium (Na)	---	mg/L	3.0	3.2	3.5	---	---	3.2	1.8	2.7	---	3.2	3.7	---	3.9	3.9	---	---	---	---	---	---	---
Strontium (Sr)	---	mg/L	0.071700	0.088000	0.103000	---	---	0.078800	0.033900	0.064000	---	0.080700	0.090960	---	0.109000	0.110000	---	---	---	---	---	---	---
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	---	<0.00005	<0.00005	---	---	---	---	---	---	---
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	---	<0.0001	<0.0001	---	---	---	---	---	---	---
Titanium (Ti)	---	mg/L	0.0006	0.0021	0.0012	---	---	0.0032	0.0061	0.0014	---	0.0011	0.0006	---	0.0005	0.0005	---	---	---	---	---	---	---
Uranium (U)	0.00005	mg/L	0.00011	0.00016	0.00023	---	---	0.00024	0.00018	0.00008	---	0.00012	0.00017	---	0.00033	0.00031	---	---	---	---	---	---	---
Vanadium (V)	0.0001	mg/L	0.0002	0.0004	0.0002	---	---	0.0004	0.0009	0.0005	---	0.0006	<0.0001	---	<0.0001	<0.0001	---	---	---	---	---	---	---
Zinc (Zn)	---	mg/L	<0.0005	0.0092	0.0240	---	---	0.0007	0.0010	0.0007	---	<0.0005	<0.0005	---	0.0017	0.0019	---	---	---	---	---	---	---

Elements	WQ7																	
	~LIMS:EC-62129		~LIMS:EC-62363	~LIMS:EC-62562		~LIMS:EC-62667	~LIMS:EC-62773	~LIMS:L1124156		~LIMS:EC-62887	~LIMS:EC-63034	~LIMS:EC-63191	~LIMS:L1151662	~LIMS:EC-63237	~LIMS:L1154508	~LIMS:EC-63357	~LIMS:L1161703	~LIMS:L1165411
Aluminum (Al)	0.030	0.030	0.035	0.229	0.226	0.025	0.050	---	---	0.015	0.091	0.516	---	0.617	0.266	0.197	---	---
Antimony (Sb)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	0.00006	<0.00005	<0.00005	---	0.00005	<0.00005	<0.00005	---	---
Arsenic (As)	0.0004	0.0004	0.0005	0.0006	0.0007	0.0004	0.0005	---	---	0.0004	0.0004	0.0008	---	0.0005	0.0005	0.0003	---	---
Barium (Ba)	0.00693	0.00684	0.00747	0.01260	0.01260	0.00874	0.01510	---	---	0.01050	0.01020	0.01230	---	0.00924	0.00668	0.00556	---	---
Beryllium (Be)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	---
Boron (B)	0.006	0.005	0.001	<0.001	<0.001	0.001	<0.001	---	---	0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	---	---
Cadmium (Cd	<0.000015	<0.000015	<0.000015	0.000029	0.000033	<0.000015	0.000054	---	---	<0.000015	<0.000015	<0.000015	---	<0.000015	0.000025	<0.000015	---	---
Calcium (Ca)	12.4	12.4	12.5	14.7	14.8	15.4	18.3	---	---	16.8	15.1	5.9	---	5.9	4.9	5.1	---	---
Chromium (C	<0.0003	<0.0003	<0.0003	0.0005	0.0005	<0.0003	0.0006	---	---	<0.0003	<0.0003	0.0005	---	0.0008	<0.0003	<0.0003	---	---
Cobalt (Co)	0.00003	0.00003	0.00006	0.00017	0.00016	0.00004	0.00003	---	---	0.00003	0.00005	0.00019	---	0.00018	0.00005	0.00003	---	---
Copper (Cu)	0.0002	0.0001	0.0002	0.0008	0.0009	<0.0001	0.0007	---	---	<0.0001	0.0003	0.0011	---	0.0007	0.0004	0.0005	---	---
Iron (Fe)	0.1280	0.1280	0.2230	0.5060	0.5010	0.1120	0.1520	---	---	0.1030	0.2170	0.6980	---	0.5950	0.2820	0.2070	---	---
Lead (Pb)	0.00009	0.00009	<0.00005	0.00013	0.00013	<0.00005	0.00010	---	---	<0.00005	<0.00005	0.00027	---	0.00022	<0.00005	<0.00005	---	---
Lithium (Li)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	---	---
Magnesium (M	2.80	2.77	2.99	3.45	3.43	3.45	3.96	---	---	3.82	3.75	1.40	---	1.40	1.11	1.10	---	---
Manganese (M	0.01640	0.01620	0.02690	0.05290	0.05290	0.01820	0.01950	---	---	0.01840	0.01690	0.05670	---	0.02210	0.01740	0.01200	---	---
Mercury (Hg)	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	---	---	<0.000008	<0.000008	<0.000005	---	<0.000005	<0.000005	<0.000005	---	---
Molybdenum (	0.00051	0.00050	0.00061	0.00070	0.00071	0.00067	0.00086	---	---	0.00084	0.00057	0.00025	---	0.00026	0.00017	0.00020	---	---
Nickel (Ni)	0.00013	0.00013	0.00020	0.00045	0.00043	0.00011	0.00042	---	---	0.00018	0.00029	0.00049	---	0.00048	0.00010	0.00027	---	---
Phosphorus (	<0.02	<0.02	<0.02	0.02	0.02	<0.02	<0.02	---	---	<0.02	0.03	0.04	---	0.03	<0.02	<0.02	---	---
Potassium (K)	<0.5	<0.5	<0.5	0.6	0.5	0.5	0.6	---	---	0.5	1.6	0.5	---	<0.5	<0.5	<0.5	---	---
Selenium (Se)	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	---	---
Silicon	6.30	6.33	6.10	6.58	6.54	7.74	7.08	---	---	7.29	5.30	5.02	---	4.95	4.69	5.02	---	---
Silver (Ag)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	---
Sodium (Na)	2.9	2.9	3.1	3.4	3.4	3.4	3.8	---	---	3.7	3.1	2.0	---	2.0	1.8	1.8	---	---
Strontium (Sr)	0.071300	0.071300	0.077500	0.090100	0.090200	0.095700	0.110000	---	---	0.101000	0.080000	0.039900	---	0.040300	0.034400	0.036100	---	---
Thallium (Tl)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	---
Tin (Sn)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	---
Titanium (Ti)	0.0008	0.0007	0.0013	0.0098	0.0101	0.0009	0.0023	---	---	0.0007	0.0031	0.0129	---	0.0200	0.0045	0.0045	---	---
Uranium (U)	0.00011	0.00011	0.00013	0.00020	0.00020	0.00020	0.00025	---	---	0.00028	0.00015	0.00025	---	0.00017	0.00018	0.00014	---	---
Vanadium (V)	0.0002	0.0002	0.0003	0.0009	0.0009	0.0002	0.0003	---	---	0.0001	0.0004	0.0018	---	0.0013	0.0007	0.0004	---	---
Zinc (Zn)	<0.0005	<0.0005	0.0015	0.0112	0.0112	0.0102	0.0681	---	---	0.0067	<0.0005	0.0038	---	0.0076	0.0012	0.0016	---	---

Table 1-15: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ7							WQ7-D	11~5504-D	FIELD DUP		L997208-2	WQ8																										
		Sample ID	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:EC-64543	~LIMS:L1018027	~LIMS:L1007174	~LIMS:L1009554	~LIMS:L1018027		~LIMS:L1105609	~LIMS:EC-60740	~LIMS:L1007174	~LIMS:L1009554		~LIMS:L1014653	~LIMS:L1018027	~LIMS:L1033697		~LIMS:L1046189	~LIMS:L1061327	~LIMS:EC-62129	~LIMS:EC-62363		~LIMS:EC-62544	~LIMS:EC-62667	~LIMS:EC-62773	~LIMS:L1124156	~LIMS:EC-62887	~LIMS:EC-63034	~LIMS:EC-63189	~LIMS:L1150853	~LIMS:L1154508	~LIMS:EC-63357	~LIMS:L1161703	~LIMS:L1165411	~LIMS:EC-63411
		Unit																																							
Aluminum (Al)	---	mg/L	0.334	0.051	0.052	0.025	0.017	0.030	0.013	---	---	---	---	---	---	<0.002	---	---	---	---	---	---	---	---	---	0.009	0.003	---	0.147	0.016	<0.002	---	0.016	0.011	0.028	0.028	0.013	0.010	---	---	0.012
Antimony (Sb)	0.00005	mg/L	0.00089	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	---	---	<0.00005
Arsenic (As)	0.0001	mg/L	0.0005	0.0006	0.0006	0.0005	0.0005	0.0003	0.0004	---	---	---	---	---	---	<0.0002	---	---	---	---	---	---	---	---	---	0.0004	0.0005	---	0.0006	0.0005	0.0005	---	0.0005	0.0004	0.0005	0.0005	0.0005	0.0004	---	---	0.0005
Barium (Ba)	---	mg/L	0.00731	0.00725	0.00821	0.00825	0.00895	0.00873	0.00852	---	---	---	---	---	---	0.00563	---	---	---	---	---	---	---	---	---	0.00629	0.00599	---	0.00938	0.00630	0.00672	---	0.00673	0.00593	0.00730	0.00639	0.00598	0.00734	---	---	0.00607
Beryllium (Be)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---	---	<0.0001	---	---	---	---	---	---	---	---	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001
Boron (B)	0.001	mg/L	0.012	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	---	---	---	---	---	---	0.001	---	---	---	---	---	---	---	---	---	0.005	0.002	---	0.002	0.002	<0.001	---	0.002	<0.001	<0.001	0.001	<0.001	0.001	---	---	<0.001
Cadmium (Cd	0.000015	mg/L	0.000122	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	---	---	---	---	---	<0.000015	---	---	---	---	---	---	---	---	---	<0.000015	<0.000015	---	<0.000015	<0.000015	<0.000015	---	<0.000015	<0.000015	0.000017	<0.000015	0.000018	<0.000015	---	---	<0.000015
Calcium (Ca)	---	mg/L	5.4	9.6	11.7	15.1	16.7	15.0	17.0	---	---	---	---	---	---	21.6	---	---	---	---	---	---	---	---	---	21.3	20.2	---	22.1	21.8	23.2	---	22.9	19.6	19.9	19.6	19.7	25.4	---	---	19.2
Chromium (Cr	0.0003	mg/L	0.0007	<0.0003	<0.0003	<0.0003	<0.0003	0.0003	<0.0003	---	---	---	---	---	---	<0.0005	---	---	---	---	---	---	---	---	---	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	---	---	<0.0003
Cobalt (Co)	0.00002	mg/L	0.00010	<0.00002	0.00005	0.00004	0.00004	0.00005	0.00004	---	---	---	---	---	---	<0.00005	---	---	---	---	---	---	---	---	---	0.00003	<0.00002	---	0.00007	<0.00002	<0.00002	---	<0.00002	0.00003	0.00003	<0.00002	<0.00002	<0.00002	---	---	<0.00002
Copper (Cu)	0.0001	mg/L	0.0363	0.0004	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---	---	0.0002	---	---	---	---	---	---	---	---	---	0.0045	0.0002	---	0.0005	<0.0001	0.0003	---	<0.0001	0.0006	0.0007	0.0033	0.0003	0.0002	---	---	<0.0001
Iron (Fe)	---	mg/L	0.1900	0.1180	0.1940	0.1750	0.1720	0.1141	0.1166	---	---	---	---	---	---	0.0095	---	---	---	---	---	---	---	---	---	0.0326	0.0289	---	0.2350	0.0211	0.0232	---	0.0416	0.0293	0.0831	0.0643	0.0443	0.0296	---	---	0.0278
Lead (Pb)	0.00005	mg/L	0.00094	<0.00005	0.00037	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	0.00008	<0.00005	<0.00005	---	<0.00005	0.00005	<0.00005	0.00013	<0.00005	<0.00005	---	---	<0.00005
Lithium (Li)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---	---	---	<0.005	---	---	---	---	---	---	---	---	---	<0.001	<0.001	---	<0.001	<0.001	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001
Magnesium (M	0.5	mg/L	23.50	2.11	2.58	3.22	3.56	3.64	3.98	---	---	---	---	---	---	5.00	---	---	---	---	---	---	---	---	---	4.76	4.64	---	5.25	4.89	5.11	---	5.07	4.67	4.59	4.69	4.86	4.50	---	---	4.45
Manganese (M	---	mg/L	0.01230	0.01440	0.02250	0.02470	0.02670	0.02344	0.02248	---	---	---	---	---	---	0.00342	---	---	---	---	---	---	---	---	---	0.00851	0.02240	---	0.07730	0.00588	0.00322	---	0.00608	0.01780	0.14700	0.03180	0.03660	0.01060	---	---	0.00842
Mercury (Hg)	0.000005	mg/L	<0.000005	0.000006	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	---	---	---	---	---	---	<0.000008	---	---	---	---	---	---	---	---	---	<0.000008	<0.000008	---	<0.000008	<0.000008	<0.000008	---	<0.000008	<0.000008	<0.000005	<0.000005	<0.000005	<0.000005	---	---	<0.000005
Molybdenum (	---	mg/L	0.00030	0.00048	0.00060	0.00073	0.00075	0.00058	0.00070	---	---	---	---	---	---	0.00055	---	---	---	---	---	---	---	---	---	0.00048	0.00052	---	0.00055	0.00050	0.00054	---	0.00056	0.00050	0.00049	0.00053	0.00054	0.00063	---	---	0.00047
Nickel (Ni)	0.00005	mg/L	<0.00005	0.00025	0.00077	0.00020	0.00009	0.00017	0.00010	---	---	---	---	---	---	0.00024	---	---	---	---	---	---	---	---	---	0.00021	0.00028	---	0.00038	0.00019	0.00030	---	0.00028	0.00024	0.00025	0.00020	<0.00005	0.00023	---	---	<0.00005
Phosphorus (	0.02	mg/L	4.88	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	---	---	---	---	---	---	0.02	---	---	---	---	---	---	---	---	---	0.04	<0.02	---	0.05	<0.02	<0.02	---	<0.02	0.04	0.03	0.02	<0.02	<0.02	---	---	<0.02
Potassium (K)	0.5	mg/L	15.4	<0.5	0.6	0.5	0.6	0.5	0.6	---	---	---	---	---	---	0.9	---	---	---	---	---	---	---	---	---	0.9	0.8	---	0.9	0.9	0.9	---	0.9	1.0	0.8	0.8	0.8	0.7	---	---	0.7
Selenium (Se)	0.0006	mg/L	0.0009	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	---	---	---	---	<0.0006	---	---	---	---	---	---	---	---	---	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	<0.0006
Silicon	---	mg/L	5.05	5.91	6.70	6.40	6.30	6.43	6.48	---	---	---	---	---	---	4.42	---	---	---	---	---	---	---	---	---	3.77	4.51	---	5.14	5.51	4.93	---	5.61	4.43	4.66	4.38	4.70	4.49	---	---	4.01
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005
Sodium (Na)	---	mg/L	107.0	2.7	3.2	3.3	3.8	3.6	3.8	---	---	---	---	---	---	3.6	---	---	---	---	---	---	---	---	---	3.4	3.3	---	3.7	3.6	3.7	---	3.8	3.4	3.7	3.6	3.6	3.4	---	---	3.4
Strontium (Sr)	---	mg/L	0.046700	0.064500	0.080500	0.090800	0.099800	0.088900	0.097490	---	---	---	---	---	---	0.110000	---	---	---	---	---	---	---	---	---	0.094100	0.095700	---	0.107000	0.104000	0.109000	---	0.106000	0.089000	0.103000	0.095900	0.096500	0.096600	---	---	0.098000
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	---	---	<0.00005	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005
Tin (Sn)	0.0001	mg/L	0.0021	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	---	---	<0.0001	---	---	---	---	---	---	---	---	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001
Titanium (Ti)	---	mg/L	0.0039	0.0012	0.0011	0.0007	0.0006	0.0008	0.0006	---	---	---	---	---	---	0.0002	---	---	---	---	---	---	---	---	---	0.0004	0.0002	---	0.0073	0.0004	0.0003	---	0.0014	0.0005	0.0004	0.0011	0.0006	0.0003	---	---	0.0004
Uranium (U)	0.00005	mg/L	0.00013	0.00009	0.00012	0.00016	0.00019	0.00017	0.00022	---	---	---	---	---	---	0.00010	---	---	---	---	---	---	---	---	---	0.00008	0.00009	---	0.00012	0.00009	0.00009	---	0.00009	0.00008	0.00010	0.00009	0.00008	0.00005	---	---	0.00010
Vanadium (V)	0.0001	mg/L	0.0005	0.0005	0.0006	0.0003	0.0003	<0.0001	<0.0001	---	---	---	---	---	---	<0.0001	---	---	---	---	---	---	---	---	---	0.0001	0.0002	---	0.0004	0.0001	0.0001	---	<0.0001	0.0002	<0.0001	0.0001	0.0002	<0.0001	---	---	0.0002
Zinc (Zn)	---	mg/L	0.1330	<0.0005	0.0108	<0.0005	0.0022	0.0180	0.0017	---	---	---	---	---	---	0.0032	---	---	---	---	---	---	---	---	---	0.0116	0.0014	---	0.0007	0.0014	<0.0005	---	0.0009	<0.0005	0.0020	0.0060	0.0011	0.0010	---	---	0.0016

Table 1-16: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ8					WQ8~(12-8097)-D	WQ8~12-11617-D	WQ8-D	11~5405-D	Field dup WQ9			Field Dup-WQ9	L997208-3	WQ Duplicate		
		Sample ID	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:L1180440	~LIMS:L1211510	~LIMS:L1194631	~LIMS:L1007174	~LIMS:EC-60612	~LIMS:L990525	~LIMS:L997464	~LIMS:EC-60740		~LIMS:EC-63233		~LIMS:EC-64543
		Unit																	
Aluminum (Al)	---	mg/L	0.014	0.012	0.058	0.011	0.116	---	---	---	---	0.031	---	---	0.051	---	---	0.210	0.016
Antimony (Sb	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	<0.00005	---	---	<0.00005	---	---	0.00005	<0.00005
Arsenic (As)	0.0001	mg/L	0.0004	0.0005	0.0004	0.0004	0.0005	---	---	---	---	0.0003	---	---	0.0002	---	---	0.0005	0.0005
Barium (Ba)	---	mg/L	0.00610	0.00618	0.00677	0.00644	0.00887	---	---	---	---	0.00792	---	---	0.00848	---	---	0.00812	0.00737
Beryllium (Be)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	<0.0001	---	---	<0.0001	---	---	<0.0001	<0.0001
Boron (B)	0.001	mg/L	<0.001	0.002	0.001	<0.001	<0.001	---	---	---	---	<0.001	---	---	0.001	---	---	<0.001	<0.001
Cadmium (Cd	0.000015	mg/L	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	---	---	---	---	<0.000015	---	---	<0.000015	---	---	<0.000015	<0.000015
Calcium (Ca)	---	mg/L	19.7	21.0	20.7	22.0	21.0	---	---	---	---	22.0	---	---	21.7	---	---	15.1	23.0
Chromium (C	0.0003	mg/L	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	---	---	---	---	<0.0005	---	---	<0.0005	---	---	<0.0003	<0.0003
Cobalt (Co)	0.00002	mg/L	<0.00002	0.00003	0.00004	<0.00002	0.00007	---	---	---	---	<0.00005	---	---	0.00005	---	---	0.00005	0.00003
Copper (Cu)	0.0001	mg/L	0.0003	<0.0001	0.0002	0.0003	<0.0001	---	---	---	---	0.0002	---	---	0.0003	---	---	0.0004	<0.0001
Iron (Fe)	---	mg/L	0.0322	0.0323	0.1220	0.0320	0.1967	---	---	---	---	0.1790	---	---	0.2410	---	---	0.2810	0.1332
Lead (Pb)	0.00005	mg/L	<0.00005	0.00074	<0.00005	<0.00005	0.00009	---	---	---	---	<0.00005	---	---	<0.00005	---	---	0.00006	<0.00005
Lithium (Li)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	---	---	<0.005	---	---	<0.005	---	---	<0.001	<0.001
Magnesium (M	0.5	mg/L	4.44	4.70	4.66	4.83	5.01	---	---	---	---	4.83	---	---	5.00	---	---	3.58	5.19
Manganese (M	---	mg/L	0.01110	0.01120	0.02180	0.00748	0.09825	---	---	---	---	0.02680	---	---	0.03720	---	---	0.02930	0.02636
Mercury (Hg)	0.000005	mg/L	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	---	---	---	---	<0.000008	---	---	<0.000008	---	---	<0.000005	<0.000005
Molybdenum (	---	mg/L	0.00057	0.00063	0.00062	0.00059	0.00053	---	---	---	---	0.00068	---	---	0.00072	---	---	0.00050	0.00060
Nickel (Ni)	0.00005	mg/L	0.00023	0.00078	0.00035	0.00013	0.00042	---	---	---	---	0.00027	---	---	0.00029	---	---	0.00020	0.00020
Phosphorus (	0.02	mg/L	<0.02	<0.02	0.03	0.03	0.05	---	---	---	---	<0.02	---	---	0.03	---	---	0.03	<0.02
Potassium (K)	0.5	mg/L	0.7	0.8	0.9	0.9	0.8	---	---	---	---	0.9	---	---	0.9	---	---	0.7	0.9
Selenium (Se)	0.0006	mg/L	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	---	---	<0.0006	---	---	<0.0006	---	---	<0.0006	<0.0006
Silicon	---	mg/L	3.78	3.18	3.16	2.89	4.64	---	---	---	---	5.10	---	---	5.10	---	---	4.64	5.22
Silver (Ag)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	<0.00005	---	---	<0.00005	---	---	<0.00005	<0.00005
Sodium (Na)	---	mg/L	3.5	3.6	3.4	3.8	3.6	---	---	---	---	3.6	---	---	3.8	---	---	2.9	3.8
Strontium (Sr)	---	mg/L	0.095700	0.104000	0.095700	0.102000	0.096810	---	---	---	---	0.112000	---	---	0.115000	---	---	0.079600	0.104300
Thallium (Tl)	0.00005	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	---	---	<0.00005	---	---	<0.00005	---	---	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	---	---	<0.0001	---	---	<0.0001	---	---	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	0.0005	0.0003	0.0025	0.0005	0.0063	---	---	---	---	0.0017	---	---	0.0025	---	---	0.0076	0.0005
Uranium (U)	0.00005	mg/L	0.00007	0.00010	0.00010	0.00010	0.00012	---	---	---	---	0.00014	---	---	0.00015	---	---	0.00011	0.00012
Vanadium (V)	0.0001	mg/L	0.0002	0.0003	0.0005	0.0002	<0.0001	---	---	---	---	<0.0001	---	---	<0.0001	---	---	0.0006	<0.0001
Zinc (Zn)	---	mg/L	<0.0005	0.0070	<0.0005	0.0028	0.0006	---	---	---	---	<0.0010	---	---	0.0028	---	---	0.0005	0.0007

Elements	WQ9																					
	~LIMS:L1105609	~LIMS:EC-60612		~LIMS:L990525	~LIMS:EC-60740	~LIMS:L1007174	~LIMS:L1009554		~LIMS:L1014653	~LIMS:L1018027	~LIMS:L1033697		~LIMS:L1046189		~LIMS:L1061327	~LIMS:EC-62129	~LIMS:EC-62363		~LIMS:EC-62544	~LIMS:EC-62667	~LIMS:EC-62773	~LIMS:L1124156
Aluminum (Al)	---	0.042	0.043	0	0.074	---	---	---	---	---	---	---	---	---	---	0.024	0.042	---	0.020	0.071	0.030	---
Antimony (Sb	---	<0.00005	<0.00005	0	<0.00005	---	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---
Arsenic (As)	---	0.0004	0.0004	0	0.0002	---	---	---	---	---	---	---	---	---	---	0.0006	0.0006	---	0.0005	0.0006	0.0006	---
Barium (Ba)	---	0.00806	0.00798	0	0.00913	---	---	---	---	---	---	---	---	---	---	0.00774	0.00725	---	0.00757	0.00852	0.00784	---
Beryllium (Be)	---	<0.0001	<0.0001	0	<0.0001	---	---	---	---	---	---	---	---	---	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---
Boron (B)	---	0.001	0.001	0	<0.001	---	---	---	---	---	---	---	---	---	---	0.005	0.001	---	0.002	0.002	<0.001	---
Cadmium (Cd	---	<0.000015	<0.000015	0	<0.000015	---	---	---	---	---	---	---	---	---	---	<0.000015	<0.000015	---	<0.000015	<0.000015	<0.000015	---
Calcium (Ca)	---	21.7	21.6	0	21.8	---	---	---	---	---	---	---	---	---	---	18.7	19.1	---	20.6	22.0	21.7	---
Chromium (C	---	<0.0005	<0.0005	0	<0.0005	---	---	---	---	---	---	---	---	---	---	<0.0003	<0.0003	---	<0.0003	<0.0003	<0.0003	---
Cobalt (Co)	---	<0.00005	0.00005	0	0.00007	---	---	---	---	---	---	---	---	---	---	0.00003	0.00005	---	0.00003	0.00004	<0.00002	---
Copper (Cu)	---	0.0002	0.0002	0	0.0004	---	---	---	---	---	---	---	---	---	---	0.0002	0.0003	---	0.0003	0.0002	0.0004	---
Iron (Fe)	---	0.1990	0.1980	0	0.2950	---	---	---	---	---	---	---	---	---	---	0.2340	0.1990	---	0.1310	0.1900	0.1320	---
Lead (Pb)	---	<0.00005	<0.00005	0	<0.00005	---	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---
Lithium (Li)	---	<0.005	<0.005	0	<0.005	---	---	---	---	---	---	---	---	---	---	<0.001	<0.001	---	<0.001	<0.001	<0.001	---
Magnesium (M	---	4.89	4.87	0	4.95	---	---	---	---	---	---	---	---	---	---	4.05	4.44	---	4.84	4.79	4.70	---
Manganese (M	---	0.02920	0.02900	0	0.04240	---	---	---	---	---	---	---	---	---	---	0.02900	0.03430	---	0.02510	0.02450	0.01850	---
Mercury (Hg)	---	<0.000008	<0.000008	0	<0.000008	---	---	---	---	---	---	---	---	---	---	<0.000008	<0.000008	---	<0.000008	<0.000008	<0.000008	---
Molybdenum (	---	0.00067	0.00069	0	0.00070	---	---	---	---	---	---	---	---	---	---	0.00058	0.00058	---	0.00061	0.00061	0.00064	---
Nickel (Ni)	---	0.00025	0.00027	0	0.00032	---	---	---	---	---	---	---	---	---	---	0.00016	0.00028	---	0.00018	0.00023	0.00024	---
Phosphorus (	---	0.02	0.02	0	0.03	---	---	---	---	---	---	---	---	---	---	<0.02	<0.02	---	<0.02	<0.02	<0.02	---
Potassium (K)	---	0.9	0.9	0	0.9	---	---	---	---	---	---	---	---	---	---	0.8	0.8	---	0.8	0.9	0.8	---
Selenium (Se)	---	<0.0006	<0.0006	0	<0.0006	---	---	---	---	---	---	---	---	---	---	<0.0006	<0.0006	---	<0.0006	<0.0006	<0.0006	---
Silicon	---	5.16	5.09	0	5.40	---	---	---	---	---	---	---	---	---	---	5.16	4.75	---	5.37	6.16	5.37	---
Silver (Ag)	---	<0.00005	<0.00005	0	<0.00005	---	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---
Sodium (Na)	---	3.7	3.7	0	3.8	---	---	---	---	---	---	---	---	---	---	3.2	3.3	---	3.6	3.6	3.5	---
Strontium (Sr)	---	0.112000	0.113000	0	0.116000	---	---	---	---	---	---	---	---	---	---	0.090600	0.095200	---	0.104000	0.109000	0.108000	---
Thallium (Tl)	---	<0.00005	<0.00005	0	<0.00005	---	---	---	---	---	---	---	---	---	---	<0.00005	<0.00005	---	<0.00005	<0.00005	<0.00005	---
Tin (Sn)	---	<0.0001	<0.0001	0	<0.0001	---	---	---	---	---	---	---	---	---	---	<0.0001	<0.0001	---	<0.0001	<0.0001	<0.0001	---
Titanium (Ti)	---	0.0024	0.0022	0	0.0040	---	---	---	---	---	---	---	---	---	---	0.0009	0.0026	---	0.0010	0.0038	0.0015	---
Uranium (U)	---	0.00014	0.00014	0	0.00016	---	---	---	---	---	---	---	---	---	---	0.00010	0.00010	---	0.00010	0.00011	0.00012	---
Vanadium (V)	---	<0.0001	<0.0001	0	<0.0001	---	---	---	---	---	---	---	---	---	---	0.0002	0.0003	---	0.0002	0.0003	0.0002	---
Zinc (Zn)	---	0.0039	0.0036	0	0.0020	---	---	---	---	---	---	---	---	---	---	<0.0005	0.0012	---	<0.0005	0.0011	0.0008	---

Table 1-17: Surface Water Analytical Results for Metals, 2012 Sampling Program

Elements	MDL	Area	WQ9															
		Sample ID	~LIMS:EC-62887	~LIMS:L1136681	~LIMS:EC-63034	~LIMS:EC-63189	~LIMS:L1150853	~LIMS:L1154508	~LIMS:EC-63357	~LIMS:L1161703	~LIMS:L1165411	~LIMS:EC-63411	~LIMS:EC-63577	~LIMS:EC-63753	~LIMS:EC-63959	~LIMS:EC-64183	~LIMS:EC-64399	~LIMS:EC-64543
		Unit																
Aluminum (Al)	---	mg/L	0.026	---	0.139	0.208	0.145	0.167	0.058	---	---	0.064	0.014	0.016	0.019	0.021	0.019	0.009
Antimony (Sb	0.00005	mg/L	<0.00005	---	0.00005	<0.00005	<0.00005	0.00005	0.00006	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	0.0001	mg/L	0.0005	---	0.0007	0.0006	0.0005	0.0005	0.0005	---	---	0.0005	0.0005	0.0007	0.0005	0.0005	0.0005	0.0005
Barium (Ba)	---	mg/L	0.0078	---	0.0102	0.00998	0.00761	0.0075	0.00743	---	---	0.00691	0.00694	0.00706	0.00726	0.00801	0.00823	0.00719
Beryllium (Be	0.0001	mg/L	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	0.001	mg/L	0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
Cadmium (Cd	0.000015	mg/L	<0.000015	---	<0.000015	0.00005	<0.000015	0.000058	<0.000015	---	---	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Calcium (Ca)	---	mg/L	21.8	---	19	15.8	15	14.5	15.7	---	---	16	18.5	20	20.8	21	19	22
Chromium (Ci	0.0003	mg/L	<0.0003	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	---	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	0.00002	mg/L	0.00003	---	0.00008	0.00011	0.00004	0.00004	0.00005	---	---	<0.00002	<0.00002	0.00003	0.00003	0.00003	0.00004	0.00003
Copper (Cu)	0.0001	mg/L	<0.0001	---	0.0003	0.0005	0.0019	0.0004	0.0004	---	---	<0.0001	0.0003	<0.0001	0.0001	0.0002	<0.0001	<0.0001
Iron (Fe)	---	mg/L	0.144	---	0.34	0.294	0.235	0.248	0.128	---	---	0.139	0.115	0.163	0.154	0.181	0.1797	0.1339
Lead (Pb)	0.00005	mg/L	<0.00005	---	<0.00005	0.00009	0.00014	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Lithium (Li)	0.001	mg/L	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001	---	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (M	0.5	mg/L	4.85	---	4.4	3.45	3.53	3.53	3.54	---	---	3.69	4.14	4.33	4.43	4.51	4.71	5.06
Manganese (M	---	mg/L	0.0204	---	0.0495	0.0896	0.0284	0.0303	0.0195	---	---	0.0243	0.0199	0.0273	0.0181	0.0222	0.03596	0.02579
Mercury (Hg)	0.000005	mg/L	<0.000008	---	<0.000008	<0.000005	<0.000005	<0.000005	<0.000005	---	---	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum (	---	mg/L	0.00066	---	0.00061	0.00045	0.0005	0.00046	0.00055	---	---	0.0005	0.00062	0.00062	0.00065	0.00067	0.00055	0.00059
Nickel (Ni)	0.00005	mg/L	0.00026	---	0.00035	0.00044	0.00012	<0.00005	0.0003	---	---	<0.00005	0.00025	0.00025	0.00048	0.00014	0.00026	0.00019
Phosphorus (I	0.02	mg/L	<0.02	---	0.04	0.03	0.02	<0.02	<0.02	---	---	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.02
Potassium (K	0.5	mg/L	0.9	---	1.3	0.9	0.7	0.7	0.7	---	---	0.7	0.7	0.8	0.8	0.8	0.8	0.9
Selenium (Se	0.0006	mg/L	<0.0006	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	---	---	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Silicon	---	mg/L	6.17	---	5.54	5.01	4.58	4.78	4.75	---	---	4.39	4.35	4.01	4.17	4.19	5.39	5.02
Silver (Ag)	0.00005	mg/L	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium (Na)	---	mg/L	3.7	---	3.2	3.2	2.9	2.9	3	---	---	3	3.3	3.5	3.4	3.7	3.6	3.8
Strontium (Sr	---	mg/L	0.106	---	0.0882	0.0866	0.0791	0.0779	0.0836	---	---	0.0845	0.0932	0.103	0.101	0.104	0.09691	0.1029
Thallium (Tl)	0.00005	mg/L	<0.00005	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	---	---	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin (Sn)	0.0001	mg/L	<0.0001	---	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	---	mg/L	0.0015	---	0.0064	0.0072	0.005	0.0063	0.002	---	---	0.002	0.0006	0.0007	0.001	0.0009	0.0011	0.0004
Uranium (U)	0.00005	mg/L	0.00013	---	0.00015	0.00012	0.00011	0.00011	0.00007	---	---	0.00011	0.00008	0.0001	0.0001	0.00011	0.00011	0.00012
Vanadium (V)	0.0001	mg/L	0.0002	---	0.0007	0.0006	0.0004	0.0006	0.0002	---	---	0.0003	0.0004	0.0004	0.0003	0.0002	<0.0001	<0.0001
Zinc (Zn)	---	mg/L	0.0015	---	0.0021	0.0036	0.003	0.002	0.0012	---	---	0.0015	<0.0005	0.0009	<0.0005	0.0025	0.0014	0.0008

Elements	WQ1	WQ1	WQ4	WQ6	WQ7	WQ13	WQ14	WQ Duplicate	Field Blank	Travel Blank	WQ3	WQ5
	12-16741-	12-16741-D	12-16742-	12-16743-	12-16744-	12-16746-	12-16747-	12-16748-	12-16749-	12-16750-	12-16751-	12-16752-
Aluminum (Al)	0.12	0.119	0.094	0.052	0.03	0.022	0.006	0.021	< 0.002	< 0.002	0.031	0.068
Antimony (Sb	0.00013	0.00012	0.00025	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Arsenic (As)	0.0005	0.0005	0.0011	0.0004	0.0003	0.0004	< 0.0001	0.0003	< 0.0001	< 0.0001	0.0012	0.0003
Barium (Ba)	0.00323	0.0032	0.00384	0.00643	0.00873	0.00853	0.0131	0.00887	< 0.00005	< 0.00005	0.00505	0.00433
Beryllium (Be	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	< 0.000015	< 0.000015	0.000106	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	0.000025
Calcium (Ca)	2.9	2.8	11.4	6.7	14.7	19.7	29.1	14.9	< 0.5	< 0.5	12.2	7.5
Chromium (Ci	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	0.001	0.0003
Cobalt (Co)	0.00004	0.00003	0.00003	0.00002	0.00005	0.00004	0.00002	0.00004	< 0.00002	< 0.00002	0.00002	0.00003
Copper (Cu)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Iron (Fe)	0.181	0.181	0.128	0.0924	0.114	0.221	0.2	0.113	< 0.0001	< 0.0001	0.0854	0.143
Lead (Pb)	< 0.00005	< 0.00005	0.00012	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00007	< 0.00005
Lithium (Li)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (M	0.67	0.66	2.05	1.2	3.64	4.72	6.52	3.71	< 0.50	< 0.50	3.18	2.27
Manganese (M	0.0116	0.0115	0.0207	0.00661	0.0234	0.0455	0.0237	0.0233	< 0.00005	< 0.00005	0.00653	0.296
Mercury (Hg)	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum (	0.00014	0.00012	0.00009	0.00039	0.00058	0.00053	0.00043	0.0006	< 0.00005	< 0.00005	0.00071	0.00016
Nickel (Ni)	0.00021	0.00019	0.00043	0.00011	0.00017	0.00026	0.00018	0.00018	< 0.00005	< 0.00005	< 0.00005	0.00031
Phosphorus (I	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	< 0.02
Potassium (K	< 0.5	< 0.5	0.6	< 0.5	0.5	0.8	1	0.5	< 0.5	< 0.5	0.5	< 0.5
Selenium (Se	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	6.75	6.25	6.01	6.1	6.43	5.94	8.66	6.77	< 0.01	< 0.01	8.93	5.59
Silver (Ag)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	2.3	2.3	4.9	2.5	3.6	3.5	4.7	3.7	< 0.5	< 0.5	3.8	2.7
Strontium (Sr	0.0247	0.0246	0.0597	0.0501	0.0889	0.0986	0.132	0.091	< 0.000005	< 0.000005	0.0798	0.046
Thallium (Tl)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	0.0014	0.0015	0.0016	0.0009	0.0008	0.0011	0.0004	0.0006	< 0.0002	< 0.0002	0.001	0.0012
Uranium (U)	0.00008	0.00008	< 0.00005	0.00009	0.00017	0.00011	0.00015	0.00017	< 0.00005	< 0.00005	0.00018	< 0.00005
Vanadium (V)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.001	< 0.0001
Zinc (Zn)	0.0039	0.0038	0.0411	0.0014	0.018	0.0011	0.0011	< 0.0005	< 0.0005	< 0.0005	0.003	0.0018

Elements	WQ8	WQ10	WQ11	WQ12	WQ15	WQ16	CP01	CP01	CP02	CP03	CP06
	12-16753-	12-16754-	12-16755-	12-16756-	12-16757-	12-16758-	12-16865-	12-16865-D	12-16866-	12-16867-	12-16868-
Aluminum (Al)	0.116	0.031	0.09	0.043	0.022	0.006	0.014	0.013	0.008	0.047	0.082
Antimony (Sb	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Arsenic (As)	0.0005	0.0004	< 0.0001	0.0001	0.0001	0.0003	0.0001	0.0001	0.0007	0.0002	< 0.0001
Barium (Ba)	0.00887	0.00727	0.00993	0.0063	0.00837	0.00366	0.0123	0.0124	0.00391	0.00269	0.00405
Beryllium (Be	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	0.000026
Calcium (Ca)	20.5	11.9	15.1	7.3	7.8	6.2	12.2	12.3	12.1	10.1	7.9
Chromium (Ci	< 0.0003	0.0004	0.0004	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	0.0005	< 0.0003	0.0003
Cobalt (Co)	0.00007	< 0.00002	0.00003	0.00003	< 0.00002	< 0.00002	0.00006	0.00006	< 0.00002	0.00005	0.00005
Copper (Cu)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Iron (Fe)	0.197	0.0594	0.0502	0.202	0.0691	0.0141	0.654	0.659	0.0043	0.86	0.075
Lead (Pb)	0.00009	0.00019	< 0.00005	< 0.00005	< 0.00005	0.0004	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Lithium (Li)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (M	5.01	2.61	3.25	1.29	1.15	1.24	2.94	2.94	1.35	2.16	1.44
Manganese (M	0.0982	0.00265	0.00134	0.013	0.0335	0.00525	0.0433	0.0434	0.00495	0.0196	0.0314
Mercury (Hg)	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum (	0.00053	0.00066	0.00026	0.00045	0.0006	0.00073	0.00027	0.00029	0.00063	0.00029	0.00077
Nickel (Ni)	0.00042	0.00011	0.00016	0.00013	0.00009	< 0.00005	0.00012	0.00012	< 0.00005	< 0.00005	0.00032
Phosphorus (I	0.05	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Potassium (K	0.8	< 0.5	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.8
Selenium (Se	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	4.64	6.71	6.3	3.82	2.22	1.52	5.12	5.84	5.31	6.89	6.95
Silver (Ag)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	3.6	3.2	3.2	2.2	1.9	2	2.7	2.7	2.3	2.4	2.3
Strontium (Sr	0.0968	0.0788	0.088	0.0546	0.0727	0.0413	0.0545	0.0551	0.0514	0.0489	0.0348
Thallium (Tl)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	0.0063	0.0006	0.0019	0.001	0.0004	< 0.0002	0.0005	0.0005	< 0.0002	0.0009	0.0004
Uranium (U)	0.00012	0.0002	0.00015	0.00011	0.00014	0.00022	< 0.00005	< 0.00005	0.00006	< 0.00005	0.0002
Vanadium (V)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Zinc (Zn)	0.0006	0.0023	0.0009	0.0012	0.001	0.0017	0.0029	0.0029	0.0013	0.0016	0.0036

Table 1-18: Surface Water Analytical Results for Metals, 2012/2013 Sampling Program

Elements	MDL	Area	CP07	CP08	CP15	CP16	CW100	CP DUP	Field Blank	Trip Blank	avidson Rand	Field Blank	Trip Blank	CP01	CP01	CP07	CP08
		Sample ID	12-16869-	12-16870-	12-16871-	12-16872-	12-16873-	12-16874-	12-16875-	12-16876-	12-18170-	12-18171-	12-18172-	12-18396-	12-18396-D	12-18397-	12-18398-
		Unit															
Aluminum (Al)	---	mg/L	0.132	0.606	0.015	0.056	1.88	0.055	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.034	0.023	0.033	0.634
Antimony (Sb)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00009	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Arsenic (As)	0.0001	mg/L	< 0.0001	< 0.0001	0.0004	< 0.0001	0.0135	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	0.0001	0.0001	< 0.0001	< 0.0001
Barium (Ba)	---	mg/L	0.00456	0.00571	0.00255	0.00264	0.0144	0.00256	< 0.00005	< 0.00005	0.00636	< 0.00005	< 0.00005	0.0144	0.0143	0.00422	0.0061
Beryllium (Be)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0025	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	0.000015	mg/L	0.000092	0.000168	< 0.000015	< 0.000015	0.0048	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	0.000052	0.000173
Calcium (Ca)	---	mg/L	25.3	19.7	8.3	2.7	14	2.7	< 0.5	< 0.5	18.1	< 0.5	< 0.5	14.2	14.3	22.3	22
Chromium (C	0.0003	mg/L	< 0.0003	< 0.0003	< 0.0003	0.0005	< 0.0003	0.0005	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Cobalt (Co)	0.00002	mg/L	0.00051	0.00189	< 0.00002	0.00006	0.00284	0.00004	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	0.00008	0.00008	0.00015	0.00222
Copper (Cu)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0192	< 0.0001	< 0.0001	< 0.0001	0.151	< 0.0001	< 0.0001	0.0002	0.0003	0.0009	0.0015
Iron (Fe)	---	mg/L	0.297	0.223	0.0048	0.107	17.9	0.089	< 0.0001	< 0.0001	0.0663	< 0.0001	< 0.0001	0.918	0.911	0.0919	0.238
Lead (Pb)	0.00005	mg/L	0.00009	< 0.00005	< 0.00005	< 0.00005	0.00162	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Lithium (Li)	0.001	mg/L	< 0.001	0.001	< 0.001	< 0.001	0.006	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Magnesium (M	0.5	mg/L	2.36	2.23	0.87	0.73	1.74	0.72	< 0.50	< 0.50	4.97	< 0.50	< 0.50	3.21	3.28	1.57	2.44
Manganese (M	---	mg/L	0.0459	0.0712	0.00015	0.0153	4.23	0.00365	< 0.00005	< 0.00005	0.00054	< 0.00005	< 0.00005	0.062	0.0615	0.0233	0.096
Mercury (Hg)	0.000005	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum (	---	mg/L	0.0002	0.00011	0.00032	0.0002	0.00046	0.0002	< 0.00005	< 0.00005	0.00043	< 0.00005	< 0.00005	0.00028	0.00028	0.00007	0.00009
Nickel (Ni)	0.00005	mg/L	0.00054	0.00093	< 0.00005	0.00016	0.00311	0.00009	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00012	0.00014	0.00032	0.00106
Phosphorus (	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02	0.09	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Potassium (K)	0.5	mg/L	0.7	0.9	< 0.5	< 0.5	3.4	< 0.5	< 0.5	< 0.5	0.8	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1
Selenium (Se)	0.0006	mg/L	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	---	mg/L	5.94	10.4	4.58	5.3	11.5	5.15	< 0.01	< 0.01	7.17	< 0.01	< 0.01	6	6.64	5	12.7
Silver (Ag)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	---	mg/L	2.3	3.1	1.6	1.3	1.4	1.2	< 0.5	< 0.5	4	< 0.5	< 0.5	2.9	3	1.8	3.5
Strontium (Sr)	---	mg/L	0.0677	0.0573	0.0379	0.0229	0.0254	0.0234	< 0.000005	< 0.000005	0.0963	< 0.000005	< 0.000005	0.06	0.0602	0.0566	0.0627
Thallium (Tl)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	---	mg/L	0.0014	0.0003	0.0002	0.0007	0.0267	0.0006	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0007	0.0005	0.0006	0.0003
Uranium (U)	0.00005	mg/L	0.00006	< 0.00005	< 0.00005	0.00009	0.00101	0.00009	< 0.00005	< 0.00005	0.0001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Vanadium (V)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0006	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Zinc (Zn)	---	mg/L	0.0119	0.0215	0.0033	0.0021	3.31	0.0025	< 0.0005	< 0.0005	0.0383	< 0.0005	< 0.0005	0.0026	0.0026	0.0144	0.0244

Elements	Field Blank	Trip Blank	WQ17	WQ17	WQ26	WQ11	WQ10	WQ3	WQ5	WQ15	WQ16	WQ12	WQ8
	12-18399-	12-18400-	13-1292-	13-1292-D	13-1293-	13-1294-	13-1295-	13-1296-	13-1297-	13-1298-	13-1299-	13-1300-	13-1301-
Aluminum (Al)	< 0.002	< 0.002	0.021	0.018	0.009	0.03	0.012	0.022	0.057	0.026	0.028	0.048	0.01
Antimony (Sb)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00005	< 0.00005	0.00005	< 0.00005	< 0.00005
Arsenic (As)	< 0.0001	< 0.0001	0.0003	0.0003	0.0004	< 0.0001	0.0005	0.0012	0.0003	0.0002	0.0004	0.0002	0.0005
Barium (Ba)	< 0.00005	< 0.00005	0.00771	0.00766	0.00868	0.0129	0.00779	0.00462	0.00691	0.00905	0.00419	0.0064	0.0068
Beryllium (Be)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	0.000105	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium (Ca)	< 0.5	< 0.5	10.8	10.8	18.6	23.5	16.4	13.5	12.1	9.2	6.8	7.3	24
Chromium (C	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	0.0008	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Cobalt (Co)	< 0.00002	< 0.00002	0.00005	0.00005	< 0.00002	< 0.00002	< 0.00002	< 0.00002	0.00006	< 0.00002	< 0.00002	0.00003	< 0.00002
Copper (Cu)	< 0.0001	< 0.0001	0.0005	0.0006	0.0002	0.0015	0.0001	< 0.0001	0.0005	0.0003	0.0002	0.0007	0.0003
Iron (Fe)	< 0.0001	< 0.0001	0.0762	0.077	0.0193	0.0112	0.0333	0.0684	0.374	0.109	0.104	0.343	0.0384
Lead (Pb)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00035	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Lithium (Li)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (M	< 0.50	< 0.50	3.15	3.15	4.07	4.82	3.25	3.26	3.42	1.32	1.34	1.26	5.54
Manganese (M	< 0.00005	< 0.00005	0.011	0.0111	0.00594	0.00127	0.00248	0.00555	0.0209	0.024	0.0378	0.011	0.013
Mercury (Hg)	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum (	< 0.00005	< 0.00005	0.00243	0.00246	0.00081	0.00031	0.00085	0.0008	0.00019	0.00068	0.00083	0.00042	0.00054
Nickel (Ni)	< 0.00005	< 0.00005	0.00008	0.00008	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00021	< 0.00005	< 0.00005	0.0001	0.00016
Phosphorus (	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	< 0.02	< 0.02	< 0.02	< 0.02	0.02
Potassium (K)	< 0.5	< 0.5	< 0.5	< 0.5	0.6	0.7	0.5	0.6	< 0.5	< 0.5	< 0.5	< 0.5	1
Selenium (Se)	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	< 0.01	< 0.01	6.19	6.33	7.14	6.73	6.9	8.79	7.87	2.64	1.71	3.99	5.28
Silver (Ag)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	< 0.5	< 0.5	3.8	3.8	4	4	3.6	3.9	3.5	2.1	2	2.2	4
Strontium (Sr)	< 0.000005	< 0.000005	0.0645	0.0643	0.106	0.127	0.0989	0.0835	0.0689	0.0818	0.0443	0.0509	0.108
Thallium (Tl)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	< 0.0002	< 0.0002	0.0004	0.0004	0.0002	0.0007	0.0003	0.0008	0.0019	0.0004	0.001	0.001	0.0011
Uranium (U)	< 0.00005	< 0.00005	0.00009	0.00009	0.00027	0.00028	0.00032	0.00021	0.00005	0.00017	0.00029	0.00013	0.0001
Vanadium (V)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0015	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Zinc (Zn)	< 0.0005	< 0.0005	0.0024	0.0025	0.0021	0.0023	0.0022	0.0023	0.0281	0.0035	0.009	0.0027	0.0015

Elements	Trip Blank	WQ6	WQ6	WQ7	WQ9	WQ13	WQ Duplicate	Field Blank	WQ18	CP01	CP01
	13-1302-	13-1307-	13-1307-D	13-1308-	13-1309-	13-1310-	13-1311-	13-1312-	13-1337-	13-1406-	13-1406-D
Aluminum (Al)	< 0.002	0.035	---	0.065	0.005	0.106	0.026	< 0.002	1	0.032	0.031
Antimony (Sb)	< 0.00005	0.00006	---	< 0.00005	< 0.00005	0.00006	< 0.00005	< 0.00005	0.00015	< 0.00005	< 0.00005
Arsenic (As)	< 0.0001	0.0004	---	0.0004	0.0005	0.0007	0.0004	< 0.0001	0.0014	0.0012	0.0012
Barium (Ba)	< 0.00005	0.00615	---	0.0121	0.00774	0.0114	0.0114	< 0.00005	0.0419	0.0139	0.0141
Beryllium (Be)	< 0.0001	< 0.0001	---	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	< 0.001	< 0.001	---	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	< 0.000015	< 0.000015	---	0.000018	< 0.000015	0.000025	< 0.000015	< 0.000015	0.000655	< 0.000015	< 0.000015
Calcium (Ca)	< 0.5	7	---	19	22.8	23.2	18.6	< 0.5	16	14.3	14.1
Chromium (C	< 0.0003	< 0.0003	---	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	0.0068	< 0.0003	< 0.0003
Cobalt (Co)	< 0.00002	0.00002	---	0.00008	0.00003	0.00012	0.00005	< 0.00002	0.00171	0.0001	0.00009
Copper (Cu)	< 0.0001	0.0002	---	0.0003	0.0003	0.0014	0.0003	< 0.0001	0.0054	0.0003	0.0003
Iron (Fe)	< 0.0001	0.0946	---	0.228	0.12	0.945	0.147	< 0.0001	3.7	0.72	0.722
Lead (Pb)	< 0.00005	< 0.00005	---	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00036	< 0.00005	< 0.00005
Lithium (Li)	< 0.001	< 0.001	---	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Magnesium (M	< 0.50	1.29	---	4.24	5.28	5.34	4.22	< 0.50	9.69	3.22	3.13
Manganese (M	< 0.00005	0.00759	---	0.0752	0.0223	0.0563	0.0287	< 0.00005	0.37	0.0526	0.0526
Mercury (Hg)	< 0.000005	< 0.000005	---	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	0.000009	< 0.000005	< 0.000005
Molybdenum (	< 0.00005	0.0005	---	0.00078	0.00061	0.00069	0.00075	< 0.00005	0.00077	0.00031	0.00031
Nickel (Ni)	< 0.00005	0.00007	---	0.00013	0.00016	0.00034	0.00013	< 0.00005	0.0057	0.00009	0.00008
Phosphorus (	< 0.02	< 0.02	---	0.02	< 0.02	0.04	0.02	< 0.02	0.29	< 0.02	< 0.02
Potassium (K)	< 0.5	< 0.5	---	0.7	0.9	1.1	0.6	< 0.5	3.8	0.5	0.5
Selenium (Se)	< 0.0006	< 0.0006	---	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	< 0.01	6.26	---	6.38	5.83	5.41	6.68	< 0.01	16.2	5.29	5.42
Silver (Ag)	< 0.00005	< 0.00005	---	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	< 0.5	2.7	---	4.1	3.9	4.2	4	< 0.5	7.7	3.1	3
Strontium (Sr)	< 0.000005	0.0511	---	0.107	0.108	0.11	0.107	< 0.000005	0.0747	0.0596	0.0593
Thallium (Tl)	< 0.00005	< 0.00005	---	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	< 0.0001	< 0.0001	---	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	< 0.0002	0.0008	---	0.0034	0.001	0.0071	0.0018	< 0.0002	0.0766	0.0018	0.0018
Uranium (U)	< 0.00005	0.00008	---	0.00027	0.00012	0.00012	0.00026	< 0.00005	0.00022	< 0.00005	< 0.00005
Vanadium (V)	< 0.0001	< 0.0001	---	0.0002	< 0.0001	0.0004	< 0.0001	< 0.0001	0.0069	< 0.0001	< 0.0001
Zinc (Zn)	< 0.0005	0.003	---	0.0197	0.0019	0.0128	0.0074	< 0.0005	0.146	0.0029	0.0028

Table 1-19: Surface Water Analytical Results for Metals, 2013 Sampling Program

Elements	MDL	Area	CP02	CP03	CP06	CP07	CP08	CP15	CP DUP	Field Blank	Trip Blank
		Sample ID	13-1407-	13-1408-	13-1409-	13-1410-	13-1411-	13-1412-	13-1413-	13-1414-	13-1415-
		Unit									
Aluminum (Al)	---	mg/L	0.006	0.021	0.073	0.188	0.509	0.01	0.044	< 0.002	< 0.002
Antimony (Sb)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Arsenic (As)	0.0001	mg/L	0.0008	0.0002	< 0.0001	< 0.0001	< 0.0001	0.0006	0.0008	< 0.0001	< 0.0001
Barium (Ba)	---	mg/L	0.00432	0.00292	0.00414	0.00775	0.00586	0.00274	0.00423	< 0.00005	< 0.00005
Beryllium (Be)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	0.000015	mg/L	< 0.000015	< 0.000015	0.00002	0.000144	0.000161	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium (Ca)	---	mg/L	14.1	14.6	9	18.7	20.8	9.8	13.9	< 0.5	< 0.5
Chromium (Cr	0.0003	mg/L	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Cobalt (Co)	0.00002	mg/L	< 0.00002	0.00005	0.00005	0.00091	0.00216	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Copper (Cu)	0.0001	mg/L	< 0.0001	< 0.0001	0.0021	0.0012	0.0012	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Iron (Fe)	---	mg/L	0.0029	1.13	0.0934	0.252	0.221	0.0035	0.0018	< 0.0001	< 0.0001
Lead (Pb)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	0.00013	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Lithium (Li)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (M	0.5	mg/L	1.66	2.84	1.75	1.23	2.4	1.16	1.56	< 0.50	< 0.50
Manganese (M	---	mg/L	< 0.00005	0.0234	0.00725	0.0904	0.136	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Mercury (Hg)	0.000005	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum (	---	mg/L	0.0008	0.00027	0.00079	0.00008	0.00009	0.00043	0.00082	< 0.00005	< 0.00005
Nickel (Ni)	0.00005	mg/L	< 0.00005	< 0.00005	0.00034	0.00052	0.00095	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Phosphorus (	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Potassium (K)	0.5	mg/L	< 0.5	0.6	0.9	0.9	1	< 0.5	< 0.5	< 0.5	< 0.5
Selenium (Se)	0.0006	mg/L	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	---	mg/L	5.75	7.47	7.56	4.56	11.2	5.11	5.71	< 0.01	< 0.01
Silver (Ag)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	---	mg/L	2.7	2.9	2.6	1.9	3.5	2	2.5	< 0.5	< 0.5
Strontium (Sr)	---	mg/L	0.0581	0.0632	0.0363	0.0508	0.0609	0.043	0.0578	< 0.000005	< 0.000005
Thallium (Tl)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	---	mg/L	< 0.0002	0.0006	0.0004	0.0017	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium (U)	0.00005	mg/L	0.00008	< 0.00005	0.00016	0.00006	< 0.00005	< 0.00005	0.00008	< 0.00005	< 0.00005
Vanadium (V)	0.0001	mg/L	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001
Zinc (Zn)	---	mg/L	0.0024	0.0009	0.0054	0.069	0.0238	0.0049	0.0023	< 0.0005	< 0.0005

Elements	WQ21-Epi	WQ21-Epi	WQ21-Meta	WQ21-Hypo	WQ Duplicate	Trip Blank	WQ22-epi	WQ22-epi	WQ22-hyp	WQ20-epi	Field Blank	WQ20 met	WQ20 met
	13-1478-	13-1478-D	13-1479-	13-1480-	13-1481-	13-1482-	13-1611-	13-1611-D	13-1612-	13-1613-	13-1614-	13-1650-	13-1650-D
Aluminum (Al)	0.006	0.003	0.003	0.027	0.009	< 0.002	0.012	0.012	0.008	0.007	< 0.002	0.003	---
Antimony (Sb)	< 0.00005	< 0.00005	0.00006	0.00007	< 0.00005	< 0.00005	0.00009	0.00008	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---
Arsenic (As)	0.0005	0.0005	0.0004	0.0004	0.0005	< 0.0001	0.0003	0.0003	0.0002	0.0003	< 0.0001	0.0003	---
Barium (Ba)	0.0062	0.00611	0.00562	0.00573	0.00627	< 0.00005	0.00737	0.00727	0.00727	0.00932	< 0.00005	0.00878	---
Beryllium (Be)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	---
Boron (B)	0.004	0.003	0.003	0.003	0.004	< 0.001	0.003	0.003	0.002	0.001	0.002	0.001	---
Cadmium (Cd	< 0.000015	< 0.000015	< 0.000015	0.000122	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	---
Calcium (Ca)	24.8	24.9	22.4	22.9	24.2	< 0.5	14.1	14.2	13.7	22.2	< 0.5	23.3	---
Chromium (Cr	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	---
Cobalt (Co)	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	---
Copper (Cu)	0.0008	0.0008	0.0007	0.0012	0.0005	< 0.0001	0.0004	0.0003	0.0007	0.0001	< 0.0001	< 0.0001	---
Iron (Fe)	0.0083	0.0087	0.0104	0.0183	0.0112	< 0.0001	0.0632	0.0674	0.0654	0.0104	< 0.0001	0.0104	---
Lead (Pb)	0.00075	0.00073	0.00141	0.00312	0.00053	< 0.00005	0.00179	0.00177	0.00178	< 0.00005	< 0.00005	< 0.00005	---
Lithium (Li)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---
Magnesium (M	5.57	5.66	4.98	5.02	5.56	< 0.50	3.9	3.91	3.99	7.16	< 0.50	6.58	---
Manganese (M	0.00326	0.00331	0.00503	0.0063	0.00174	< 0.00005	0.0119	0.0127	0.0335	0.00833	< 0.00005	0.0189	---
Mercury (Hg)	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	---
Molybdenum (	0.00063	0.00056	0.00051	0.00055	0.00056	< 0.00005	0.00033	0.00033	0.00032	0.00068	< 0.00005	0.00061	---
Nickel (Ni)	0.00025	0.00024	0.00022	0.00041	0.00025	< 0.00005	0.00028	0.0003	0.00025	0.00039	< 0.00005	0.00036	---
Phosphorus (	0.02	0.02	< 0.02	0.02	0.02	< 0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	---
Potassium (K)	1	1	0.9	0.9	1	< 0.5	1.3	1.3	1.3	1.2	< 0.5	1.1	---
Selenium (Se)	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	---
Silicon	5.92	5.47	4.94	5.22	5.18	< 0.01	6.26	5.73	6.57	8.62	< 0.01	7.94	---
Silver (Ag)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---
Sodium (Na)	4.1	4.2	3.8	3.8	4.1	< 0.5	3.8	3.8	3.9	4.2	< 0.5	3.9	---
Strontium (Sr)	0.108	0.106	0.0994	0.0992	0.106	< 0.000005	0.0751	0.0748	0.0726	0.112	< 0.000005	0.111	---
Thallium (Tl)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---
Tin (Sn)	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	---
Titanium (Ti)	0.0002	0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002	0.0002	0.0003	0.0002	< 0.0002	< 0.0002	< 0.0002	---
Uranium (U)	0.00011	0.00009	0.00008	0.00008	0.00009	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---
Vanadium (V)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	---
Zinc (Zn)	0.0027	0.0026	0.0119	0.0203	0.004	< 0.0005	0.0051	0.0048	0.0101	0.0022	< 0.0005	0.0057	---

Elements	WQ20 hyp	WQ26	WQ26	WQ11	WQ10	WQ3	WQ15	WQ16	WQ12	WQ8	WQ6	WQ6	WQ7	WQ9	WQ Duplicate	Field Blank	Travel Blank
	13-1651-	13-1759-	13-1759-D	13-1760-	13-1761-	13-1762-	13-1763-	13-1764-	13-1765-	13-1766-	13-1779-	13-1779-D	13-1780-	13-1781-	13-1782-	13-1783-	13-1784-
Aluminum (Al)	0.022	0.007	0.007	0.051	0.011	0.029	0.033	0.011	0.028	< 0.002	0.019	---	0.039	0.008	0.01	< 0.002	< 0.002
Antimony (Sb)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Arsenic (As)	0.0004	0.0003	0.0004	< 0.0001	0.0004	0.0011	0.0001	0.0003	0.0001	0.0004	0.0003	---	0.0003	0.0004	0.0003	< 0.0001	< 0.0001
Barium (Ba)	0.0142	0.00811	0.00795	0.0124	0.00704	0.0044	0.00869	0.00374	0.00556	0.00605	0.00554	---	0.00903	0.00705	0.00813	< 0.00005	< 0.00005
Beryllium (Be)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	---	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	---	0.000105	< 0.000015	0.000017	< 0.000015	< 0.000015
Calcium (Ca)	24.4	17.9	17.9	25.1	14.9	13.1	8.4	7.5	7.1	24	7	---	17.1	21.8	17.5	< 0.5	< 0.5
Chromium (Cr	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	0.0009	< 0.0003	< 0.0003	0.0247	< 0.0003	< 0.0003	---	0.0005	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Cobalt (Co)	0.00003	< 0.00002	< 0.00002	0.00002	< 0.00002	0.00002	0.00002	< 0.00002	0.00006	< 0.00002	< 0.00002	---	0.00006	0.00003	0.00003	< 0.00002	< 0.00002
Copper (Cu)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0006	< 0.0001	< 0.0001	---	0.0011	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Iron (Fe)	0.431	0.0248	0.0236	0.0278	0.0367	0.0758	0.147	0.103	0.511	0.0125	0.0797	---	0.158	0.123	0.109	< 0.0001	< 0.0001
Lead (Pb)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---	0.00007	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Lithium (Li)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium (M	6.46	3.91	3.85	5.27	3.06	3.32	1.25	1.46	1.29	5.55	1.24	---	4	5.21	3.96	< 0.50	< 0.50
Manganese (M	0.564	0.00376	0.00369	0.00129	0.00179	0.00637	0.036	0.0384	0.0129	0.00211	0.00511	---	0.0271	0.0173	0.0225	< 0.00005	< 0.00005
Mercury (Hg)	0.000007	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	---	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum (	0.00063	0.00082	0.00084	0.00036	0.00082	0.0008	0.00069	0.00082	0.00061	0.00053	0.00055	---	0.00078	0.0006	0.0008	< 0.00005	< 0.00005
Nickel (Ni)	0.00019	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00045	0.00012	< 0.00005	---	0.00021	0.00012	0.00005	< 0.00005	< 0.00005
Phosphorus (	0.14	< 0.02	< 0.02	< 0.02	< 0.02	0.05	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	---	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Potassium (K)	1.1	0.6	0.6	0.7	0.5	0.6	< 0.5	< 0.5	< 0.5	1	< 0.5	---	1	0.9	0.6	< 0.5	< 0.5
Selenium (Se)	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	---	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	10.3	6.52	7.57	6.73	6.47	9.51	2.23	1.64	3.24	5.27	6.26	---	6.28	5.03	6.17	< 0.01	< 0.01
Silver (Ag)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	3.7	4	3.9	4.4	3.7	4.1	2	2.3	2.2	4.1	2.6	---	4	4	4	< 0.5	< 0.5
Strontium (Sr)	0.118	0.102	0.101	0.129	0.091	0.0827	0.0762	0.0448	0.0512	0.106	0.0514	---	0.0992	0.105	0.0989	< 0.000005	< 0.000005
Thallium (Tl)	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	---	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	0.0012	0.0002	0.0002	0.0008	0.0002	0.0008	0.0006	0.0003	0.0007	< 0.0002	0.0005	---	0.0023	0.001	0.0006	< 0.0002	< 0.0002
Uranium (U)	< 0.00005	0.00022	0.00022	0.00036	0.00023	0.00017	0.00015	0.00022	0.00009	0.00008	0.00006	---	0.00022	0.0001	0.00021	< 0.00005	< 0.00005
Vanadium (V)	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0012	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	---	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Zinc (Zn)	0.0028	0.004	0.0039	0.0033	0.0119	0.0044	0.0042	0.0033	0.0027	0.003	0.0024	---	0.0178	0.0037	0.0074	< 0.0005	< 0.0005

Table 1-20: Surface Water Analytical Results for Metals, 2013 Sampling Program

Elements	MDL	Area	CP01	CP01	CP02	CP03	CP06	CP07	CP08	CP15	CP DUP	Field Blank	Trip Blank
		Sample ID	13-1814-	13-1814-D	13-1815-	13-1816-	13-1817-	13-1818-	13-1819-	13-1820-	13-1821-	13-1822-	13-1823-
		Unit											
Aluminum (Al	---	mg/L	0.009	0.009	0.007	0.022	0.059	0.058	0.411	0.011	0.346	< 0.002	< 0.002
Antimony (Sb	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Arsenic (As)	0.0001	mg/L	< 0.0001	< 0.0001	0.0008	0.0002	< 0.0001	< 0.0001	< 0.0001	0.0005	< 0.0001	< 0.0001	< 0.0001
Barium (Ba)	---	mg/L	0.013	0.013	0.0043	0.00288	0.00404	0.00347	0.0059	0.00286	0.00586	< 0.00005	< 0.00005
Beryllium (Be	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron (B)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (Cd	0.000015	mg/L	< 0.000015	< 0.000015	< 0.000015	< 0.000015	0.000021	0.000085	0.000166	< 0.000015	0.000153	< 0.000015	< 0.000015
Calcium (Ca)	---	mg/L	14.3	14.4	14.8	14.5	8.3	17.7	20.4	10.2	19.8	< 0.5	< 0.5
Chromium (C	0.0003	mg/L	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	0.0012	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Cobalt (Co)	0.00002	mg/L	0.00006	0.00006	< 0.00002	0.00006	0.00003	0.00056	0.00224	< 0.00002	0.00236	< 0.00002	< 0.00002
Copper (Cu)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0017	0.0005	0.0019	< 0.0001	0.0017	< 0.0001	< 0.0001
Iron (Fe)	---	mg/L	0.685	0.698	0.001	1.01	0.0601	0.0906	0.32	0.0068	0.244	< 0.0001	< 0.0001
Lead (Pb)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Lithium (Li)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001
Magnesium (	0.5	mg/L	3.2	3.17	1.63	2.94	1.4	1.03	2.35	1.19	2.44	< 0.50	< 0.50
Manganese (	---	mg/L	0.0367	0.0374	0.0001	0.035	0.00581	0.0455	0.138	0.00045	0.137	< 0.00005	< 0.00005
Mercury (Hg)	0.000005	mg/L	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum	---	mg/L	0.00032	0.00033	0.00083	0.0003	0.00078	0.00007	0.00007	0.00046	0.00007	< 0.00005	< 0.00005
Nickel (Ni)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00022	0.00028	0.00098	< 0.00005	0.00102	< 0.00005	< 0.00005
Phosphorus (	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Potassium (K	0.5	mg/L	< 0.5	< 0.5	< 0.5	0.6	0.7	< 0.5	1	< 0.5	1	< 0.5	< 0.5
Selenium (Se	0.0006	mg/L	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Silicon	---	mg/L	4.92	4.88	5.29	6.89	7.34	3.46	10.9	4.29	10.6	< 0.01	< 0.01
Silver (Ag)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium (Na)	---	mg/L	3.1	3	2.7	3.2	2.1	1.5	3.5	2.1	3.6	< 0.5	< 0.5
Strontium (Sr	---	mg/L	0.0596	0.06	0.0577	0.0635	0.0358	0.0498	0.0609	0.044	0.0603	< 0.000005	< 0.000005
Thallium (Tl)	0.00005	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin (Sn)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Titanium (Ti)	---	mg/L	0.0005	0.0005	< 0.0002	0.0009	0.0003	0.0009	0.0004	0.0002	0.0003	< 0.0002	< 0.0002
Uranium (U)	0.00005	mg/L	< 0.00005	< 0.00005	0.00009	< 0.00005	0.00017	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Vanadium (V)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Zinc (Zn)	---	mg/L	0.0083	0.0071	0.0031	0.004	0.0057	0.0159	0.0261	0.0038	0.0252	< 0.0005	< 0.0005

Table 1-21: Vegetation Analytical Results for Metals, July 2012 Sampling Program

Elements	MDL	Area																		
		Sample ID	12-8953-	12-8953-D	12-8954-	12-8955-	12-8956-	12-8957-	12-8958-	12-8959-	12-8960-	12-8961-	12-8962-	12-8963-	12-8964-	12-8965-	12-8966-	12-8967-	12-8968-	12-8969-	12-8970-
		Unit																			
Antimony	0.1	µg/g (ppm)	0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Arsenic	0.05	µg/g (ppm)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.751	0.368
Barium	0.5	µg/g (ppm)	12.9	13	85.7	69.4	3.1	4.7	3.8	14.1	12.1	4.1	0.6	19.7	14.6	21.3	19.4	16.1	4.8	234	320
Beryllium	0.5	µg/g (ppm)	< 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	0.5	< 0.5
Boron	2	µg/g (ppm)	9	8	20	12	19	6	8	13	9	< 2	11	11	8	5	8	10	7	3	< 2
Cadmium	0.02	µg/g (ppm)	0.23	0.25	< 0.02	< 0.02	0.51	0.03	0.26	0.27	0.17	0.92	0.08	1.08	0.11	5.46	0.12	0.1	0.2	0.28	0.43
Chromium	1	µg/g (ppm)	1.8	1.8	3.4	3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	3.9	2.8
Cobalt	1	µg/g (ppm)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.5	< 1.0
Copper	0.4	µg/g (ppm)	4.2	4.1	6.2	6	3.8	< 0.4	0.4	4.9	4.5	8.9	< 0.4	4.8	5.7	8	4.1	1.3	2.2	8.6	4.6
Lead	3	µg/g (ppm)	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	6.4	8
Lithium	0.4	µg/g (ppm)	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	1.8	1.1
Mercury	0.02	µg/g (ppm)	0.41	0.45	0.28	0.14	0.17	< 0.02	0.04	0.67	0.44	0.38	0.17	0.12	< 0.02	0.05	< 0.02	< 0.02	< 0.02	0.09	0.06
Molybdenum	0.02	µg/g (ppm)	2.22	2.16	0.4	< 0.02	4.99	< 0.02	1.86	0.88	0.56	1.15	36.7	0.04	< 0.02	0.31	1.46	0.09	1.74	1.36	0.51
Nickel	2	µg/g (ppm)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.8	2.6
Selenium	1	µg/g (ppm)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Silver	0.3	µg/g (ppm)	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	1.9	1.2
Strontium	0.4	µg/g (ppm)	105	106	13.4	20.1	48.5	79.6	62	104	85.3	52.7	75.6	116	88.8	112	132	106	57	193	99.9
Thallium	0.02	µg/g (ppm)	< 0.02	< 0.02	< 0.02	< 0.02	0.28	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.09	0.05
Tin	1	µg/g (ppm)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Titanium	1	µg/g (ppm)	3	2	8	4	2	1	1	3	3	1	< 1	< 1	1	2	5	2	1	408	389
Uranium	0.04	µg/g (ppm)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	0.4	0.22
Vanadium	0.6	µg/g (ppm)	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	11.5	7.7
Zinc	0.3	µg/g (ppm)	198	193	37.3	42.3	153	106	318	120	106	27.7	109	281	88.9	399	179	97.5	161	49.5	40.7
Zirconium	0.1	µg/g (ppm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Table 1-21: Fish (Muscle) Analytical Results for Metals, August 2011 Sampling Program

Elements	MDL	Area																																			
		Sample ID	L1110331-1	L1110331-2	L1110331-3	L1110331-4	L1110331-5	L1110331-6	L1110331-7	L1110331-8	L1110331-9	L1110331-10	L1110331-11	L1110331-12	L1110331-13	L1110331-14	L1110331-15	L1110331-16	L1110331-17	L1110331-18	L1110331-19	L1110331-20	L1110331-21	L1110331-22	L1110331-23	L1110331-24	L1110331-25	L1110331-26	L1110331-27	L1110331-28	L1110331-29	L1110331-30	L1110331-31	L1110331-1	L1110331-2	L1110331-3	L1110331-4	L1110331-5
		Unit																																			
Aluminum		mg/kg wwt	<0.80	<1.2	<0.40	<0.40	0.51	3.62	<0.40	<0.40	<0.40	0.85	0.72	0.79	1.44	0.77	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.41	0.63	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.58	<0.40	<0.40	<0.80	<1.2	<0.40	<0.40	0.51
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0219	0.0179	0.018	0.0134	0.0195	0.0402	0.0222	0.0224	0.0267	0.0229	0.0181	0.0302	0.0205	0.0196	0.0182	0.0141	0.0199	0.0194	0.0154	0.009	0.008	0.0156	0.039	0.0258	0.021	0.0288	0.0158	0.0142	0.0169	0.0137	0.0151	0.0219	0.0179	0.018	0.0134	0.0195
Barium		mg/kg wwt	0.023	0.034	0.012	0.02	0.025	0.039	0.028	0.019	0.046	0.12	0.256	0.052	0.11	0.043	0.022	0.024	0.022	0.036	0.016	0.029	0.036	0.027	0.089	0.046	0.034	0.047	0.038	0.011	0.048	0.026	0.03	0.023	0.034	0.012	0.02	0.025
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	0.0022	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0022	<0.0020
Boron		mg/kg wwt	0.78	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.78	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	0.0043	0.0045	<0.0020	<0.0020	<0.0020	0.0027	0.0025	0.0039	0.0076	0.0192	0.0137	0.0153	0.0089	0.0167	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0231	<0.0020	<0.0020	0.0043	0.0045	<0.0020	<0.0020	<0.0020
Calcium		mg/kg wwt	228	260	230	198	291	210	388	299	352	1620	2680	576	2440	514	246	223	242	421	196	405	423	425	679	230	271	397	467	136	524	209	350	228	260	230	198	291
Cesium		mg/kg wwt	0.0915	0.0684	0.0598	0.0536	0.0534	0.206	0.0762	0.21	0.0197	0.0318	0.0384	0.0265	0.021	0.04	0.175	0.223	0.253	0.289	0.138	0.0884	0.111	0.254	0.152	0.15	0.0756	0.178	0.043	0.0546	0.0324	0.236	0.0431	0.0915	0.0684	0.0598	0.0536	0.0534
Chromium		mg/kg wwt	0.022	0.042	<0.010	0.011	<0.010	0.015	<0.010	0.017	0.019	0.038	0.053	0.03	0.047	0.032	0.026	0.011	0.013	0.023	0.01	0.013	0.011	0.015	<0.010	0.014	<0.010	<0.010	0.014	<0.010	0.024	0.024	0.015	0.022	0.042	<0.010	0.011	<0.010
Cobalt		mg/kg wwt	<0.0040	0.0045	0.0049	<0.0040	0.0048	0.0083	0.0068	<0.0040	0.0137	0.0095	0.0066	0.0139	0.0082	0.0108	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.004	<0.0040	<0.0040	0.0107	<0.0040	<0.0040	<0.0040	0.0045	0.0049	<0.0040	0.0048
Copper		mg/kg wwt	0.494	0.769	0.546	0.516	0.345	0.566	0.521	0.475	0.59	0.579	0.642	0.583	0.599	0.541	0.283	0.239	0.256	0.315	0.241	0.275	0.27	0.305	0.239	0.293	0.293	0.358	0.257	0.379	0.369	0.216	0.248	0.494	0.769	0.546	0.516	0.345
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	5.11	6.44	3.06	4.65	3.21	7.82	3.81	3.46	3.92	6.38	3.65	4.46	7.28	4.03	4.12	2.34	2.95	3.24	2.74	2.76	2.88	3.88	3.15	4.25	2.6	2.84	2.99	4.07	3.94	2.39	2.86	5.11	6.44	3.06	4.65	3.21
Lead		mg/kg wwt	<0.0040	0.0046	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0051	<0.0040	<0.0040	0.0062	<0.0040	0.0092	0.0051	0.0104	0.0076	0.0042	0.0046	0.0106	0.0108	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0059	0.0075	<0.0040	<0.0040	0.0046	<0.0040	<0.0040	<0.0040
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	291	290	296	314	287	264	296	255	260	289	301	251	295	262	274	283	264	286	277	271	277	289	291	292	291	291	290	302	226	283	294	291	290	296	314	287
Manganese		mg/kg wwt	0.129	0.135	0.0886	0.185	0.172	0.271	0.147	0.126	0.168	0.514	0.81	0.275	0.995	0.171	0.106	0.117	0.115	0.139	0.115	0.246	0.3	0.139	0.171	0.11	0.142	0.131	0.168	0.154	0.146	0.119	0.13	0.129	0.135	0.0886	0.185	0.172
Mercury		mg/kg wwt	0.116	0.109	0.0774	0.0858	0.0664	0.069	0.0805	0.0849	0.0872	0.0471	0.115	0.0507	0.0741	0.0535	0.0867	0.0581	0.102	0.0943	0.0619	0.062	0.0494	0.0686	0.0951	0.0829	0.0663	0.0772	0.0598	0.0813	0.0517	0.0579	0.0635	0.116	0.109	0.0774	0.0858	0.0664
Molybdenum		mg/kg wwt	<0.0040	0.0045	0.0053	<0.0040	<0.0040	0.0046	0.0041	0.004	0.006	0.0085	0.0076	0.0055	0.0088	0.005	0.004	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0047	<0.0040	<0.0040	0.0044	<0.0040	<0.0040	<0.0040	0.0045	0.0053	<0.0040	<0.0040
Nickel		mg/kg wwt	<0.030	<0.020	<0.030	<0.010	<0.020	<0.030	<0.010	<0.020	0.018	0.025	0.033	0.026	0.028	0.032	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	0.014	0.011	0.017	0.035	<0.010	<0.010	<0.010	0.02	0.015	<0.010	<0.030	<0.020	<0.030	<0.010	<0.020
Phosphorus		mg/kg wwt	2670	2710	2690	2800	2720	2590	2810	2600	2450	3190	3770	2430	3560	2570	2370	2390	2390	2480	2360	2400	2410	2470	2570	2460	2420	2490	2490	2670	2190	2390	2480	2670	2710	2690	2800	2720
Potassium		mg/kg wwt	5510	5320	5230	5590	5570	5110	5300	4770	4350	4120	3850	4150	3930	4350	4560	4520	4480	4330	4510	4450	4360	4390	4340	4420	4410	4440	4330	5320	3580	4580	4470	5510	5320	5230	5590	5570
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	5.25	4.15	5.87	4.84	5.6	4.68	5.4	4.55	5.02	5.28	5.3	5.34	4.26	7.97	4.72	4.73	4.65	5.66	3.83	3.63	4.14	4.77	7.39	6.79	4.23	7.93	2.49	4.98	6.76	4.9	2.61	5.25	4.15	5.87	4.84	5.6
Selenium		mg/kg wwt	0.458	0.481	0.441	0.357	0.44	0.377	0.531	0.469	0.428	0.385	0.336	0.359	0.4	0.151	0.134	0.113	0.087	0.118	0.087	0.114	0.092	0.094	0.078	0.086	0.056	0.066	0.075	0.393	0.126	0.095	0.069	0.458	0.481	0.441	0.357	0.44
Silver		mg/kg wwt	0.0015	0.0019	<0.0010	0.0035	<0.0010	<0.0010	<0.0010	<0.0010	0.0069	0.0034	0.0035	0.0025	0.0044	0.0033	0.0012	0.0012	0.0015	0.0026	0.0015	0.0014	0.0011	0.0016	<0.0010	0.0013	<0.0010	<0.0010	0.0034	<0.0010	0.0018	0.0014	0.0025	0.0015	0.0019	<0.0010	0.0035	<0.0010
Sodium		mg/kg wwt	740	730	540	580	670	620	660	740	660	860	870	890	780	790	409	392	497	412	386	377	344	383	378	409	414	413	398	510	750	373	408	740	730	540	580	670
Strontium		mg/kg wwt	0.22	0.282	0.231	0.204	0.334	0.249	0.563	0.339	0.326	1.87	3.32	0.557	2.32	0.611	0.35	0.326	0.348	0.588	0.251	0.521	0.481	0.525	1.88	0.647	0.559	1.11	0.973	0.124	0.613	0.336	0.665	0.22	0.282	0.231	0.204	0.334
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00676	0.00761	0.00507	0.00565	0.00435	0.00546	0.00566	0.00532	0.00375	0.0045	0.00552	0.00514	0.00352	0.00468	0.00479	0.00337	0.00532	0.0055	0.00358	0.00353	0.00445	0.00516	0.0106	0.00733	0.00662	0.00858	0.00613	0.00463	0.00371	0.0035	0.00661	0.00676	0.00761	0.00507	0.00565	0.00435
Thorium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0051	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.012	0.016	0.0074	<0.0040	0.0121	<0.0040	<0.0040	0.0087	<0.016	<0.0040	<0.016	<0.012	<0.0080	<0.0080	<0.0040	<0.0040	0.0044	0.0154	0.0061	<0.0040	0.0122	<0.0040	<0.0040	0.0116	0.005	<0.0040	<0.0040	<0.0040	<0.0080	0.0064	0.0042	0.012	0.016	0.0074	<0.0040	0.0121
Titanium		mg/kg wwt	0.018	0.034	<0.010	<0.010	0.018	0.245	<0.010	<0.010	0.015	0.044	0.053	0.033	0.082	0.027	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	0.028	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.082	<0.010	<0.010	0.018	0.034	<0.010	<0.010	0.018
Uranium		mg/kg wwt	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.0008	<0.00040	<0.00040	<0.00040	0.00142	0.00177	0.00067	0.00082	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00063	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Vanadium		mg/kg wwt	<0.0040	<0.0040	0.0047	<0.0040	<0.0040	0.0049	<0.0040	<0.0040	<0.0040	0.0072	0.0133	0.007	0.0088	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0047	<0.0040	<0.0040
Yttrium		mg/kg wwt	<0.0020	0.0021	<0.0020	<0.0020	<0.0020	0.0033	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	<0.0020
Zinc		mg/kg wwt	8.86	8.47	5.75	6.5	5.57	6.31	6.3	8.42	9.95	12.7	13.4	8.56	14.2	9.65	4.74	4.17	4.55	5.1	4.19	4.75	4.88	4.39	4.12	3.71	3.91	4.36	3.8	6.41	8.17	4.03	3.78	8.86	8.47	5.75	6.5	5.57
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Area																																			
		Sample ID	L1110331-1	L1110331-2	L1110331-3	L1110331-4	L1110331-5	L1110331-6	L1110331-7	L1110331-8	L1110331-9	L1110331-10	L1110331-11	L1110331-12	L1110331-13	L1110331-14	L1110331-15	L1110331-16	L1110331-17	L1110331-18	L1110331-19	L1110331-20	L1110331-21	L1110331-22	L1110331-23	L1110331-24	L1110331-25	L1110331-26	L1110331-27	L1110331-28	L1110331-29	L1110331-30	L1110331-31	L1110331-1	L1110331-2	L1110331-3	L1110331-4	L1110331-5
		Unit																																			
Aluminum		mg/kg	<4.0	<4.0	<2.0	<2.0	2.1	15.6	<2.0	<2.0	<2.0	3.3	2.7	3.3	5.4	3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.6	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.5	<2.0	<2.0	<4.0	<4.0	<2.0	<2.0	2.1
Antimony		mg/kg	<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	<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	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.097	0.08	0.081	0.059	0.082	0.173	0.094	0.094	0.116	0.09	0.069	0.125	0.077	0.085	0.079	0.063	0.097	0.083	0.066	0.04	0.035	0.065	0.153	0.099	0.087	0.11	0.065	0.063	0.074	0.061	0.06	0.097	0.08	0.081	0.059	0.082
Barium		mg/kg	0.1	0.15	0.053	0.09	0.106	0.166	0.118	0.081	0.199	0.469	0.976	0.214	0.415	0.187	0.095	0.108	0.108	0.156	0.068	0.129	0.159	0.112	0.351	0.177	0.141	0.179	0.157	<0.050	0.21	0.114	0.12	0.1	0.15	0.053	0.09	0.106
Beryllium		mg/kg	<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	<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	<0.010	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<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	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	3.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.4	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	0.019	0.02	<0.010	<0.010	<0.010	0.012	0.011	0.016	0.033	0.075	0.052	0.063	0.034	0.072	<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	0.101	<0.010	<0.010	0.019	0.02	<0.010	<0.010	<0.010
Calcium		mg/kg	1000	1160	1040	867	1220	904	1650	1250	1530	6340	10200	2390	9200	2230	1060	993	1190	1800	836	1780	1870	1770	2670	887	1130	1510	1920	606	2280	931	1400	1000	1160	1040	867	1220
Cesium		mg/kg	0.403	0.305	0.27	0.234	0.225	0.888	0.323	0.883	0.0858	0.125	0.146	0.11	0.0789	0.173	0.755	0.99	1.24	1.24	0.59	0.389	0.488	1.05	0.599	0.575	0.314	0.677	0.177	0.244	0.141	1.05	0.172	0.403	0.305	0.27	0.234	0.225
Chromium		mg/kg	0.096	0.186	<0.050	<0.050	<0.050	0.063	<0.050	0.069	0.082	0.147	0.203	0.123	0.176	0.138	0.112	<0.050	0.066	0.099	<0.050	0.059	<0.050	0.062	<0.050	0.053	<0.050	<0.050	0.056	<0.050	0.104	0.106	0.058	0.096	0.186	<0.050	<0.050	<0.050
Cobalt		mg/kg	<0.020	<0.020	0.022	<0.020	0.02	0.036	0.029	<0.020	0.06	0.037	0.025	0.058	0.031	0.047	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.047	<0.020	<0.020	<0.020	<0.020	0.022	<0.020	0.02
Copper		mg/kg	2.18	3.43	2.47	2.26	1.45	2.44	2.21	1.99	2.56	2.27	2.45	2.42	2.25	2.34	1.22	1.06	1.26	1.35	1.03	1.21	1.19	1.27	0.939	1.13	1.22	1.36	1.06	1.69	1.61	0.959	0.992	2.18	3.43	2.47	2.26	1.45
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	22.5	28.7	13.8	20.3	13.5	33.7	16.2	14.5	17	25	13.9	18.5	27.4	17.5	17.8	10.4	14.5	13.9	11.7	12.1	12.7	16.1	12.4	16.3	10.8	10.8	12.3	18.2	17.2	10.6	11.4	22.5	28.7	13.8	20.3	13.5
Lead		mg/kg	<0.020	0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.023	<0.020	0.04	0.023	0.051	0.033	<0.020	0.02	0.047	0.045	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.025	0.033	<0.020	<0.020	0.02	<0.020	<0.020	<0.020
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1280	1290	1340	1370	1210	1140	1260	1070	1130	1130	1150	1040	1110	1130	1180	1260	1290	1230	1180	1190	1220	1200	1140	1120	1210	1110	1200	1350	986	1260	1180	1280	1290	1340	1370	1210
Manganese		mg/kg	0.567	0.602	0.401	0.81	0.721	1.17	0.623	0.53	0.729	2.01	3.08	1.14	3.75	0.743	0.46	0.521	0.564	0.597	0.491	1.08	1.33	0.58	0.674	0.424	0.592	0.499	0.691	0.689	0.636	0.529	0.518	0.567	0.602	0.401	0.81	0.721
Mercury		mg/kg	0.511	0.486	0.35	0.375	0.279	0.297	0.341	0.356	0.379	0.184	0.436	0.21	0.279	0.232	0.375	0.258	0.501	0.404	0.264	0.273	0.218	0.285	0.374	0.319	0.276	0.294	0.246	0.363	0.225	0.257	0.254	0.511	0.486	0.35	0.375	0.279
Molybdenum		mg/kg	<0.020	<0.020	0.024	<0.020	<0.020	<0.020	<0.020	<0.020	0.026	0.033	0.029	0.023	0.033	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.024	<0.020	<0.020
Nickel		mg/kg	<0.15	<0.10	<0.15	<0.050	<0.050	<0.10	<0.050	<0.10	0.077	0.1	0.126	0.106	0.105	0.14	<0.050	<0.050	<0.050	0.06	<0.050	<0.050	<0.050	0.059	<0.050	0.066	0.146	<0.050	<0.050	<0.050	0.089	0.067	<0.050	<0.15	<0.10	<0.15	<0.050	<0.050
Phosphorus		mg/kg	11800	12100	12200	12200	11400	11200	11900	10900	10700	12500	14400	10000	13400	11100	10200	10600	11700	10600	10100	10600	10600	10300	10100	9450	10100	9490	10200	11900	9530	10600	9910	11800	12100	12200	12200	11400
Potassium		mg/kg	24300	23700	23700	24400	23400	22000	22500	20000	18900	16100	14700	17200	14800	18800	19700	20100	21900	18600	19300	19600	19300	18300	17000	17000	18300	16900	17900	23700	15600	20400	17900	24300	23700	23700	24400	23400
Rhenium		mg/kg	<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	<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	<0.010	<0.010	<0.010	<0.010
Rubidium		mg/kg	23.1	18.5	26.6	21.2	23.6	20.1	22.9	19.1	21.8	20.7	20.2	22.1	16	34.5	20.4	21	22.8	24.3	16.4	16	18.3	19.8	29.1	26.1	17.6	30.2	10.3	22.2	29.4	21.8	10.4	23.1	18.5	26.6	21.2	23.6
Selenium		mg/kg	2.02	2.14	1.99	1.56	1.85	1.62	2.25	1.97	1.86	1.51	1.28	1.49	1.51	0.65	0.58	0.5	0.43	0.51	0.37	0.5	0.41	0.39	0.31	0.33	0.23	0.25	0.31	1.75	0.55	0.42	0.28	2.02	2.14	1.99	1.56	1.85
Silver		mg/kg	0.0065	0.0086	<0.0050	0.0153	<0.0050	<0.0050	<0.0050	<0.0050	0.03	0.0135	0.0135	0.0103	0.0164	0.0142	0.0051	0.0054	0.0075	0.011	0.0063	0.006	<0.0050	0.0067	<0.0050	<0.0050	<0.0050	<0.0050	0.0141	<0.0050	0.008	0.0062	0.0099	0.0065	0.0086	<0.0050	0.0153	<0.0050
Sodium		mg/kg	3300	3300	2400	2500	2800	2700	2800	3100	2900	3400	3300	3700	2900	3400	1770	1740	2430	1770	1650	1660	1520	1590	1490	1570	1720	1570	1640	2300	3300	1660	1630	3300	3300	2400	2500	2800
Strontium		mg/kg	0.968	1.25	1.04	0.891	1.4	1.07	2.39	1.42	1.42	7.31	12.6	2.31	8.72	2.64	1.51	1.45	1.71	2.52	1.07	2.29	2.12	2.18	7.41	2.49	2.32	4.22	4.01	0.555	2.67	1.49	2.66	0.968	1.25	1.04	0.891	1.4
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0298	0.0339	0.023	0.0247	0.0183	0.0235	0.024	0.0223	0.0163	0.0176	0.021	0.0213	0.0132	0.0203	0.0207	0.015	0.0261	0.0236	0.0153	0.0155	0.0196	0.0215	0.0415	0.0282	0.0275	0.0327	0.0253	0.0206	0.0162	0.0156	0.0264	0.0298	0.0339	0.023	0.0247	0.0183
Thorium		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.022	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		mg/kg	0.053	0.071	0.033	<0.020	0.051	<0.020	<0.020	0.037	<0.060	<0.020	<0.060	<0.040	<0.040	<0.020	<0.020	<0.020	0.021	0.066	0.026	<0.020	0.054	<0.020	<0.020	0.045	0.021	<0.020	<0.020	<0.020	<0.040	0.029	<0.020	0.053	0.071	0.033	<0.020	0.051
Titanium		mg/kg	0.079	0.149	<0.050	<0.050	0.074	1.06	<0.050	<0.050	0.065	0.172	0.201	0.138	0.308	0.116	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.075	0.116	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.356	<0.050	<0.050	0.079	0.149	<0.050	<0.050	0.074
Uranium		mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0034	<0.0020	<0.0020	<0.0020	0.0056	0.0067	0.0028	0.0031	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0028	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium		mg/kg	<0.020	<0.020	0.021	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	0.028	0.051	0.029	0.033	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	<0.020
Yttrium		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<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	<0.010	<0.010	<0.010
Zinc		mg/kg	39.1	37.7	26	28.4	23.4	27.2	26.7	35.3	43.2	49.8	51	35.4	53.5	41.8	20.5	18.5	22.3	21.9	17.9	20.9	21.6	18.3	16.2	14.3	16.2	16.6	15.6	28.6	35.6	17.9	15.1	39.1	37.7	26	28.4	23.4
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Muscle) Analytical Results for Metals, August 2011 Sampling Program

Elements	MDL	Sample ID	L1110331-6	L1110331-7	L1110331-8	L1110331-9	L1110331-10	L1110331-11	L1110331-12	L1110331-13	L1110331-14	L1110331-15	L1110331-16	L1110331-17	L1110331-18	L1110331-19	L1110331-20	L1110331-21	L1110331-22	L1110331-23	L1110331-24	L1110331-25	L1110331-26	L1110331-27	L1110331-28	L1110331-29	L1110331-30
		Area																									
		Unit																									
Aluminum		mg/kg wwt	3.62	<0.40	<0.40	<0.40	0.85	0.72	0.79	1.44	0.77	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.41	0.63	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.58	<0.40
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0402	0.0222	0.0224	0.0267	0.0229	0.0181	0.0302	0.0205	0.0196	0.0182	0.0141	0.0199	0.0194	0.0154	0.009	0.008	0.0156	0.039	0.0258	0.021	0.0288	0.0158	0.0142	0.0169	0.0137
Barium		mg/kg wwt	0.039	0.028	0.019	0.046	0.12	0.256	0.052	0.11	0.043	0.022	0.024	0.022	0.036	0.016	0.029	0.036	0.027	0.089	0.046	0.034	0.047	0.038	0.011	0.048	0.026
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	0.0027	0.0025	0.0039	0.0076	0.0192	0.0137	0.0153	0.0089	0.0167	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0231	<0.0020
Calcium		mg/kg wwt	210	388	299	352	1620	2680	576	2440	514	246	223	242	421	196	405	423	425	679	230	271	397	467	136	524	209
Cesium		mg/kg wwt	0.206	0.0762	0.21	0.0197	0.0318	0.0384	0.0265	0.021	0.04	0.175	0.223	0.253	0.289	0.138	0.0884	0.111	0.254	0.152	0.15	0.0756	0.178	0.043	0.0546	0.0324	0.236
Chromium		mg/kg wwt	0.015	<0.010	0.017	0.019	0.038	0.053	0.03	0.047	0.032	0.026	0.011	0.013	0.023	0.01	0.013	0.011	0.015	<0.010	0.014	<0.010	<0.010	0.014	<0.010	0.024	0.024
Cobalt		mg/kg wwt	0.0083	0.0068	<0.0040	0.0137	0.0095	0.0066	0.0139	0.0082	0.0108	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.004	<0.0040	<0.0040	0.0107	<0.0040
Copper		mg/kg wwt	0.566	0.521	0.475	0.59	0.579	0.642	0.583	0.599	0.541	0.283	0.239	0.256	0.315	0.241	0.275	0.27	0.305	0.239	0.293	0.293	0.358	0.257	0.379	0.369	0.216
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	7.82	3.81	3.46	3.92	6.38	3.65	4.46	7.28	4.03	4.12	2.34	2.95	3.24	2.74	2.76	2.88	3.88	3.15	4.25	2.6	2.84	2.99	4.07	3.94	2.39
Lead		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	0.0051	<0.0040	<0.0040	0.0062	<0.0040	0.0092	0.0051	0.0104	0.0076	0.0042	0.0046	0.0106	0.0108	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0059	0.0075
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	264	296	255	260	289	301	251	295	262	274	283	264	286	277	271	277	289	291	292	291	291	290	302	226	283
Manganese		mg/kg wwt	0.271	0.147	0.126	0.168	0.514	0.81	0.275	0.995	0.171	0.106	0.117	0.115	0.139	0.115	0.246	0.3	0.139	0.171	0.11	0.142	0.131	0.168	0.154	0.146	0.119
Mercury		mg/kg wwt	0.069	0.0805	0.0849	0.0872	0.0471	0.115	0.0507	0.0741	0.0535	0.0867	0.0581	0.102	0.0943	0.0619	0.062	0.0494	0.0686	0.0951	0.0829	0.0663	0.0772	0.0598	0.0813	0.0517	0.0579
Molybdenum		mg/kg wwt	0.0046	0.0041	0.004	0.006	0.0085	0.0076	0.0055	0.0088	0.005	0.004	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0047	<0.0040	<0.0040	0.0044	<0.0040
Nickel		mg/kg wwt	<0.030	<0.010	<0.020	0.018	0.025	0.033	0.026	0.028	0.032	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	0.014	0.011	0.017	0.035	<0.010	<0.010	<0.010	0.02	0.015
Phosphorus		mg/kg wwt	2590	2810	2600	2450	3190	3770	2430	3560	2570	2370	2390	2390	2480	2360	2400	2410	2470	2570	2460	2420	2490	2490	2670	2190	2390
Potassium		mg/kg wwt	5110	5300	4770	4350	4120	3850	4150	3930	4350	4560	4520	4480	4330	4510	4450	4360	4390	4340	4420	4410	4440	4330	5320	3580	4580
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	4.68	5.4	4.55	5.02	5.28	5.3	5.34	4.26	7.97	4.72	4.73	4.65	5.66	3.83	3.63	4.14	4.77	7.39	6.79	4.23	7.93	2.49	4.98	6.76	4.9
Selenium		mg/kg wwt	0.377	0.531	0.469	0.428	0.385	0.336	0.359	0.4	0.151	0.134	0.113	0.087	0.118	0.087	0.114	0.092	0.094	0.078	0.086	0.056	0.066	0.075	0.393	0.126	0.095
Silver		mg/kg wwt	<0.0010	<0.0010	<0.0010	0.0069	0.0034	0.0035	0.0025	0.0044	0.0033	0.0012	0.0012	0.0015	0.0026	0.0015	0.0014	0.0011	0.0016	<0.0010	0.0013	<0.0010	<0.0010	0.0034	<0.0010	0.0018	0.0014
Sodium		mg/kg wwt	620	660	740	660	860	870	890	780	790	409	392	497	412	386	377	344	383	378	409	414	413	398	510	750	373
Strontium		mg/kg wwt	0.249	0.563	0.339	0.326	1.87	3.32	0.557	2.32	0.611	0.35	0.326	0.348	0.588	0.251	0.521	0.481	0.525	1.88	0.647	0.559	1.11	0.973	0.124	0.613	0.336
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00546	0.00566	0.00532	0.00375	0.0045	0.00552	0.00514	0.00352	0.00468	0.00479	0.00337	0.00532	0.0055	0.00358	0.00353	0.00445	0.00516	0.0106	0.00733	0.00662	0.00858	0.00613	0.00463	0.00371	0.0035
Thorium		mg/kg wwt	0.0051	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	<0.0040	<0.0040	0.0087	<0.016	<0.0040	<0.016	<0.012	<0.0080	<0.0080	<0.0040	<0.0040	0.0044	0.0154	0.0061	<0.0040	0.0122	<0.0040	<0.0040	0.0116	0.005	<0.0040	<0.0040	<0.0040	<0.0080	0.0064
Titanium		mg/kg wwt	0.245	<0.010	<0.010	0.015	0.044	0.053	0.033	0.082	0.027	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	0.028	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.082	<0.010
Uranium		mg/kg wwt	0.0008	<0.00040	<0.00040	<0.00040	0.00142	0.00177	0.00067	0.00082	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00063	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Vanadium		mg/kg wwt	0.0049	<0.0040	<0.0040	<0.0040	0.0072	0.0133	0.007	0.0088	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Yttrium		mg/kg wwt	0.0033	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Zinc		mg/kg wwt	6.31	6.3	8.42	9.95	12.7	13.4	8.56	14.2	9.65	4.74	4.17	4.55	5.1	4.19	4.75	4.88	4.39	4.12	3.71	3.91	4.36	3.8	6.41	8.17	4.03
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Sample ID	L1110331-6	L1110331-7	L1110331-8	L1110331-9	L1110331-10	L1110331-11	L1110331-12	L1110331-13	L1110331-14	L1110331-15	L1110331-16	L1110331-17	L1110331-18	L1110331-19	L1110331-20	L1110331-21	L1110331-22	L1110331-23	L1110331-24	L1110331-25	L1110331-26	L1110331-27	L1110331-28	L1110331-29	L1110331-30
		Area																									
		Unit																									
Aluminum		mg/kg	15.6	<2.0	<2.0	<2.0	3.3	2.7	3.3	5.4	3.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.6	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.5	<2.0
Antimony		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.173	0.094	0.094	0.116	0.09	0.069	0.125	0.077	0.085	0.079	0.063	0.097	0.083	0.066	0.04	0.035	0.065	0.153	0.099	0.087	0.11	0.065	0.063	0.074	0.061
Barium		mg/kg	0.166	0.118	0.081	0.199	0.469	0.976	0.214	0.415	0.187	0.095	0.108	0.108	0.156	0.068	0.129	0.159	0.112	0.351	0.177	0.141	0.179	0.157	<0.050	0.21	0.114
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	0.012	0.011	0.016	0.033	0.075	0.052	0.063	0.034	0.072	<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	0.101	<0.010
Calcium		mg/kg	904	1650	1250	1530	6340	10200	2390	9200	2230	1060	993	1190	1800	836	1780	1870	1770	2670	887	1130	1510	1920	606	2280	931
Cesium		mg/kg	0.888	0.323	0.883	0.0858	0.125	0.146	0.11	0.0789	0.173	0.755	0.99	1.24	1.24	0.59	0.389	0.488	1.05	0.599	0.575	0.314	0.677	0.177	0.244	0.141	1.05
Chromium		mg/kg	0.063	<0.050	0.069	0.082	0.147	0.203	0.123	0.176	0.138	0.112	<0.050	0.066	0.099	<0.050	0.059	<0.050	0.062	<0.050	0.053	<0.050	<0.050	0.056	<0.050	0.104	0.106
Cobalt		mg/kg	0.036	0.029	<0.020	0.06	0.037	0.025	0.058	0.031	0.047	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.047	<0.020
Copper		mg/kg	2.44	2.21	1.99	2.56	2.27	2.45	2.42	2.25	2.34	1.22	1.06	1.26	1.35	1.03	1.21	1.19	1.27	0.939	1.13	1.22	1.36	1.06	1.69	1.61	0.959
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	33.7	16.2	14.5	17	25	13.9	18.5	27.4	17.5	17.8	10.4	14.5	13.9	11.7	12.1	12.7	16.1	12.4	16.3	10.8	10.8	12.3	18.2	17.2	10.6
Lead		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.023	<0.020	0.04	0.023	0.051	0.033	<0.020	0.02	0.047	0.045	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.025	0.033
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1140	1260	1070	1130	1130	1150	1040	1110	1130	1180	1260	1290	1230	1180	1190	1220	1200	1140	1120	1210	1110	1200	1350	986	1260
Manganese		mg/kg	1.17	0.623	0.53	0.729	2.01	3.08	1.14	3.75	0.743	0.46	0.521	0.564	0.597	0.491	1.08	1.33	0.58	0.674	0.424	0.592	0.499	0.691	0.689	0.636	0.529
Mercury		mg/kg	0.297	0.341	0.356	0.379	0.184	0.436	0.21	0.279	0.232	0.375	0.258	0.501	0.404	0.264	0.273	0.218	0.285	0.374	0.319	0.276	0.294	0.246	0.363	0.225	0.257
Molybdenum		mg/kg	<0.020	<0.020	<0.020	0.026	0.033	0.029	0.023	0.033	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nickel		mg/kg	<0.10	<0.050	<0.10	0.077	0.1	0.126	0.106	0.105	0.14	<0.050	<0.050	<0.050	0.06	<0.050	<0.050	<0.050	0.059	<0.050	0.066	0.146	<0.050	<0.050	<0.050	0.089	0.067
Phosphorus		mg/kg	11200	11900	10900	10700	12500	14400	10000	13400	11100	10200	10600	11700	10600	10100	10600	10600	10300	10100	9450	10100	9490	10200	11900	9530	10600
Potassium		mg/kg	22000	22500	20000	18900	16100	14700	17200	14800	18800	19700	20100	21900	18600	19300	19600	19300	18300	17000	17000	18300	16900	17900	23700	15600	20400
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Rubidium		mg/kg	20.1	22.9	19.1	21.8	20.7	20.2	22.1	16	34.5	20.4	21	22.8	24.3	16.4	16	18.3	19.8	29.1	26.1	17.6	30.2	10.3	22.2	29.4	21.8
Selenium		mg/kg	1.62	2.25	1.97	1.86	1.51	1.28	1.49	1.51	0.65	0.58	0.5	0.43	0.51	0.37	0.5	0.41	0.39	0.31	0.33	0.23	0.25	0.31	1.75	0.55	0.42
Silver		mg/kg	<0.0050	<0.0050	<0.0050	0.03	0.0135	0.0135	0.0103	0.0164	0.0142	0.0051	0.0054	0.0075	0.011	0.0063	0.006	<0.0050	0.0067	<0.0050	<0.0050	<0.0050	<0.0050	0.0141	<0.0050	0.008	0.0062
Sodium		mg/kg	2700	2800	3100	2900	3400	3300	3700	2900	3400	1770	1740	2430	1770	1650	1660	1520	1590	1490	1570	1720	1570	1640	2300	3300	1660
Strontium		mg/kg	1.07	2.39	1.42	1.42	7.31	12.6	2.31	8.72	2.64	1.51	1.45	1.71	2.52	1.07	2.29	2.12	2.18	7.41	2.49	2.32	4.22	4.01	0.555	2.67	1.49
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0235	0.024	0.0223	0.0163	0.0176	0.021	0.0213	0.0132	0.0203	0.0207	0.015	0.0261	0.0236	0.0153	0.0155	0.0196	0.0215	0.0415	0.0282	0.0275	0.0327	0.0253	0.0206	0.0162	0.0156
Thorium		mg/kg	0.022	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		mg/kg	<0.020	<0.020	0.037	<0.060	<0.020	<0.060	<0.040	<0.040	<0.020	<0.020	<0.020	0.021	0.066	0.026	<0.020	0.054	<0.020	<0.020	0.045	0.021	<0.020	<0.020	<0.020	<0.040	0.029
Titanium		mg/kg	1.06	<0.050	<0.050	0.065	0.172	0.201	0.138	0.308	0.116	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.075	0.116	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.356	<0.050
Uranium		mg/kg	0.0034	<0.0020	<0.0020	<0.0020	0.0056	0.0067	0.0028	0.0031	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0028	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium		mg/kg	0.021	<0.020	<0.020	<0.020	0.028	0.051	0.029	0.033	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Yttrium		mg/kg	0.014	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Zinc		mg/kg	27.2	26.7	35.3	43.2	49.8	51	35.4	53.5	41.8	20.5	18.5	22.3	21.9	17.9	20.9	21.6	18.3	16.2	14.3	16.2	16.6	15.6	28.6	35.6	17.9
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Muscle) Analytical Results for Metals, August 2011/2012 Sampling Program

Elements	MDL	Area																									
		Sample ID	L1110331-31	L1227117-9	L1227117-10	L1227117-11	L1227117-12	L1227117-13	L1227117-14	L1227117-15	L1227117-16	L1227117-17	L1227117-18	L1227117-19	L1227117-20	L1227117-21	L1227117-22	L1227117-23	L1227117-24	L1227117-25	L1227117-26	L1227117-27	L1227117-28	L1227117-29	L1227117-30	L1227117-31	L1227117-32
		Unit																									
Aluminum		mg/kg wwt	<0.40	<0.40	3.83	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.85	<0.40	0.41	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0151	0.0295	0.0463	0.0302	0.06	0.029	0.0223	0.0416	0.0341	0.269	0.0136	0.0189	0.0229	0.0453	0.0116	0.028	0.0153	0.0071	0.0186	0.0233	0.0225	0.0157	0.0402	0.0284	0.0406
Barium		mg/kg wwt	0.03	<0.010	0.035	0.011	0.017	0.015	0.021	0.021	0.032	0.016	0.014	<0.010	0.042	0.015	0.014	0.014	0.013	<0.010	0.019	0.018	0.01	0.016	0.018	0.011	0.031
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0022	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	<0.20	<0.20	0.31	<0.20	<0.20	0.25	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.57	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	<0.0020	<0.0020	<0.0020	0.0047	0.0036	<0.0020	0.0022	<0.0020	0.0065	0.0034	<0.0020	<0.0020	0.0034	0.0085	<0.0020	0.0038	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0031	<0.0020	0.0029
Calcium		mg/kg wwt	350	294	428	281	517	354	384	535	574	291	227	280	227	319	328	219	357	380	283	408	352	410	269	348	438
Cesium		mg/kg wwt	0.0431	0.0089	0.005	0.0061	0.0066	0.0083	0.0055	0.0047	0.0096	0.0077	0.019	0.0057	0.0065	0.0135	0.0121	0.0251	0.0076	0.0058	0.0086	0.0036	0.0056	0.0059	0.008	0.0038	0.0052
Chromium		mg/kg wwt	0.015	<0.010	<0.010	0.015	<0.010	0.011	<0.010	0.017	0.032	0.029	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.069	0.032	<0.010	<0.010
Cobalt		mg/kg wwt	<0.0040	0.0169	0.0246	0.0146	0.0326	0.0121	0.0102	0.0107	0.0129	0.0153	0.0053	0.0152	0.0124	0.0354	0.0079	0.0134	0.0065	<0.0040	0.0097	0.0131	0.0125	0.0114	0.0066	0.0083	0.014
Copper		mg/kg wwt	0.248	0.632	0.668	0.491	0.581	0.519	0.48	0.465	0.457	0.374	0.325	0.381	0.47	0.623	0.47	0.694	0.251	0.405	0.398	0.346	0.426	0.645	0.658	0.321	0.404
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	2.86	3.55	6.36	3.85	2.3	3.62	2.53	3.25	4.64	4.03	2.25	3.04	3.83	2.71	3.38	4.84	2.8	2.66	2.69	1.65	2.67	4.38	4.21	1.69	2.89
Lead		mg/kg wwt	<0.0040	<0.0040	0.0057	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	294	231	223	247	232	241	233	335	271	249	279	211	193	260	298	244	314	338	265	257	277	242	252	249	318
Manganese		mg/kg wwt	0.13	0.156	0.296	0.127	0.526	0.13	0.269	0.21	0.198	0.0926	0.141	0.098	0.555	0.141	0.11	0.12	0.0992	0.1	0.139	0.143	0.0942	0.122	0.114	0.282	0.932
Mercury		mg/kg wwt	0.0635	0.122	0.119	0.123	0.0898	0.0773	0.0962	0.0741	0.115	0.0847	0.0695	0.0785	0.0528	0.0782	0.0948	0.0837	0.107	0.21	0.0942	0.0734	0.0927	0.0928	0.125	0.113	0.103
Molybdenum		mg/kg wwt	<0.0040	0.0043	0.0055	0.005	0.0056	0.005	0.0072	0.0066	0.009	<0.0040	<0.0040	<0.0040	<0.0040	0.0055	0.0041	0.0053	<0.0040	<0.0040	0.0052	<0.0040	0.0045	0.0045	0.0055	<0.0040	0.0057
Nickel		mg/kg wwt	<0.010	0.03	0.014	<0.010	0.014	0.018	0.02	<0.030	<0.040	0.018	0.065	0.012	<0.010	0.011	0.014	<0.010	<0.010	<0.010	0.021	0.02	<0.010	0.013	0.031	<0.010	<0.010
Phosphorus		mg/kg wwt	2480	2380	2420	2440	2430	2280	2190	3260	2660	2340	2540	2200	1830	2510	2890	2360	2980	3030	2430	2420	2520	2420	2280	2190	2900
Potassium		mg/kg wwt	4470	4350	3840	4950	3970	4260	3830	5660	4850	4500	4710	4040	3630	4470	5300	4510	6040	5380	4480	4470	4590	4480	3720	3930	5240
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	2.61	3.23	2.38	2.74	3.42	2.81	2.5	2.38	3.02	1.83	2.21	1.78	2.15	3.25	2	4.22	1.58	1.21	3.17	1.94	2.56	2.45	2.03	1.25	2.1
Selenium		mg/kg wwt	0.069	0.769	0.528	0.668	0.601	0.727	0.64	0.86	0.856	0.452	0.543	0.385	0.365	0.682	0.575	0.91	0.388	0.329	0.748	0.461	0.522	0.465	0.604	0.679	0.746
Silver		mg/kg wwt	0.0025	0.002	<0.0010	0.003	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0030	<0.0020	<0.0010	<0.0010	<0.0010
Sodium		mg/kg wwt	408	780	880	1010	860	810	740	920	1140	660	540	730	320	730	970	770	990	680	660	750	800	740	712	850	900
Strontium		mg/kg wwt	0.665	0.177	0.287	0.16	0.339	0.266	0.276	0.321	0.403	0.21	0.152	0.184	0.244	0.255	0.179	0.221	0.143	0.103	0.158	0.227	0.229	0.221	0.201	0.162	0.278
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00661	0.00297	0.00237	0.0025	0.0028	0.00216	0.00227	0.00201	0.00277	0.00224	0.00263	0.00182	0.00199	0.00488	0.0027	0.00466	0.00185	0.00112	0.00284	0.00251	0.00287	0.00235	0.00218	0.00154	0.00233
Thorium		mg/kg wwt	<0.0020	<0.0020	0.006	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.0042	0.013	0.0136	0.0068	0.0136	0.0286	0.0115	0.0217	0.0128	0.0185	0.0124	0.0099	0.0175	0.0124	0.0081	0.0098	0.0108	0.0073	0.0344	0.0089	0.0201	0.0246	0.0102	0.0088	0.0149
Titanium		mg/kg wwt	<0.010	<0.010	0.121	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.072	<0.010	0.026	<0.010	<0.010	<0.010	<0.010	0.028	<0.010	<0.010	0.01	<0.010	<0.010
Uranium		mg/kg wwt	<0.00040	<0.00040	0.0019	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00048	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Vanadium		mg/kg wwt	<0.0040	<0.0040	0.0088	<0.0040	<0.0040	<0.0040	<0.0040	0.0042	0.0054	<0.0040	<0.0040	<0.0040	0.0055	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Yttrium		mg/kg wwt	<0.0020	<0.0020	0.0034	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Zinc		mg/kg wwt	3.78	8.82	8.43	7.44	9.03	6.89	7.4	8.84	14.2	6.75	5.07	7.88	10.4	6.83	5.72	11	4.29	3.52	9.81	7.37	8.68	8.98	7.33	6.27	9.68
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Area																									
		Sample ID	L1110331-31	L1227117-9	L1227117-10	L1227117-11	L1227117-12	L1227117-13	L1227117-14	L1227117-15	L1227117-16	L1227117-17	L1227117-18	L1227117-19	L1227117-20	L1227117-21	L1227117-22	L1227117-23	L1227117-24	L1227117-25	L1227117-26	L1227117-27	L1227117-28	L1227117-29	L1227117-30	L1227117-31	L1227117-32
		Unit																									
Aluminum		mg/kg	<2.0	<2.0	13.7	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Antimony		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.06	0.121	0.166	0.128	0.244	0.124	0.083	0.167	0.15	1.21	0.057	0.082	0.114	0.183	0.048	0.119	0.065	0.028	0.076	0.091	0.095	0.062	0.164	0.11	0.16
Barium		mg/kg	0.12	<0.050	0.126	<0.050	0.07	0.065	0.077	0.086	0.139	0.07	0.061	<0.050	0.211	0.06	0.059	0.06	0.053	<0.050	0.079	0.07	<0.050	0.064	0.072	<0.050	0.122
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	<0.010	<0.010	<0.010	0.02	0.015	<0.010	<0.010	<0.010	0.029	0.015	<0.010	<0.010	0.017	0.034	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	0.011
Calcium		mg/kg	1400	1210	1530	1190	2110	1510	1430	2150	2530	1300	963	1220	1140	1290	1370	928	1520	1480	1150	1600	1500	1630	1100	1350	1730
Cesium		mg/kg	0.172	0.0367	0.018	0.026	0.0267	0.0354	0.0207	0.0188	0.0426	0.0347	0.0804	0.0249	0.0325	0.0546	0.0503	0.107	0.0326	0.0224	0.0349	0.014	0.0237	0.0236	0.0326	0.0147	0.0206
Chromium		mg/kg	0.058	<0.050	<0.050	0.065	<0.050	<0.050	<0.050	0.068	0.14	0.128	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.274	0.13	<0.050	<0.050
Cobalt		mg/kg	<0.020	0.07	0.088	0.062	0.133	0.052	0.038	0.043	0.057	0.068	0.023	0.066	0.062	0.143	0.033	0.057	0.028	<0.020	0.039	0.051	0.053	0.045	0.027	0.032	0.055
Copper		mg/kg	0.992	2.6	2.39	2.08	2.37	2.22	1.79	1.86	2.01	1.68	1.38	1.66	2.35	2.52	1.96	2.95	1.07	1.58	1.62	1.36	1.81	2.57	2.69	1.25	1.59
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	11.4	14.6	22.8	16.3	9.3	15.5	9.5	13	20.5	18.1	9.5	13.2	19.2	11	14.1	20.6	11.9	10.4	11	6.5	11.4	17.4	17.2	6.6	11.4
Lead		mg/kg	<0.020	<0.020	0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1180	950	799	1050	945	1030	872	1350	1200	1120	1180	915	967	1050	1240	1030	1340	1310	1080	1000	1180	964	1030	969	1250
Manganese		mg/kg	0.518	0.64	1.06	0.541	2.14	0.557	1.01	0.842	0.873	0.415	0.595	0.426	2.78	0.571	0.46	0.511	0.423	0.389	0.566	0.56	0.4	0.484	0.465	1.1	3.68
Mercury		mg/kg	0.254	0.503	0.427	0.521	0.366	0.331	0.359	0.298	0.508	0.38	0.294	0.341	0.264	0.316	0.395	0.355	0.455	0.816	0.384	0.287	0.394	0.369	0.51	0.439	0.408
Molybdenum		mg/kg	<0.020	<0.020	<0.020	0.021	0.023	0.021	0.027	0.027	0.04	<0.020	<0.020	<0.020	<0.020	0.022	<0.020	0.022	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	0.022	<0.020	0.023
Nickel		mg/kg	<0.050	0.122	<0.050	<0.050	0.055	0.077	0.074	<0.10	<0.20	0.08	0.277	0.054	<0.050	<0.050	0.058	<0.050	<0.050	<0.050	0.087	0.077	<0.050	<0.050	0.127	<0.050	<0.050
Phosphorus		mg/kg	9910	9800	8690	10300	9880	9780	8190	13100	11700	10500	10800	9560	9170	10100	12000	10000	12700	11800	9880	9480	10700	9630	9330	8530	11400
Potassium		mg/kg	17900	17900	13800	21000	16200	18300	14300	22700	21400	20200	19900	17600	18100	18100	22100	19200	25700	20900	18300	17500	19500	17800	15200	15300	20700
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Rubidium		mg/kg	10.4	13.3	8.53	11.6	13.9	12	9.33	9.53	13.3	8.22	9.34	7.74	10.7	13.1	8.35	17.9	6.75	4.71	12.9	7.58	10.9	9.77	8.29	4.86	8.29
Selenium		mg/kg	0.28	3.16	1.89	2.83	2.45	3.11	2.39	3.45	3.78	2.03	2.3	1.67	1.82	2.75	2.39	3.87	1.65	1.28	3.05	1.81	2.22	1.85	2.47	2.64	2.94
Silver		mg/kg	0.0099	0.0082	<0.0050	0.0126	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0076	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.015	<0.010	<0.0050	<0.0050	<0.0050
Sodium		mg/kg	1630	3200	3200	4300	3500	3500	2800	3700	5000	2900	2300	3200	1600	2900	4000	3200	4200	2600	2700	2900	3400	3000	2910	3300	3500
Strontium		mg/kg	2.66	0.728	1.03	0.679	1.38	1.14	1.03	1.29	1.78	0.943	0.645	0.798	1.22	1.03	0.745	0.941	0.61	0.4	0.643	0.891	0.972	0.879	0.821	0.631	1.1
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0264	0.0122	0.0085	0.0106	0.0114	0.0092	0.0085	0.0081	0.0122	0.01	0.0111	0.0079	0.0099	0.0197	0.0113	0.0198	0.0079	0.0044	0.0116	0.0098	0.0122	0.0093	0.0089	0.006	0.0092
Thorium		mg/kg	<0.010	<0.010	0.021	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		mg/kg	<0.020	0.053	0.049	0.029	0.055	0.122	0.043	0.087	0.056	0.083	0.053	0.043	0.087	0.05	0.034	0.042	0.046	0.028	0.14	0.035	0.085	0.098	0.041	0.034	0.059
Titanium		mg/kg	<0.050	<0.050	0.435	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.363	<0.050	0.109	<0.050	<0.050	<0.050	<0.050	0.109	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium		mg/kg	<0.0020	<0.0020	0.0068	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium		mg/kg	<0.020	<0.020	0.031	<0.020	<0.020	<0.020	<0.020	<0.020	0.024	<0.020	<0.020	<0.020	0.028	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Yttrium		mg/kg	<0.010	<0.010	0.012	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Zinc		mg/kg	15.1	36.3	30.2	31.6	36.8	29.5	27.6	35.5	62.7	30.3	21.4	34.2	52.1	27.6	23.8	46.8	18.3	13.7	40	28.9	36.8	35.7	29.9	24.4	38.2
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Muscle) Analytical Results for Metals, September 2012 Sampling Program

Elements	MDL	Sample ID	L1227117-33	L1227117-34	L1227117-35	L1227117-36	L1227117-37	L1227117-38	L1227117-39	L1227117-40	L1227117-41	L1227117-42	L1227117-43	L1227117-44	L1227117-45	L1227117-46	L1227117-47	L1227117-48	L1227117-49	L1227117-50
		Area																		
		Unit																		
Aluminum		mg/kg wwt	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	3.67	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.065	0.0779	0.0161	0.0062	0.0596	0.112	0.017	0.19	0.0677	0.0359	0.0707	0.0232	0.0243	0.0132	0.0397	0.0495	0.0205	0.0219
Barium		mg/kg wwt	0.014	0.017	0.017	<0.010	<0.010	0.011	0.013	0.066	0.03	0.058	0.113	0.043	0.037	<0.010	0.112	0.069	0.042	0.018
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0025	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Calcium		mg/kg wwt	162	396	306	56.5	131	107	171	229	152	364	618	81.7	121	110	348	287	212	270
Cesium		mg/kg wwt	0.0057	0.0039	0.0039	<0.0010	0.0029	0.0033	0.0022	0.0041	0.117	0.099	0.138	0.0476	0.0834	0.0217	0.102	0.134	0.1	0.14
Chromium		mg/kg wwt	0.012	0.017	0.011	<0.010	0.022	<0.010	<0.010	0.019	<0.010	0.029	0.047	<0.010	0.012	0.01	0.022	0.047	0.027	0.015
Cobalt		mg/kg wwt	0.0059	0.0082	0.0062	<0.0040	0.0064	<0.0040	<0.0040	0.0063	<0.0040	<0.0040	0.0053	<0.0040	<0.0040	<0.0040	<0.0040	0.0055	0.0073	0.0055
Copper		mg/kg wwt	0.337	0.275	0.22	0.053	0.332	0.205	0.273	0.328	0.377	0.172	0.194	0.203	0.207	0.153	0.347	0.43	0.293	0.195
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	3.11	3.25	2.1	0.74	3.65	2.9	4.02	7.94	4.1	2.44	3.54	2.22	2.64	2.43	3.64	4.67	4.11	3.36
Lead		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0144	0.0049	0.0113	0.0088	0.0066	<0.0040	<0.0040	0.0091	0.0534	0.0058	0.0055
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	311	294	273	67.2	246	237	262	216	261	293	321	309	274	297	278	294	261	264
Manganese		mg/kg wwt	0.16	0.288	0.18	0.0367	0.0824	0.0993	0.0978	0.292	0.102	0.142	0.167	0.0795	0.099	0.078	0.19	0.136	0.162	0.108
Mercury		mg/kg wwt	0.0719	0.0526	0.0739	0.0122	0.0551	0.0763	0.0767	0.0772	0.119	0.0983	0.0718	0.0654	0.116	0.128	0.127	0.0577	0.0933	0.101
Molybdenum		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0041	<0.0040	<0.0040	<0.0040	0.0077	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Nickel		mg/kg wwt	0.014	0.02	<0.010	<0.010	0.023	0.011	<0.010	0.047	0.02	0.017	0.048	0.021	0.011	0.01	0.018	0.036	0.024	0.025
Phosphorus		mg/kg wwt	2320	2390	2460	528	2230	2230	2380	2100	2280	2540	2630	2390	2330	2490	2440	2550	2390	2380
Potassium		mg/kg wwt	4790	4780	3650	1120	4350	3640	4520	4280	4520	4640	5010	4950	4270	4520	4640	4640	3770	3820
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	2.77	2.53	2.74	0.579	1.62	2.05	1.5	2.06	4.46	3.61	5.67	2.31	2.9	1.88	4.02	5.12	2.99	3.28
Selenium		mg/kg wwt	0.221	0.212	0.224	0.043	0.277	0.27	0.288	0.207	0.087	0.101	0.103	0.073	0.115	0.104	0.109	0.099	0.177	0.154
Silver		mg/kg wwt	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	0.0015	0.0025	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0048	0.0019	<0.0010	<0.0010
Sodium		mg/kg wwt	531	512	576	116	590	656	616	718	527	480	527	430	471	468	436	503	491	418
Strontium		mg/kg wwt	0.108	0.279	0.211	0.037	0.085	0.081	0.117	0.228	0.418	0.894	1.59	0.1	0.214	0.103	1.03	0.676	0.335	0.311
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00131	0.00202	0.00139	0.00042	0.00137	0.00214	0.00062	0.00245	0.0066	0.00733	0.00882	0.008	0.00714	0.00397	0.00888	0.00698	0.00449	0.00361
Thorium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.017	0.0193	0.0048	0.0048	0.0046	<0.0040	<0.0040	0.0081	<0.0040	0.0043	<0.0040	0.0161	0.0062	0.0092	0.0156	0.0091	<0.0040	0.0133
Titanium		mg/kg wwt	<0.010	0.043	<0.010	0.026	<0.010	<0.010	0.041	0.164	<0.010	<0.010	0.047	0.012	<0.010	<0.010	0.013	<0.010	0.016	0.011
Uranium		mg/kg wwt	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00042	<0.00040
Vanadium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0087	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Yttrium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Zinc		mg/kg wwt	5.53	5.78	5.32	0.92	4.57	4.48	4.83	8.19	5.77	4.36	5.41	3.46	3.3	3.92	4.97	6.53	6.84	6.71
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Sample ID	L1227117-51	L1227117-52	L1227117-53	L1227117-54	L1227117-55	L1227117-56	L1227117-89	L1227117-90	L1227117-91	L1227117-92	L1227117-93	L1227117-94	L1227117-95	L1227117-96	L1227117-164	L1227117-165	L1227117-166	L1227117-167	L1227117-168	L1227117-169	L1227117-170
		Area																					
		Unit																					
Aluminum		mg/kg wwt	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.67	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.019	0.0145	0.0179	0.008	0.0486	0.0114	0.0272	0.0207	0.0266	0.0385	0.0462	0.036	0.0465	0.0788	0.0243	0.0493	0.0082	0.0248	0.0138	0.0145	0.0508
Barium		mg/kg wwt	<0.010	0.019	0.041	<0.010	0.031	0.045	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	0.018	0.149	<0.010	0.013	0.016	<0.010	<0.010
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0025	<0.0020	<0.0020	<0.0020
Calcium		mg/kg wwt	204	379	356	131	331	332	86.1	111	127	105	96.5	111	88.1	125	341	881	121	301	276	292	116
Cesium		mg/kg wwt	0.143	0.0925	0.112	0.085	0.795	0.116	1.4	0.62	0.299	0.817	1.24	0.653	0.476	0.697	0.0048	0.126	0.082	0.0062	0.0065	0.0132	0.76
Chromium		mg/kg wwt	0.016	0.036	0.028	0.013	0.022	0.013	<0.010	0.01	0.025	<0.010	<0.010	<0.010	<0.010	0.017	0.017	0.021	0.014	<0.010	0.012	<0.010	<0.010
Cobalt		mg/kg wwt	0.0051	0.0043	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0056	<0.0040	<0.0040	<0.0040	<0.0040	0.0047	0.0063	0.0059	<0.0040	0.0106	0.0064	0.0087	0.0042
Copper		mg/kg wwt	0.212	0.36	0.257	0.17	0.378	0.302	0.356	0.55	0.414	0.554	0.553	0.477	0.329	0.544	0.212	0.349	0.175	0.432	0.369	0.466	0.453
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	2.97	3.94	4.04	2.11	3.14	3.62	2.38	2.38	3.62	4.96	3.44	3.58	3.17	4.56	2.99	4.64	2.29	2.59	3.37	2.8	4.07
Lead		mg/kg wwt	0.0105	0.0109	<0.0040	<0.0040	0.0061	0.0058	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0112	0.0046	<0.0040	<0.0040	<0.0040	<0.0040
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	276	262	271	283	285	290	303	284	287	272	281	301	301	292	291	323	306	246	262	303	278
Manganese		mg/kg wwt	0.0927	0.114	0.7	0.0787	0.119	0.238	0.0741	0.0736	0.0826	0.0868	0.0693	0.0834	0.0803	0.12	0.227	0.229	0.0717	0.16	0.0894	0.146	0.097
Mercury		mg/kg wwt	0.0971	0.108	0.106	0.049	0.0884	0.0473	0.259	0.254	0.148	0.231	0.294	0.246	0.118	0.115	0.0684	0.0553	0.0497	0.113	0.0961	0.12	0.199
Molybdenum		mg/kg wwt	<0.0040	0.004	0.0043	<0.0040	0.0049	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0068	0.0046	<0.0040	<0.0040
Nickel		mg/kg wwt	0.024	0.03	0.032	0.025	0.029	0.015	0.013	0.031	0.024	0.024	0.014	0.021	0.012	0.018	0.024	0.026	0.024	<0.010	0.024	0.017	0.013
Phosphorus		mg/kg wwt	2450	2450	2420	2410	2530	2420	2370	2300	2330	2230	2220	2390	2480	2350	2510	2710	2360	2320	2470	2790	2260
Potassium		mg/kg wwt	4390	4260	3590	3740	3760	4400	4580	3470	4200	4030	4000	4200	4550	4510	4320	4830	4800	4020	4430	5470	3650
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	3.33	2.86	3.38	2.43	10.2	2.45	10.7	5.55	4.48	7.6	9.16	6.06	5.9	5.61	2.76	4.83	2.37	2.58	2.48	2.42	7.39
Selenium		mg/kg wwt	0.141	0.153	0.118	0.133	0.127	0.12	0.15	0.132	0.169	0.143	0.15	0.149	0.165	0.15	0.196	0.089	0.119	0.691	0.617	0.712	0.165
Silver		mg/kg wwt	<0.0010	0.0031	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	0.0011	<0.0010	<0.0010	0.0018	<0.0010	0.0011	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	0.0011	<0.0010
Sodium		mg/kg wwt	464	555	514	438	585	433	384	443	440	507	413	387	367	430	467	524	492	780	650	980	505
Strontium		mg/kg wwt	0.268	0.381	0.429	0.107	0.643	0.337	0.143	0.175	0.161	0.173	0.146	0.143	0.132	0.214	0.265	2.03	0.092	0.212	0.106	0.206	0.187
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00373	0.00388	0.00433	0.0051	0.0078	0.00633	0.00852	0.00515	0.00515	0.00559	0.00849	0.00745	0.00668	0.00678	0.00215	0.00708	0.00496	0.00236	0.00217	0.00269	0.00533
Thorium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.0208	0.0081	0.0135	<0.0040	0.0103	0.0055	<0.0040	0.0105	<0.0040	0.0065	0.0074	0.0068	0.0084	0.0064	0.0162	0.0059	<0.0040	0.0111	0.0362	0.0104	0.0081
Titanium		mg/kg wwt	<0.010	0.015	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium		mg/kg wwt	<0.00040	<0.00040	0.00203	<0.00040	<0.00040	0.00093	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Vanadium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Yttrium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Zinc		mg/kg wwt	6.32	7.87	7.67	3.24	6.89	4.21	3.85	5.04	5.46	4.39	4.52	5.1	4.85	4.64	4.89	5.55	3.88	7.3	7.49	6.9	4.18
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Sample ID	L1227117-33	L1227117-34	L1227117-35	L1227117-36	L1227117-37	L1227117-38	L1227117-39	L1227117-40	L1227117-41	L1227117-42	L1227117-43	L1227117-44	L1227117-45	L1227117-46	L1227117-47	L1227117-48	L1227117-49	L1227117-50
		Area																		
		Unit																		
Aluminum		mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	20.7	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Antimony		mg/kg	<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	<0.010	<0.010
Arsenic		mg/kg	0.302	0.349	0.074	0.027	0.263	0.578	0.08	1.07	0.308	0.845	0.292	0.11	0.107	0.057	0.167	0.195	0.082	0.092
Barium		mg/kg	0.064	0.078	0.076	<0.050	<0.050	0.059	0.06	0.373	0.135	1.47	0.468	0.204	0.163	<0.050	0.471	0.271	0.166	0.077
Beryllium		mg/kg	<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	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010
Boron		mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Calcium		mg/kg	754	1780	1410	245	580	554	806	1290	690	8470	2550	387	534	478	1470	1130	848	1140
Cesium		mg/kg	0.0264	0.0174	0.018	<0.0050	0.0129	0.0172	0.0104	0.0231	0.535	2.58	0.57	0.225	0.368	0.094	0.427	0.526	0.4	0.591
Chromium		mg/kg	0.056	0.076	0.052	<0.050	0.099	<0.050	<0.050	0.107	<0.050	1.15	0.194	<0.050	0.052	<0.050	0.094	0.186	0.109	0.064
Cobalt		mg/kg	0.027	0.037	0.028	<0.020	0.029	<0.020	<0.020	0.036	<0.020	0.093	0.022	<0.020	<0.020	<0.020	<0.020	0.021	0.029	0.023
Copper		mg/kg	1.56	1.23	1.01	0.229	1.47	1.06	1.28	1.85	1.72	4	0.801	0.962	0.913	0.666	1.46	1.71	1.17	0.821
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	14.5	14.5	9.6	3.2	16.1	15	18.9	44.9	18.7	66.1	14.6	10.5	11.6	10.6	15.3	18.4	16.4	14.1
Lead		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.081	0.022	0.269	0.036	0.031	<0.020	<0.020	0.038	0.21	0.023	0.023
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1440	1320	1250	292	1090	1230	1230	1220	1190	6830	1330	1460	1210	1290	1170	1160	1040	1110
Manganese		mg/kg	0.743	1.29	0.828	0.159	0.364	0.514	0.46	1.65	0.465	3.81	0.688	0.376	0.437	0.338	0.8	0.535	0.647	0.456
Mercury		mg/kg	0.334	0.235	0.339	0.053	0.244	0.395	0.361	0.436	0.543	2.29	0.296	0.31	0.511	0.554	0.535	0.227	0.373	0.425
Molybdenum		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.023	<0.020	0.141	<0.020	0.037	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nickel		mg/kg	0.065	0.088	<0.050	<0.050	0.103	0.055	<0.050	0.264	0.092	0.442	0.2	0.101	<0.050	<0.050	0.076	0.14	0.095	0.105
Phosphorus		mg/kg	10800	10700	11300	2290	9840	11500	11200	11800	10400	59100	10900	11300	10300	10800	10300	10000	9560	10000
Potassium		mg/kg	22200	21400	16700	4870	19200	18800	21300	24200	20600	108000	20700	23400	18900	19600	19500	18300	15100	16100
Rhenium		mg/kg	<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	<0.010	<0.010
Rubidium		mg/kg	12.9	11.3	12.6	2.51	7.16	10.6	7.06	11.6	20.3	89.8	23.4	10.9	12.8	8.17	16.9	20.1	11.9	13.8
Selenium		mg/kg	1.03	0.95	1.03	0.19	1.23	1.39	1.36	1.17	0.4	2	0.42	0.35	0.51	0.45	0.46	0.39	0.71	0.65
Silver		mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0059	<0.0050	0.0069	0.0142	0.0054	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0203	0.0075	<0.0050	<0.0050
Sodium		mg/kg	2470	2290	2640	500	2610	3390	2900	4050	2400	11200	2170	2040	2080	2030	1830	1980	1960	1760
Strontium		mg/kg	0.501	1.25	0.966	0.16	0.378	0.42	0.551	1.29	1.9	24.5	6.54	0.471	0.947	0.446	4.33	2.66	1.34	1.31
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0061	0.009	0.0064	<0.0020	0.0061	0.0111	0.0029	0.0138	0.03	0.173	0.0364	0.0379	0.0315	0.0172	0.0373	0.0275	0.0179	0.0152
Thorium		mg/kg	<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	<0.010	<0.010
Tin		mg/kg	0.079	0.086	0.022	0.021	0.02	<0.020	<0.020	0.046	<0.020	0.117	<0.020	0.076	0.027	0.04	0.066	0.036	<0.020	0.056
Titanium		mg/kg	<0.050	0.192	<0.050	0.113	<0.050	<0.050	0.193	0.927	<0.050	0.147	0.196	0.055	<0.050	<0.050	0.053	<0.050	0.064	<0.050
Uranium		mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.049	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Yttrium		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Zinc		mg/kg	25.7	25.9	24.4	4.01	20.2	23.2	22.8	46.2	26.3	108	22.3	16.4	14.6	17	20.9	25.7	27.3	28.3
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Elements	MDL	Sample ID	L1227117-51	L1227117-52	L1227117-53	L1227117-54	L1227117-55	L1227117-56	L1227117-89	L1227117-90	L1227117-91	L1227117-92	L1227117-93	L1227117-94	L1227117-95	L1227117-96	L1227117-164	L1227117-165	L1227117-166	L1227117-167	L1227117-168	L1227117-169	L1227117-170
		Area																					
		Unit																					
Aluminum		mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.8	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Antimony		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.078	0.059	0.072	0.035	0.199	0.05	0.107	0.082	0.102	0.162	0.183	0.147	0.196	0.314	0.101	0.196	0.038	0.1	0.054	0.061	0.211
Barium		mg/kg	<0.050	0.079	0.167	<0.050	0.127	0.196	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.076	0.592	<0.050	0.054	0.064	<0.050	<0.050
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010
Calcium		mg/kg	840	1550	1440	569	1360	1450	339	442	485	444	382	453	372	498	1420	3500	562	1210	1080	1230	483
Cesium		mg/kg	0.59	0.377	0.452	0.37	3.25	0.506	5.5	2.47	1.14	3.45	4.91	2.66	2.01	2.78	0.02	0.501	0.38	0.0251	0.0254	0.0556	3.16
Chromium		mg/kg	0.064	0.145	0.114	0.056	0.091	0.055	<0.050	<0.050	0.097	<0.050	<0.050	<0.050	<0.050	0.067	0.069	0.084	0.064	<0.050	<0.050	<0.050	<0.050
Cobalt		mg/kg	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	0.026	0.023	<0.020	0.043	0.025	0.037	<0.020
Copper		mg/kg	0.874	1.47	1.04	0.738	1.55	1.32	1.4	2.19	1.59	2.34	2.19	1.95	1.39	2.17	0.885	1.39	0.812	1.74	1.45	1.97	1.88
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	12.2	16.1	16.4	9.2	12.8	15.8	9.4	9.5	13.9	20.9	13.6	14.6	13.4	18.2	12.5	18.4	10.6	10.4	13.2	11.8	16.9
Lead		mg/kg	0.043	0.045	<0.020	<0.020	0.025	0.026	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.045	0.021	<0.020	<0.020	<0.020	<0.020
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1140	1070	1100	1230	1170	1270	1190	1130	1100	1150	1110	1230	1270	1160	1210	1280	1420	990	1030	1280	1160
Manganese		mg/kg	0.382	0.463	2.83	0.342	0.487	1.04	0.292	0.293	0.316	0.366	0.274	0.34	0.339	0.477	0.948	0.909	0.333	0.646	0.351	0.618	0.403
Mercury		mg/kg	0.4	0.442	0.43	0.213	0.362	0.206	1.02	1.01	0.568	0.973	1.16	1	0.498	0.46	0.285	0.22	0.231	0.456	0.377	0.505	0.829
Molybdenum		mg/kg	<0.020	<0.020	<0.020	<0.020	0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.028	<0.020	<0.020	<0.020
Nickel		mg/kg	0.1	0.121	0.131	0.107	0.119	0.064	0.053	0.125	0.09	0.101	0.055	0.087	0.05	0.073	0.1	0.103	0.112	<0.050	0.094	0.072	0.055
Phosphorus		mg/kg	10100	9980	9800	10500	10400	10600	9330	9150	8930	9390	8800	9740	10400	9360	10400	10800	10900	9360	9690	11800	9370
Potassium		mg/kg	18100	17400	14500	16300	15400	19200	18000	13800	16100	17000	15800	17100	19200	18000	18000	19200	22300	16200	17400	23100	15200
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010
Rubidium		mg/kg	13.7	11.7	13.7	10.6	41.9	10.7	42.2	22.1	17.2	32.1	36.2	24.7	24.9	22.4	11.5	19.2	11	10.4	9.73	10.2	30.7
Selenium		mg/kg	0.58	0.62	0.48	0.58	0.52	0.52	0.59	0.53	0.65	0.6	0.59	0.61	0.7	0.6	0.82	0.35	0.55	2.78	2.42	3.01	0.69
Silver		mg/kg	<0.0050	0.0127	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0075	<0.0050	<0.0050	<0.0050	0.0053	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium		mg/kg	1910	2260	2080	1900	2390	1890	1510	1770	1690	2140	1640	1580	1550	1710	1950	2080	2280	3100	2600	4100	2100
Strontium		mg/kg	1.1	1.55	1.74	0.467	2.63	1.47	0.561	0.695	0.618	0.728	0.576	0.585	0.558	0.855	1.11	8.06	0.425	0.856	0.418	0.871	0.778
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0154	0.0158	0.0175	0.0222	0.0319	0.0276	0.0335	0.0205	0.0197	0.0236	0.0336	0.0304	0.0282	0.027	0.009	0.0281	0.023	0.0095	0.0085	0.0114	0.0222
Thorium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		mg/kg	0.086	0.033	0.055	<0.020	0.042	0.024	<0.020	0.042	<0.020	0.028	0.029	0.028	0.035	0.026	0.067	0.023	<0.020	0.045	0.142	0.044	0.034
Titanium		mg/kg	<0.050	0.06	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.072	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium		mg/kg	<0.0020	<0.0020	0.0082	<0.0020	<0.0020	0.004	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Yttrium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010
Zinc		mg/kg	26	32.1	31	14.1	28.2	18.3	15.2	20.1	20.9	18.5	17.9	20.8	20.4	18.5	20.4	22	18	29.4	29.4	29.2	17.4
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Liver) Analytical Results for Metals, August 2011/2012 Sampling Program

Elements	MDL	Sample ID	L1110278-1	L1110278-2	L1110278-3	L1110278-4	L1110278-5	L1110278-6	L1110278-7	L1110278-8	L1110278-9	L1110278-10	L1110278-11	L1110278-12	L1110278-13	L1110278-14	L1110278-15	L1110278-16	L1110278-17	L1110278-18	L1110278-19	L1110278-20	L1110278-21	L1110278-22	L1227117-57	L1227117-58	L1227117-59	L1227117-60	L1227117-61	L1227117-62	L1227117-63	L1227117-64
		Area																														
		Unit																														
Aluminum		mg/kg wwt	4.24	2.67	0.89	2.63	1.42	0.58	1.89	1.95	1.54	1.1	2.61	1.73	3.6	1.7	1.35	2.52	2.86	0.92	2.2	5.2	1.34	0.96	5.93	2.69	4	2.44	1.84	5.44	2.16	1.63
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0028	<0.0040	0.0024	<0.0020	<0.0040	0.0022	<0.0040	0.0022
Arsenic		mg/kg wwt	0.0374	0.0314	0.046	0.0405	0.0355	0.032	0.0446	0.0474	0.0328	0.0302	0.0302	0.0309	0.0162	0.0328	0.0649	0.0278	0.0183	0.06	0.0203	0.0416	0.0339	0.0611	0.142	0.0521	0.0992	0.0716	0.0353	0.0485	0.101	0.0502
Barium		mg/kg wwt	0.05	0.021	<0.010	0.015	0.031	0.02	0.104	0.032	0.039	0.024	0.036	0.043	0.034	0.018	0.033	0.027	0.029	0.032	0.023	0.056	0.018	0.041	0.087	0.09	0.136	0.085	0.027	0.073	0.038	0.043
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0020	<0.0020	<0.0040	<0.0020	<0.0040	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0020	<0.0020	<0.0040	<0.0020	<0.0040	<0.0020
Boron		mg/kg wwt	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.60	<0.20	<0.40	<0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.20	0.21	<0.40	<0.20	<0.40	<0.20
Cadmium		mg/kg wwt	0.153	0.173	0.133	0.162	0.121	0.216	0.167	0.0485	0.0617	0.0412	0.0558	0.0585	0.093	0.034	0.0105	0.007	0.0265	0.005	0.0151	0.184	0.0355	0.0054	0.189	0.104	0.207	0.168	0.149	0.0544	0.0762	0.175
Calcium		mg/kg wwt	87	71	41.9	42	87.7	42	73.5	107	98	505	119	138	111	96.8	81.7	82.8	90.9	105	75.9	107	89.5	106	131	119	97	82	80	59	107	117
Cesium		mg/kg wwt	0.0578	0.0432	0.0395	0.0505	0.0594	0.0736	0.0293	0.148	0.101	0.187	0.0661	0.0512	0.0609	0.0849	0.148	0.0785	0.0352	0.167	0.0291	0.0684	0.101	0.164	0.0119	0.0083	0.0204	0.0174	0.0176	0.0133	0.0077	0.0091
Chromium		mg/kg wwt	0.121	0.176	0.064	0.082	0.081	0.032	0.09	0.249	0.281	0.073	0.141	0.085	0.13	0.062	0.044	0.061	0.076	0.106	0.042	0.145	0.073	0.091	<0.11	<0.080	<0.56	<0.070	<0.090	<0.080	<0.060	<0.030
Cobalt		mg/kg wwt	0.017	0.0174	0.0208	0.0186	0.0273	0.0251	0.0354	0.0162	0.0168	0.0122	0.0137	0.0111	0.0138	0.0125	0.0186	0.0343	0.0178	0.0252	0.0204	0.0203	0.0159	0.0232	0.0983	0.054	0.0682	0.0751	0.0424	0.0368	0.0523	0.0267
Copper		mg/kg wwt	16.2	13.6	42.6	29.3	23.5	31.2	24.5	103	30.4	9.38	55.5	21.5	55.4	15.7	121	87	84	82.4	73.4	33.3	26.9	88.5	81	53.6	86.6	65.5	62.1	73.7	46.5	54.6
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0080	<0.0040	<0.0040	<0.0080	<0.0040	<0.0080	<0.0040
Iron		mg/kg wwt	114	144	125	199	87.6	72.5	102	398	117	80.1	255	106	78.7	126	110	190	61.5	123	270	123	163	116	192	173	217	148	127	164	114	175
Lead		mg/kg wwt	0.0067	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.01	0.0107	0.0352	0.0126	0.0137	0.019	0.0163	<0.0040	0.0068	<0.0040	<0.0040	0.0056	0.0065	0.0081	0.0044	0.0046	0.0079	0.0142	0.0308	0.005	<0.0080	0.0133	0.113	<0.0040
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	0.029	0.028	<0.040	<0.020	<0.040	<0.020
Magnesium		mg/kg wwt	181	189	205	203	215	209	224	207	198	781	209	201	192	215	215	176	180	176	198	219	215	180	321	277	302	255	246	233	378	237
Manganese		mg/kg wwt	1.29	1.1	1.03	1.41	1.38	1.43	1.75	1.29	1.43	1.79	1.27	1.69	1.11	1.42	1.75	1.45	1.1	1.54	1.29	1.59	1.65	1.61	3.56	2.18	2.47	2.15	1.81	1.63	3.21	1.6
Mercury		mg/kg wwt	0.136	0.0864	0.137	0.134	0.0978	0.0918	0.0966	0.171	0.0877	0.137	0.104	0.115	0.103	0.15	0.221	0.129	0.107	0.138	0.118	0.107	0.143	0.147	0.258	0.0271	0.123	0.105	0.0231	0.0507	0.0153	0.206
Molybdenum		mg/kg wwt	0.198	0.157	0.236	0.308	0.216	0.224	0.196	0.31	0.256	0.205	0.272	0.289	0.233	0.223	0.388	0.291	0.298	0.29	0.315	0.244	0.283	0.297	0.319	0.233	0.305	0.275	0.218	0.234	0.33	0.277
Nickel		mg/kg wwt	0.057	0.091	<0.020	<0.040	<0.030	<0.050	0.05	0.123	0.145	0.087	0.054	0.052	0.068	0.049	<0.030	<0.030	<0.030	<0.040	<0.030	0.087	0.072	<0.060	<0.10	<0.090	0.334	<0.060	0.219	<0.060	<0.060	<0.040
Phosphorus		mg/kg wwt	3170	3720	3990	4010	3860	4090	4230	3730	3610	3560	3920	3650	3440	3850	4250	3330	3480	3350	3950	4050	4170	3500	6020	5240	5110	4920	4890	4840	7320	4380
Potassium		mg/kg wwt	2640	2770	3590	3450	2970	2860	3260	3220	3140	3070	3090	2780	3160	3050	3790	3420	3240	3520	3710	3260	3220	3360	4530	3600	4190	3510	3500	3630	4800	3980
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0020	<0.0020	<0.0040	<0.0020	<0.0040	<0.0020
Rubidium		mg/kg wwt	3.38	2.66	4.39	3.62	3.55	3.21	5.31	3.89	3.77	4.15	2.67	2.68	3.2	3.25	8.29	6	3.19	7.45	2.35	4.08	3.77	7.19	4.07	2.76	3.5	3.74	3.2	2.61	3.13	2.49
Selenium		mg/kg wwt	3.42	3.42	4.06	3.58	2.92	2.89	2.25	5.12	2.68	1.53	2.95	1.59	1.42	1.8	2.91	1.91	1.63	2.02	2.15	5.38	2.07	2.19	9.03	6.52	5.95	6.24	5.87	6.69	7.49	7.93
Silver		mg/kg wwt	1.05	1.31	1.65	1.63	1.15	1.23	1.26	4.78	2.14	2.17	4	2.4	2.66	3.3	3.63	1.57	3.48	0.92	4.18	2.25	2.84	1.1	2.36	1.48	2.43	1.94	2.15	0.935	0.861	1.62
Sodium		mg/kg wwt	1080	1140	1180	1240	1220	900	1200	1100	970	1140	1020	1040	1030	950	1160	1280	1430	1820	1360	1320	1010	1750	1840	1700	1160	1230	1400	1170	1800	1850
Strontium		mg/kg wwt	0.138	0.091	0.063	0.072	0.217	0.08	0.141	0.278	0.176	0.39	0.213	0.347	0.169	0.15	0.328	0.272	0.269	0.419	0.213	0.179	0.166	0.429	0.205	0.126	0.139	0.12	0.108	0.072	0.108	0.147
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0080	<0.0040	<0.0040	<0.0080	<0.0040	<0.0080	<0.0040
Thallium		mg/kg wwt	0.0284	0.0321	0.0388	0.0379	0.0374	0.0435	0.0311	0.0372	0.0178	0.0233	0.0235	0.0253	0.0268	0.0354	0.186	0.0737	0.0444	0.128	0.0849	0.0314	0.049	0.127	0.0363	0.0244	0.0324	0.0362	0.0262	0.0239	0.0406	0.018
Thorium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0020	<0.0020	<0.0040	<0.0020	<0.0040	<0.0020
Tin		mg/kg wwt	<0.016	<0.024	0.0068	0.0052	0.0714	<0.0040	<0.020	<0.0040	<0.0040	<0.012	<0.0080	<0.0040	<0.0080	<0.0040	0.0107	0.0112	0.0164	0.0124	0.0142	<0.012	<0.0040	0.0203	0.0504	0.126	0.104	0.153	0.0471	0.1	0.0708	0.0313
Titanium		mg/kg wwt	0.208	0.115	0.016	0.014	0.018	0.014	0.122	0.152	0.043	0.024	0.072	0.06	0.389	0.031	0.066	0.102	0.176	0.025	0.129	0.275	0.069	0.016	0.521	0.199	0.121	0.07	0.081	0.312	0.078	0.069
Uranium		mg/kg wwt	0.00187	0.0011	0.0007	0.00118	0.00093	0.00107	0.00107	0.00311	0.00384	0.00516	0.00533	0.00618	0.00755	0.00364	0.00146	0.00119	0.00292	0.00065	0.00077	0.00261	0.00424	0.00072	0.00267	0.00095	0.00125	0.00087	0.00087	0.00101	<0.00080	0.00057
Vanadium		mg/kg wwt	0.0297	0.025	0.0145	0.0395	0.0115	0.0074	0.0145	0.021	0.0099	0.0211	0.0151	0.0136	0.0225	0.0115	0.0135	0.0148	0.0215	0.0117	0.011	0.0364	0.0157	0.0105	0.0559	0.0305	0.0397	0.0346	0.0263	0.0403	0.0198	0.0243
Yttrium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0025	<0.0020	<0.0020	0.0042	<0.0040	0.0038	0.0036	<0.0040	0.0056	<0.0040	<0.0020
Zinc		mg/kg wwt	30.5	26.8	28	31.2	27.5	28.1	32.8	54.5	34.7	30.2	33.6	31.5	38.9	33.3	33.7	31.9	29.8	28.6	30.8	37	38	29.5	76.5	33.3	41.4	35.7	29.4	31.9	44.1	30.7
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.048	<0.040	<0.040	<0.040	<0.040	<0.080	<0.040	0.086	<0.080	<0.040	<0.080	<0.040

Elements	MDL	Sample ID	L1110278-1	L1110278-2	L1110278-3	L1110278-4	L1110278-5	L1110278-6	L1110278-7	L1110278-8	L1110278-9	L1110278-10	L1110278-11	L1110278-12	L1110278-13	L1110278-14	L1110278-15	L1110278-16	L1110278-17	L1110278-18	L1110278-19	L1110278-20	L1110278-21	L1110278-22	L1227117-57	L1227117-58	L1227117-59	L1227117-60	L1227117-61	L1227117-62	L1227117-63	L1227117-64
		Area																														
		Unit																														
Aluminum		mg/kg	14	9.9	2.9	9.2	4.9	<2.0	5.5	6.7	6.5	4.6	9.5	6.6	12.9	5.7	4.3	10.3	11.8	3.8	8	17.5	4.5	3.9	12.1	7.5	10	7	5.4	15.4	4.5	4.6
Antimony		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.123	0.116	0.15	0.141	0.122	0.108	0.131	0.162	0.137	0.126	0.11	0.118	0.058	0.11	0.208	0.113	0.075	0.251	0.074	0.14	0.113	0.248	0.289	0.144	0.249	0.206	0.104	0.137	0.208	0.142
Barium		mg/kg	0.166	0.08	<0.050	0.053	0.107	0.068	0.306	0.111	0.162	0.099	0.132	0.165	0.12	0.06	0.106	0.108	0.121	0.134	0.084	0.187	0.062	0.168	0.178	0.25	0.342	0.244	0.079	0.206	0.079	0.121
Beryllium		mg/kg	<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	<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
Bismuth		mg/kg	<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	<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
Boron		mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<1.0	<2.0	<3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	0.506	0.641	0.433	0.566	0.415	0.728	0.488	0.166	0.258	0.172	0.204	0.223	0.333	0.114	0.034	0.028	0.109	0.021	0.055	0.62	0.119	0.022	0.386	0.289	0.518	0.484	0.438	0.154	0.158	0.495
Calcium		mg/kg	286	262	137	147	301	141	215	366	410	2110	433	528	395	324	262	337	374	441	276	360	299	432	267	330	242	237	236	167	222	332
Cesium		mg/kg	0.191	0.16	0.129	0.177	0.204	0.247	0.0858	0.508	0.424	0.779	0.242	0.195	0.218	0.284	0.475	0.319	0.145	0.697	0.106	0.23	0.338	0.668	0.0243	0.0231	0.0512	0.0502	0.0517	0.0377	0.0159	0.0256
Chromium		mg/kg	0.399	0.652	0.209	0.288	0.278	0.107	0.264	0.852	1.17	0.303	0.516	0.323	0.466	0.209	0.143	0.247	0.31	0.444	0.152	0.488	0.244	0.371	<0.25	<0.25	<1.4	<0.20	<0.30	<0.25	<0.15	<0.10
Cobalt		mg/kg	0.056	0.064	0.068	0.065	0.094	0.084	0.104	0.055	0.07	0.051	0.05	0.042	0.049	0.042	0.06	0.14	0.073	0.105	0.074	0.068	0.053	0.094	0.201	0.15	0.171	0.216	0.125	0.104	0.108	0.075
Copper		mg/kg	53.5	50.6	139	103	80.9	105	71.8	353	127	39.1	203	82	198	52.5	389	354	345	345	266	112	90	360	166	149	217	189	183	209	96.2	154
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	375	533	409	696	301	244	297	1360	488	334	931	406	282	420	353	772	252	516	982	415	543	470	393	480	544	426	374	465	237	494
Lead		mg/kg	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	0.029	0.037	0.147	0.053	0.05	0.073	0.058	<0.020	0.022	<0.020	<0.020	0.023	0.023	0.027	<0.020	<0.020	<0.020	0.039	0.077	<0.020	<0.020	0.038	0.234	<0.020
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	600	700	669	709	737	700	657	708	828	3250	762	768	687	721	689	718	738	735	719	740	719	732	660	770	760	740	730	660	780	670
Manganese		mg/kg	4.26	4.08	3.37	4.91	4.73	4.82	5.14	4.4	5.99	7.44	4.64	6.43	3.98	4.75	5.62	5.92	4.52	6.42	4.69	5.36	5.53	6.57	7.29	6.04	6.19	6.19	5.34	4.63	6.65	4.53
Mercury		mg/kg	0.448	0.32	0.447	0.467	0.336	0.309	0.283	0.587	0.367	0.571	0.38	0.439	0.369	0.501	0.708	0.526	0.439	0.576	0.429	0.361	0.477	0.598	0.527	0.075	0.31	0.303	0.068	0.144	0.032	0.582
Molybdenum		mg/kg	0.654	0.582	0.768	1.08	0.744	0.753	0.575	1.06	1.07	0.853	0.993	1.1	0.833	0.747	1.25	1.18	1.22	1.21	1.14	0.82	0.945	1.21	0.652	0.645	0.766	0.792	0.642	0.663	0.682	0.781
Nickel		mg/kg	0.187	0.337	<0.10	<0.15	<0.10	<0.20	0.147	0.421	0.607	0.361	0.196	0.197	0.244	0.165	<0.10	<0.15	<0.15	<0.20	<0.10	0.292	0.24	<0.25	<0.20	<0.25	0.839	<0.20	<0.65	<0.15	<0.15	<0.15
Phosphorus		mg/kg	10500	13800	13000	14000	13300	13800	12400	12800	15100	14800	14300	13900	12300	12900	13600	13600	14300	14000	14300	13600	13900	14200	12300	14500	12800	14200	14400	13700	15100	12400
Potassium		mg/kg	8700	10300	11700	12100	10200	9600	9500	11000	13100	12800	11300	10600	11300	10200	12200	13900	13300	14700	13500	11000	10800	13700	9300	10000	10500	10100	10400	10300	10000	11300
Rhenium		mg/kg	<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	<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
Rubidium		mg/kg	11.1	9.86	14.3	12.7	12.2	10.8	15.6	13.3	15.8	17.3	9.73	10.2	11.5	10.9	26.6	24.4	13.1	31.2	8.52	13.7	12.6	29.3	8.32	7.65	8.78	10.8	9.42	7.41	6.47	7.02
Selenium		mg/kg	11.3	12.7	13.3	12.5	10	9.7	6.59	17.5	11.2	6.39	10.8	6.08	5.09	6.01	9.32	7.76	6.7	8.43	7.82	18.1	6.93	8.93	18.5	18.1	14.9	18	17.3	18.9	15.5	22.4
Silver		mg/kg	3.48	4.84	5.39	5.69	3.94	4.12	3.68	16.4	8.93	9.06	14.6	9.14	9.52	11	11.6	6.38	14.3	3.85	15.2	7.56	9.49	4.48	4.82	4.11	6.09	5.58	6.34	2.65	1.78	4.57
Sodium		mg/kg	3600	4200	3800	4300	4200	3000	3500	3800	4100	4700	3700	4000	3700	3200	3700	5200	5900	7600	4900	4400	3400	7100	3800	4600	2900	3500	4200	3300	3800	5200
Strontium		mg/kg	0.455	0.336	0.207	0.25	0.747	0.27	0.413	0.95	0.736	1.62	0.779	1.32	0.606	0.503	1.05	1.11	1.1	1.75	0.775	0.601	0.555	1.75	0.419	0.35	0.35	0.346	0.317	0.203	0.223	0.415
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0936	0.119	0.127	0.133	0.129	0.146	0.091	0.127	0.0743	0.0971	0.0858	0.0967	0.0959	0.118	0.597	0.3	0.183	0.536	0.308	0.106	0.164	0.518	0.0742	0.0677	0.0812	0.104	0.0771	0.0676	0.084	0.0508
Thorium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		mg/kg	<0.060	<0.080	0.022	<0.020	0.246	<0.020	<0.060	<0.020	<0.020	<0.040	<0.020	<0.020	<0.020	<0.020	0.034	0.046	0.067	0.052	0.051	<0.040	<0.020	0.083	0.103	0.35	0.262	0.44	0.139	0.284	0.147	0.088
Titanium		mg/kg	0.686	0.427	0.051	<0.050	0.061	<0.050	0.358	0.521	0.18	0.101	0.265	0.23	1.39	0.105	0.211	0.415	0.723	0.104	0.469	0.924	0.231	0.066	1.07	0.552	0.304	0.203	0.239	0.885	0.162	0.195
Uranium		mg/kg	0.0062	0.0041	0.0023	0.0041	0.0032	0.0036	0.0031	0.0106	0.0161	0.0215	0.0195	0.0236	0.027	0.0122	0.0047	0.0048	0.012	0.0027	0.0028	0.0088	0.0142	0.0029	0.0055	0.0026	0.0031	0.0025	0.0026	0.0029	<0.0020	<0.0020
Vanadium		mg/kg	0.098	0.093	0.047	0.138	0.039	0.025	0.043	0.072	0.041	0.088	0.055	0.052	0.081	0.039	0.043	0.06	0.088	0.049	0.04	0.123	0.053	0.043	0.114	0.085	0.1	0.1	0.077	0.114	0.041	0.068
Yttrium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	<0.010	0.016	<0.010	<0.010
Zinc		mg/kg	101	99.5	91.4	109	94.6	94.6	96.2	187	145	126	123	120	139	111	108	130	122	119	112	124	127	120	156	92.3	104	103	86.7	90.5	91.2	86.6
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.25	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Liver) Analytical Results for Metals, September 2012 Sampling Program

Elements	MDL	Sample ID	L1227117-65	L1227117-66	L1227117-67	L1227117-68	L1227117-69	L1227117-70	L1227117-71	L1227117-72	L1227117-73	L1227117-74	L1227117-75	L1227117-76	L1227117-77	L1227117-78	L1227117-79	L1227117-80	L1227117-81	L1227117-82	L1227117-83
		Area																			
		Unit																			
Aluminum		mg/kg wwt	1.14	3.13	0.84	1.07	2.01	2.36	3.81	9.74	4.39	2.26	2.41	2.25	2.95	0.92	1.97	1.59	1.24	1.18	1.11
Antimony		mg/kg wwt	<0.0020	<0.0020	0.0063	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0472	0.0756	0.0624	0.0514	0.0463	0.0583	0.026	0.0838	0.0479	0.0325	0.0356	0.0246	0.0314	0.0154	0.0495	0.0322	0.0371	0.038	0.0295
Barium		mg/kg wwt	0.051	0.037	0.032	0.034	0.045	0.037	0.029	0.069	0.033	0.405	0.071	0.055	0.046	0.05	0.052	0.067	0.02	0.023	0.011
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	0.0021	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	2.77	<0.20	<0.20	2.27	0.23	0.4	<0.20	<0.20	<0.20	<0.20	2.22	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	0.0964	0.0915	0.0481	0.0748	0.079	0.154	0.0988	0.414	0.0302	0.0398	0.0356	0.0302	0.0317	0.0208	0.0174	0.0212	0.15	0.0785	0.0733
Calcium		mg/kg wwt	479	104	114	75.9	79	64.9	61.2	89.4	72.1	102	207	99.9	108	96	81.8	106	88.4	105	117
Cesium		mg/kg wwt	0.0038	0.0028	0.0035	0.0024	0.0039	0.0019	<0.0010	0.0026	0.0702	0.0557	0.0619	0.0261	0.0329	0.0133	0.0775	0.0654	0.0771	0.111	0.0918
Chromium		mg/kg wwt	<0.020	<0.13	<0.020	<0.10	<0.020	0.267	0.087	<0.090	<0.030	0.028	0.078	<0.040	0.336	<0.050	0.03	<0.070	<0.070	0.296	<0.14
Cobalt		mg/kg wwt	0.0302	0.0673	0.0529	0.0354	0.0546	0.0294	0.0188	0.0433	0.0323	0.0223	0.0241	0.0147	0.0229	0.0153	0.0202	0.0231	0.0284	0.0231	0.0208
Copper		mg/kg wwt	122	114	142	105	135	182	98.9	420	72	253	202	96.1	235	67.2	179	218	118	62.5	123
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	317	344	250	263	438	243	371	370	136	318	186	308	503	359	135	255	473	505	298
Lead		mg/kg wwt	<0.0040	0.0059	0.0099	<0.0040	<0.0040	<0.0040	0.0062	<0.0040	0.0173	0.0188	0.0236	0.0264	0.0161	0.048	0.0122	0.051	0.008	0.0134	0.0269
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	235	243	294	268	185	200	158	183	206	261	236	257	221	262	219	220	269	260	224
Manganese		mg/kg wwt	2.16	2.4	2.81	1.97	2.08	1.48	1.01	1.76	1.67	1.46	1.21	1.59	1.58	1.29	1.46	1.21	1.73	1.78	1.25
Mercury		mg/kg wwt	0.109	0.0988	0.192	0.159	0.0981	0.106	0.0785	0.116	0.18	0.161	0.177	0.133	0.189	0.3	0.179	0.0951	0.194	0.204	0.142
Molybdenum		mg/kg wwt	0.239	0.267	0.312	0.328	0.256	0.371	0.216	0.556	0.311	0.461	0.344	0.389	0.378	0.287	0.367	0.296	0.481	0.414	0.333
Nickel		mg/kg wwt	<0.030	0.174	<0.050	<0.070	<0.030	0.115	0.047	<0.060	<0.020	0.181	0.055	<0.030	0.182	<0.060	0.019	<0.050	<0.050	0.132	<0.070
Phosphorus		mg/kg wwt	4710	4840	5720	5340	3680	3810	2780	3550	3990	5220	4920	5170	4520	4990	4290	4080	5500	5010	4340
Potassium		mg/kg wwt	4380	3570	5000	5150	3210	3280	2500	3150	3220	4370	4000	4180	3780	4170	3120	3580	4540	4310	4240
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	3.09	2.83	3.15	3.34	1.8	1.97	1.11	1.9	4.04	4.02	4.95	2.57	3.05	2.07	3.65	4.31	3.85	3.83	4
Selenium		mg/kg wwt	3.93	7.13	5.97	6.5	15.5	17.1	9.03	41.4	1.42	7.41	4.03	3.18	10.6	8.84	3.96	4.51	11.7	11.1	9.63
Silver		mg/kg wwt	1.72	2.31	2.14	2.65	0.999	1.05	3.61	1.58	1	2.74	2.5	3.51	1.23	2.22	1.79	1.45	2.27	1.32	1.91
Sodium		mg/kg wwt	1130	1250	2000	1450	1440	1560	1150	1490	1250	1480	1770	1630	1240	1610	1420	1730	1510	1230	1240
Strontium		mg/kg wwt	0.376	0.124	0.128	0.063	0.112	0.101	0.076	0.166	0.357	0.42	0.602	0.273	0.365	0.204	0.416	0.363	0.179	0.188	0.24
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	0.0086	0.0103	<0.0040	0.0202	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.0103	0.0175	0.0184	0.00912	0.00809	0.0212	0.00417	0.0311	0.0474	0.0685	0.0544	0.0593	0.0893	0.0403	0.0864	0.0706	0.0583	0.0573	0.0322
Thorium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.0741	0.144	0.03	0.0925	0.125	0.0573	0.041	0.0367	0.251	0.0753	0.0483	0.0831	0.0454	0.103	0.0766	0.159	0.0255	0.078	0.205
Titanium		mg/kg wwt	<0.010	0.113	0.026	0.033	0.015	0.025	0.085	0.349	0.021	0.017	0.015	0.016	0.012	0.016	0.019	0.021	0.014	0.03	0.01
Uranium		mg/kg wwt	0.0011	0.00233	<0.00040	0.0007	0.00248	0.00388	0.00574	0.0139	0.011	0.00249	0.00317	0.0035	0.00369	0.00081	0.0033	0.00208	0.00959	0.00855	0.00326
Vanadium		mg/kg wwt	0.0607	0.0563	0.0153	0.0317	0.0843	0.22	0.298	0.948	0.075	0.022	0.0372	0.0226	0.0361	0.0068	0.0288	0.0244	0.0262	0.0263	0.014
Yttrium		mg/kg wwt	0.0024	0.0036	<0.0020	0.0021	0.0022	0.0023	0.0035	0.007	0.006	<0.0020	0.0023	<0.0020	0.0021	<0.0020	<0.0020	0.0023	0.0051	<0.0020	<0.0020
Zinc		mg/kg wwt	46	51.3	54.6	38.1	30.5	39.2	123	43.2	37.4	40.6	43.9	46.3	43	42.8	39.7	33	44.7	36.3	46.7
Zirconium		mg/kg wwt	<0.040	0.044	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	L1227117-84	L1227117-85	L1227117-86	L1227117-87	L1227117-88	L1227117-97	L1227117-98	L1227117-99	L1227117-100	L1227117-101	L1227117-102	L1227117-103	L1227117-104	L1227117-175	L1227117-176	L1227117-177	L1227117-178	L1227117-179	L1227117-180	L1227117-181
Aluminum	0.58	1.47	2.32	2.2	3.14	0.54	0.78	<0.40	0.6	<0.40	<0.40	<0.40	0.57	<0.40	3.92	2.21	2.78	1.71	3.74	2.1
Antimony	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic	0.0194	0.0342	0.0191	0.063	0.0223	0.0627	0.0638	0.0716	0.0406	0.0342	0.0347	0.0794	0.0995	0.0431	0.0537	0.0367	0.0361	0.0518	0.0417	0.0631
Barium	0.044	0.02	0.035	0.026	0.072	<0.010	0.043	0.031	0.035	0.013	0.015	0.024	0.033	0.014	0.371	0.031	0.038	0.025	0.044	0.023
Beryllium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020
Boron	<0.20	2.52	0.25	0.26	<0.20	<0.20	0.27	<0.20	0.36	0.72	<0.20	1.17	<0.20	0.38	3.3	<0.40	<0.20	<0.20	<0.20	<0.20
Cadmium	0.049	0.0805	0.104	0.0343	0.116	0.0089	0.0165	0.0172	0.0113	0.0073	0.0078	0.0129	0.0145	0.0089	0.114	0.169	0.0474	0.0877	0.0271	0.0333
Calcium	126	200	121	101	562	97.6	248	176	211	96.3	104	216	206	90.7	118	98	62	84.3	82.8	106
Cesium	0.0717	0.0878	0.0506	0.662	0.0622	1.07	0.537	0.263	0.516	0.893	0.516	0.369	0.598	1.01	0.0092	0.0185	0.0133	0.0038	0.0671	0.677
Chromium	0.026	0.034	0.065	<0.060	<0.23	0.019	1.52	<0.020	0.013	0.042	0.015	0.011	<0.010	0.049	<0.090	<0.090	<0.050	<0.020	<0.030	<0.060
Cobalt	0.0147	0.0191	0.0129	0.0153	0.011	0.0159	0.0281	0.0388	0.0186	0.02	0.0171	0.0192	0.0263	0.0229	0.0533	0.0488	0.0255	0.0568	0.0293	0.0145
Copper	19.9	72.5	121	89.6	88.2	82.4	88.1	69.8	129	58.8	42.8	45.5	43.6	70.2	64.4	74.1	97.3	138	54.9	98.3
Gallium	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0080	<0.0080	<0.0040	<0.0040	<0.0040	<0.0040
Iron	138	220	266	37.5	103	57.6	157	220	187	169	143	190	231	205	188	150	183	445	131	36.8
Lead	0.0198	0.0096	0.0213	0.0258	0.0092	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0213	0.0093	0.0067	<0.0040	0.0318	0.0147
Lithium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.040	<0.020	<0.020	<0.020	<0.020
Magnesium	267	255	225	233	203	189	217	218	200	236	213	166	236	239	258	256	244	186	214	230
Manganese	1.96	2.35	1.3	1.26	1.37	0.899	1.15	0.894	0.733	1.26	1.75	0.645	2.31	1.48	2.23	2.09	1.62	2.05	1.6	1.22
Mercury	0.244	0.254	0.123	0.207	0.0848	0.325	0.473	0.22	0.399	0.518	0.249	0.172	0.149	0.543	0.028	0.0169	0.0359	0.102	0.182	0.193
Molybdenum	0.296	0.415	0.355	0.374	0.273	0.211	0.271	0.2	0.192	0.196	0.202	0.143	0.198	0.222	0.255	0.241	0.23	0.253	0.281	0.365
Nickel	0.104	0.021	0.029	<0.030	0.099	<0.010	0.044	<0.020	0.017	0.026	0.013	<0.010	<0.010	0.027	<0.11	<0.060	<0.040	<0.020	<0.020	<0.030
Phosphorus	4690	4880	4470	4280	4110	3230	3400	3660	3280	3620	3630	2780	3500	3800	5450	5030	4950	3590	4180	4150
Potassium	4770	4160	4570	4290	3490	3510	3280	3670	2960	3580	3490	3090	3370	3570	3800	3500	3460	3250	3420	4160
Rhenium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium	3.98	3.69	2.84	11.1	2.21	9.61	5.35	4.23	5.41	7.97	6.06	4.05	6.23	8.85	2.99	3.22	2.67	1.83	3.9	11.6
Selenium	2.78	6.22	2.4	2.01	1.6	2.94	5.24	6.65	4.38	1.4	2.22	4.94	2.41	1.74	7.54	6.44	7.82	16.9	1.14	2.01
Silver	3.2	1.99	1.45	2.48	2.21	1.88	1.02	0.851	0.707	0.632	0.344	0.307	0.113	0.548	1.7	2.36	1.18	1.33	1.55	1.98
Sodium	1100	1460	1370	1210	1480	1540	1270	1450	1230	1200	1110	1450	1140	1200	1800	<1400	1100	1430	1300	1140
Strontium	0.24	0.264	0.142	0.327	0.594	0.381	0.95	0.561	0.654	0.218	0.283	0.722	0.842	0.252	0.165	0.137	0.063	0.103	0.367	0.312
Tellurium	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0080	<0.0080	<0.0040	0.0086	<0.0040	<0.0040
Thallium	0.0284	0.0375	0.0295	0.125	0.0511	0.0721	0.0418	0.0612	0.049	0.0468	0.039	0.0535	0.043	0.0533	0.0257	0.0292	0.0214	0.00872	0.0461	0.118
Thorium	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0040	<0.0020	<0.0020	<0.0020	<0.0020
Tin	0.132	0.174	0.0279	0.0617	0.0795	0.0252	0.0508	0.0589	0.0314	0.0416	0.0416	0.0413	0.0297	0.0426	0.173	0.101	0.0428	0.0712	0.0136	0.0574
Titanium	0.012	0.055	0.015	0.013	0.01	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.181	0.048	0.12	0.025	0.015	<0.010
Uranium	0.00263	0.0114	0.0117	0.00696	0.0263	0.00332	0.00309	0.00296	0.00231	0.00411	0.00123	0.00296	0.00418	0.00482	0.00117	0.001	0.00072	0.00255	0.00979	0.00731
Vanadium	0.0103	0.0217	0.026	0.0227	0.0325	0.0144	0.0135	0.0082	0.0089	0.0083	0.004	0.0054	0.0179	0.0102	0.0339	0.0309	0.027	0.0867	0.0697	0.0235
Yttrium	0.0024	0.0033	0.0023	<0.0020	0.0031	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0040	<0.0040	0.0035	0.0021	0.006	<0.0020
Zinc	40.4	44.9	39.7	36.6	32.2	24.6	58.6	62.1	37	27.3	35.5	28.4	37.2	30.5	36.4	35.5	30	33.3	36.3	36.6
Zirconium	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.080	<0.080	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Sample ID	L1227117-65	L1227117-66	L1227117-67	L1227117-68	L1227117-69	L1227117-70	L1227117-71	L1227117-72	L1227117-73	L1227117-74	L1227117-75	L1227117-76	L1227117-77	L1227117-78	L1227117-79	L1227117-80	L1227117-81	L1227117-82	L1227117-83
		Area																			
		Unit																			
Aluminum		mg/kg	3.6	8.3	<2.0	3.1	7.7	8.9	17.6	35.7	15.8	6.7	7.3	6.8	9.2	2.4	6.8	5.9	3.2	3.2	3.5
Antimony		mg/kg	<0.010	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.149	0.202	0.146	0.147	0.177	0.22	0.12	0.308	0.172	0.096	0.108	0.074	0.098	0.04	0.171	0.119	0.096	0.103	0.093
Barium		mg/kg	0.162	0.099	0.074	0.099	0.171	0.138	0.132	0.255	0.12	1.2	0.216	0.166	0.143	0.13	0.178	0.249	0.051	0.063	<0.050
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010
Boron		mg/kg	<1.0	7.4	<1.0	<1.0	8.7	<1.0	1.9	<1.0	<1.0	<1.0	<1.0	6.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	0.304	0.244	0.113	0.214	0.302	0.579	0.456	1.52	0.109	0.118	0.108	0.091	0.099	0.054	0.06	0.078	0.388	0.213	0.231
Calcium		mg/kg	1510	277	267	217	303	244	282	328	259	302	630	301	337	250	282	391	229	284	369
Cesium		mg/kg	0.012	0.0076	0.0082	0.0069	0.015	0.0072	<0.0050	0.0097	0.252	0.165	0.188	0.0786	0.103	0.0346	0.267	0.241	0.199	0.301	0.289
Chromium		mg/kg	<0.10	<0.35	<0.050	<0.30	<0.10	1.01	0.403	<0.35	<0.10	0.084	0.236	<0.10	1.05	<0.15	0.102	<0.25	<0.20	0.801	<0.45
Cobalt		mg/kg	0.095	0.179	0.124	0.101	0.209	0.111	0.087	0.159	0.116	0.066	0.073	0.044	0.072	0.04	0.07	0.085	0.073	0.063	0.065
Copper		mg/kg	385	305	331	300	514	683	456	1540	259	751	613	289	733	175	618	804	305	169	387
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	1000	917	585	752	1670	914	1710	1360	487	943	566	926	1570	938	466	942	1220	1370	940
Lead		mg/kg	<0.020	<0.020	0.023	<0.020	<0.020	<0.020	0.029	<0.020	0.062	0.056	0.072	0.079	0.05	0.125	0.042	0.188	0.021	0.036	0.085
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	741	648	687	769	706	755	728	670	739	773	716	773	691	683	756	812	697	705	705
Manganese		mg/kg	6.83	6.39	6.57	5.63	7.95	5.56	4.66	6.47	6	4.33	3.68	4.77	4.93	3.36	5.04	4.47	4.47	4.84	3.94
Mercury		mg/kg	0.343	0.263	0.449	0.455	0.375	0.4	0.362	0.425	0.646	0.477	0.538	0.401	0.589	0.783	0.618	0.351	0.501	0.552	0.446
Molybdenum		mg/kg	0.753	0.711	0.73	0.94	0.98	1.4	0.994	2.04	1.12	1.37	1.05	1.17	1.18	0.749	1.27	1.09	1.24	1.12	1.05
Nickel		mg/kg	<0.10	0.463	<0.15	<0.20	<0.10	0.431	0.217	<0.20	<0.10	0.536	0.167	<0.10	0.568	<0.15	0.067	<0.20	<0.15	0.358	<0.25
Phosphorus		mg/kg	14900	12900	13400	15300	14100	14300	12800	13000	14300	15500	15000	15600	14100	13000	14800	15100	14200	13600	13700
Potassium		mg/kg	13800	9500	11700	14800	12300	12300	11500	11600	11600	12900	12200	12600	11800	10900	10800	13200	11700	11700	13400
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010
Rubidium		mg/kg	9.77	7.54	7.37	9.58	6.87	7.43	5.14	6.96	14.5	11.9	15	7.75	9.52	5.4	12.6	15.9	9.95	10.4	12.6
Selenium		mg/kg	12.4	19	14	18.6	59.4	64.2	41.6	152	5.11	22	12.2	9.57	33	23.1	13.7	16.7	30.2	30	30.4
Silver		mg/kg	5.42	6.17	5	7.59	3.82	3.96	16.6	5.79	3.6	8.11	7.61	10.6	3.84	5.8	6.18	5.36	5.88	3.58	6
Sodium		mg/kg	3600	3300	4700	4100	5500	5900	5300	5500	4500	4400	5400	4900	3900	4200	4900	6400	3900	3300	3900
Strontium		mg/kg	1.19	0.331	0.298	0.181	0.427	0.379	0.351	0.609	1.28	1.24	1.83	0.823	1.14	0.534	1.43	1.34	0.464	0.51	0.757
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	0.033	0.039	<0.020	0.074	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0326	0.0467	0.0431	0.0261	0.0309	0.0797	0.0192	0.114	0.17	0.203	0.165	0.178	0.279	0.105	0.298	0.261	0.151	0.155	0.101
Thorium		mg/kg	<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	<0.010	<0.010	<0.010
Tin		mg/kg	0.234	0.383	0.07	0.265	0.476	0.216	0.189	0.135	0.904	0.223	0.147	0.25	0.142	0.268	0.264	0.586	0.066	0.211	0.645
Titanium		mg/kg	<0.050	0.302	0.062	0.095	0.059	0.095	0.392	1.28	0.074	0.051	<0.050	<0.050	<0.050	<0.050	0.067	0.076	<0.050	0.08	<0.050
Uranium		mg/kg	0.0035	0.0062	<0.0020	0.002	0.0095	0.0146	0.0265	0.0511	0.0396	0.0074	0.0096	0.0105	0.0115	0.0021	0.0114	0.0077	0.0248	0.0232	0.0103
Vanadium		mg/kg	0.192	0.15	0.036	0.091	0.322	0.827	1.37	3.48	0.27	0.065	0.113	0.068	0.113	<0.020	0.099	0.09	0.068	0.071	0.044
Yttrium		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	0.026	0.022	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010
Zinc		mg/kg	145	137	128	109	117	148	567	159	134	120	134	139	134	112	137	122	116	98.5	147
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Elements	L1227117-84	L1227117-85	L1227117-86	L1227117-87	L1227117-88	L1227117-97	L1227117-98	L1227117-99	L1227117-100	L1227117-101	L1227117-102	L1227117-103	L1227117-104	L1227117-175	L1227117-176	L1227117-177	L1227117-178	L1227117-179	L1227117-180	L1227117-181
Aluminum	<2.0	4.6	7.1	7.3	11.7	2.5	3.1	<2.0	2.6	<2.0	<2.0	<2.0	2.3	<2.0	10.4	6.1	7.7	6.4	13.6	7.1
Antimony	<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	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic	0.062	0.107	0.059	0.211	0.083	0.289	0.256	0.278	0.173	0.154	0.147	0.351	0.403	0.186	0.142	0.102	0.1	0.192	0.152	0.213
Barium	0.142	0.064	0.106	0.087	0.268	<0.050	0.173	0.122	0.147	0.058	0.063	0.106	0.133	0.062	0.98	0.085	0.105	0.095	0.159	0.079
Beryllium	<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	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth	<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	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010
Boron	<1.0	7.9	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	1.5	3.2	<1.0	5.2	<1.0	1.6	8.7	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium	0.157	0.252	0.321	0.115	0.431	0.041	0.066	0.067	0.048	0.033	0.033	0.057	0.059	0.039	0.301	0.467	0.131	0.326	0.099	0.112
Calcium	401	626	372	339	2090	449	994	684	897	434	441	955	835	392	310	270	170	314	302	359
Cesium	0.229	0.275	0.156	2.21	0.231	4.91	2.15	1.02	2.2	4.02	2.19	1.63	2.42	4.36	0.024	0.0511	0.0368	0.014	0.244	2.28
Chromium	0.083	0.106	0.201	<0.20	<0.85	0.09	6.1	<0.10	0.054	0.19	0.065	<0.050	<0.050	0.213	<0.25	<0.25	<0.15	<0.10	<0.10	<0.20
Cobalt	0.047	0.06	0.04	0.051	0.041	0.073	0.113	0.151	0.079	0.09	0.073	0.085	0.106	0.099	0.141	0.135	0.071	0.211	0.107	0.049
Copper	63.7	227	373	300	328	379	353	271	548	265	182	201	177	304	171	205	269	514	200	332
Gallium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.020	<0.020	<0.020	<0.020	<0.020
Iron	441	690	819	126	381	265	631	857	794	761	608	839	937	885	497	414	507	1650	477	124
Lead	0.063	0.03	0.066	0.086	0.034	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.056	0.026	<0.020	<0.020	0.116	0.05
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	853	799	693	778	755	871	872	847	850	1070	904	734	957	1030	680	710	670	693	780	775
Manganese	6.25	7.37	3.99	4.23	5.09	4.14	4.63	3.48	3.12	5.68	7.45	2.85	9.37	6.38	5.9	5.77	4.48	7.61	5.82	4.11
Mercury	0.779	0.795	0.378	0.692	0.315	1.5	1.9	0.857	1.7	2.34	1.06	0.759	0.604	2.35	0.074	0.047	0.099	0.38	0.663	0.651
Molybdenum	0.946	1.3	1.09	1.25	1.01	0.973	1.09	0.776	0.817	0.883	0.857	0.632	0.804	0.961	0.677	0.668	0.636	0.939	1.02	1.23
Nickel	0.331	0.064	0.09	<0.10	0.369	<0.050	0.178	<0.10	0.074	0.116	0.057	<0.050	<0.050	0.116	<0.30	<0.20	<0.10	<0.10	<0.050	<0.10
Phosphorus	15000	15300	13700	14300	15300	14900	13600	14200	14000	16300	15400	12300	14200	16400	14400	13900	13700	13300	15200	14000
Potassium	15200	13000	14000	14400	13000	16200	13100	14300	12600	16100	14800	13700	13600	15400	10200	9700	9600	12100	12500	14000
Rhenium	<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	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010
Rubidium	12.7	11.6	8.74	37.3	8.21	44.2	21.5	16.4	23	35.9	25.7	17.9	25.2	38.2	7.91	8.91	7.39	6.79	14.2	39
Selenium	8.87	19.5	7.39	6.71	5.95	13.5	21	25.9	18.6	6.3	9.43	21.8	9.76	7.52	20	17.8	21.7	62.8	4.16	6.77
Silver	10.2	6.23	4.45	8.31	8.22	8.67	4.1	3.31	3.01	2.85	1.46	1.36	0.456	2.37	4.5	6.53	3.26	4.96	5.63	6.67
Sodium	3500	4600	4200	4100	5500	7100	5100	5600	5200	5400	4700	6400	4600	5200	4700	<4000	3100	5300	4700	3900
Strontium	0.768	0.826	0.436	1.09	2.21	1.75	3.81	2.18	2.78	0.983	1.2	3.19	3.41	1.09	0.44	0.38	0.174	0.383	1.34	1.05
Tellurium	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.040	<0.020	<0.020	0.032	<0.020	<0.020
Thallium	0.0907	0.117	0.0907	0.419	0.19	0.332	0.168	0.238	0.208	0.211	0.166	0.236	0.174	0.23	0.0681	0.0809	0.0593	0.0324	0.168	0.396
Thorium	<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	<0.020	<0.010	<0.010	<0.010	<0.010	<0.010
Tin	0.42	0.544	0.086	0.206	0.296	0.116	0.204	0.229	0.133	0.187	0.177	0.183	0.12	0.184	0.458	0.279	0.119	0.265	0.05	0.193
Titanium	<0.050	0.173	<0.050	<0.050	<0.050	<0.050	0.061	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.48	0.132	0.333	0.092	0.054	<0.050
Uranium	0.0084	0.0358	0.036	0.0233	0.0979	0.0153	0.0124	0.0115	0.0098	0.0185	0.0052	0.0131	0.0169	0.0208	<0.0040	0.0028	<0.0020	0.0095	0.0357	0.0246
Vanadium	0.033	0.068	0.08	0.076	0.121	0.066	0.054	0.032	0.038	0.038	<0.020	0.024	0.072	0.044	0.09	0.085	0.075	0.322	0.254	0.079
Yttrium	<0.010	0.01	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	0.022	<0.010
Zinc	129	141	122	122	120	113	235	242	157	123	151	126	151	132	96.3	98.3	83	124	132	124
Zirconium	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.40	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Whole Fish) Analytical Results for Metals, August 2011 Sampling Program

Elements	MDL	Area / Sample ID / Unit	L1110359-1	L1110359-2	L1110359-3	L1110359-4	L1110359-5	L1110359-6	L1110359-7	L1110359-8	L1110359-9	L1110359-10	L1110359-11	L1110359-12	L1110359-13	L1110359-14	L1110359-15	L1110359-16	L1110359-17	L1110359-18	L1110359-19	L1110359-20	L1110359-21	L1110359-22
Aluminum		mg/kg wwt	19.7	0.59	8.36	2.83	11.6	0.56	1.35	1.85	8.1	4.85	9.28	11.2	30.6	35.3	10.8	2.18	3.11	2.67	0.9	4.12	2.31	3.11
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0815	0.0174	0.0532	0.0504	0.0438	0.032	0.0369	0.0326	0.0682	0.0644	0.061	0.0755	0.0559	0.0422	0.0593	0.0157	0.0258	0.0224	0.0197	0.0254	0.0513	0.0292
Barium		mg/kg wwt	0.464	0.505	1.72	1.22	2.5	0.236	0.697	0.662	1.92	1.14	2.16	0.353	0.589	0.724	0.719	0.244	0.275	0.317	0.281	0.468	0.767	0.244
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	0.65	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	0.0397	<0.0020	<0.0020	<0.0020	0.0033	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	0.0025	0.0338	0.0179	0.0176	0.0427	0.0082	0.0105	0.0071	0.007	0.0123	<0.0020	0.0116
Calcium		mg/kg wwt	8090	5050	6910	3190	4170	2510	3970	2340	3630	2930	3590	5820	5040	7870	9180	6750	7950	7750	7460	8020	2180	6750
Cesium		mg/kg wwt	0.0084	0.0404	0.147	0.139	0.151	0.0677	0.113	0.134	0.138	0.152	0.159	0.0168	0.0103	0.0074	0.0446	0.0232	0.0098	0.007	0.0155	0.0111	0.134	0.0097
Chromium		mg/kg wwt	0.364	0.02	0.041	0.028	0.03	0.086	0.023	0.035	0.033	0.036	0.043	0.173	0.14	0.101	0.137	0.167	0.097	0.376	0.147	0.051	0.021	0.145
Cobalt		mg/kg wwt	0.0294	0.008	0.0141	0.0128	0.0148	0.0117	0.0129	0.0133	0.0132	0.012	0.0149	0.0419	0.0424	0.0542	0.0446	0.0131	0.0223	0.0191	0.0118	0.0129	0.0126	0.0221
Copper		mg/kg wwt	1.6	1.06	2.01	1.45	2.3	1.06	1.36	1.46	2.18	1.74	2.85	1.31	1.22	1.15	2.02	1.1	1.32	0.937	0.979	1.11	1.69	1.28
Gallium		mg/kg wwt	0.0047	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0044	0.0075	0.0064	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	35.7	15.8	28.7	17.3	37.5	14.9	15.4	18.5	31.6	21.4	31.8	39.9	40.2	44.3	33.1	15.7	17.8	14.6	12.6	17.2	17	18.9
Lead		mg/kg wwt	0.0067	0.0139	0.0342	0.0143	0.0283	0.0049	0.006	0.0054	0.0241	0.0076	0.0231	0.0067	0.0067	0.0082	0.0064	0.0059	0.0084	0.0048	<0.0040	0.0094	0.0095	0.0112
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	416	321	324	299	294	283	296	264	284	277	282	373	351	404	413	371	394	402	399	409	259	352
Manganese		mg/kg wwt	6.06	1.73	4.65	1.79	7.83	0.823	1.15	1.93	5.56	3.11	5.46	6.29	7.5	8.68	4.71	1.81	2.53	2.45	2.29	2.77	1.31	2.38
Mercury		mg/kg wwt	0.0225	0.046	0.0566	0.0621	0.0447	0.0603	0.0566	0.0649	0.0544	0.0703	0.0473	0.0697	0.0457	0.0469	0.0887	0.0499	0.0434	0.0341	0.0407	0.0388	0.056	0.0384
Molybdenum		mg/kg wwt	0.0323	0.0103	0.0206	0.011	0.024	0.0104	0.0117	0.0154	0.0266	0.0184	0.022	0.0324	0.0227	0.0186	0.0333	0.0158	0.0144	0.015	0.0156	0.0136	0.0112	0.0151
Nickel		mg/kg wwt	0.222	<0.020	<0.020	<0.020	0.028	0.036	<0.020	0.083	0.062	<0.020	0.023	<0.10	0.059	<0.060	<0.030	0.077	<0.040	0.2	0.07	<0.030	<0.020	<0.050
Phosphorus		mg/kg wwt	6430	4640	5050	3540	3690	3260	3910	3010	3490	3200	3400	5420	5020	6460	7240	5860	6580	6330	6340	6550	2960	5820
Potassium		mg/kg wwt	4270	3870	3420	3680	3460	3600	3830	3640	3590	3450	3530	4630	4510	4250	4110	4460	4470	4270	4400	4200	3820	3970
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	1.8	2.32	6.62	6.27	6.43	4.1	5.5	5.78	6.33	6.87	6.65	5.43	2.74	2.45	4.85	3.42	2.97	2.43	3.38	2.91	5.99	2.94
Selenium		mg/kg wwt	1.09	0.122	0.159	0.148	0.118	0.104	0.144	0.127	0.156	0.133	0.13	0.649	1.15	0.961	1.21	0.827	1.53	1.26	1.02	0.83	0.147	1.49
Silver		mg/kg wwt	0.0103	0.0228	0.0267	0.019	0.0256	0.0302	0.0161	0.0195	0.0426	0.0257	0.0308	0.0272	0.0059	0.005	0.0261	0.0066	0.0084	0.0068	0.0057	0.0076	0.0228	0.0084
Sodium		mg/kg wwt	1100	649	738	707	705	692	702	673	658	698	685	1030	1070	1040	1040	980	1080	1040	1010	910	716	960
Strontium		mg/kg wwt	5.95	11	20	12.8	17.6	4.94	12.4	9.01	13.1	10.7	15.8	5.92	4.17	6.13	10.3	4.85	5.68	5.86	5.68	6.59	8.58	4.8
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00402	0.00687	0.0119	0.0101	0.0122	0.00578	0.0084	0.00886	0.0119	0.0107	0.00981	0.00633	0.00519	0.00522	0.0086	0.00395	0.00553	0.00504	0.00483	0.00519	0.00933	0.0054
Thorium		mg/kg wwt	0.0024	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0028	0.0028	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.0095	0.0127	<0.0040	0.0137	0.0077	0.006	<0.0040	<0.0040	0.0059	<0.0040	0.0085	0.0083	<0.0040	0.0096	<0.0040	0.0077	0.0047	0.0222	0.0055	<0.0040	0.0109	0.0067
Titanium		mg/kg wwt	0.995	0.013	0.187	0.072	0.283	0.014	0.025	0.042	0.193	0.106	0.231	0.609	1.27	1.54	0.462	0.108	0.101	0.098	0.034	0.215	0.059	0.167
Uranium		mg/kg wwt	0.00723	0.00097	0.00437	0.00138	0.00521	0.00073	0.00113	0.00141	0.00436	0.00279	0.00471	0.00597	0.0047	0.00582	0.00809	0.00112	0.00142	0.00167	0.00163	0.00266	0.00123	0.0015
Vanadium		mg/kg wwt	0.078	<0.0040	0.0177	0.0058	0.0206	<0.0040	0.0048	0.0051	0.0156	0.0089	0.0184	0.0629	0.0843	0.0948	0.0444	0.0186	0.031	0.0342	0.0231	0.0258	0.0048	0.031
Yttrium		mg/kg wwt	0.0204	<0.0020	0.0098	0.0035	0.0126	<0.0020	<0.0020	0.0032	0.0087	0.0057	0.011	0.0121	0.0215	0.0267	0.014	<0.0020	0.0027	<0.0020	<0.0020	0.006	0.0031	0.0027
Zinc		mg/kg wwt	45	29	23	24.5	30.5	23.8	20	27.9	23.4	12.8	26.9	31.8	28.9	32.5	29.1	28.9	31.7	36.3	36.8	34	29.7	29.6
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Area / Sample ID / Unit	L1110359-1	L1110359-2	L1110359-3	L1110359-4	L1110359-5	L1110359-6	L1110359-7	L1110359-8	L1110359-9	L1110359-10	L1110359-11	L1110359-12	L1110359-13	L1110359-14	L1110359-15	L1110359-16	L1110359-17	L1110359-18	L1110359-19	L1110359-20	L1110359-21	L1110359-22
Aluminum		mg/kg	71.3	2.1	28	9.5	37.1	<2.0	4.9	6.7	28	16	34	39	114	140	42.1	8.1	11.2	10.2	3.3	14.3	8	11.2
Antimony		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.295	0.063	0.178	0.168	0.141	0.113	0.135	0.117	0.236	0.212	0.223	0.263	0.208	0.167	0.232	0.058	0.093	0.086	0.073	0.088	0.178	0.105
Barium		mg/kg	1.68	1.82	5.77	4.07	8.03	0.831	2.54	2.39	6.63	3.75	7.92	1.23	2.19	2.86	2.81	0.9	0.989	1.21	1.05	1.62	2.66	0.875
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	2.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	0.144	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.118	0.066	0.07	0.167	0.03	0.038	0.027	0.026	0.043	<0.010	0.042
Calcium		mg/kg	29300	18200	23200	10600	13400	8850	14500	8420	12500	9660	13100	20300	18700	31100	35900	25000	28600	29700	27800	27700	7550	24200
Cesium		mg/kg	0.0304	0.145	0.494	0.463	0.485	0.239	0.412	0.482	0.477	0.501	0.581	0.0583	0.0384	0.0294	0.174	0.0857	0.0354	0.0266	0.0576	0.0384	0.465	0.0348
Chromium		mg/kg	1.32	0.073	0.136	0.094	0.096	0.302	0.082	0.127	0.115	0.118	0.156	0.604	0.521	0.398	0.534	0.617	0.349	1.44	0.549	0.177	0.071	0.522
Cobalt		mg/kg	0.106	0.029	0.047	0.043	0.048	0.041	0.047	0.048	0.046	0.04	0.055	0.146	0.158	0.214	0.174	0.048	0.08	0.073	0.044	0.045	0.044	0.079
Copper		mg/kg	5.79	3.82	6.74	4.82	7.39	3.75	4.94	5.25	7.54	5.73	10.4	4.54	4.53	4.56	7.87	4.08	4.75	3.58	3.65	3.84	5.87	4.59
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.028	0.025	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	129	57	96.1	57.7	120	52.6	56.3	66.8	109	70.4	116	139	149	175	129	57.9	64	56	46.9	59.6	58.8	68
Lead		mg/kg	0.024	0.05	0.115	0.048	0.091	<0.020	0.022	<0.020	0.083	0.025	0.084	0.023	0.025	0.033	0.025	0.022	0.03	<0.020	<0.020	0.033	0.033	0.04
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1500	1150	1090	997	943	997	1080	950	981	914	1030	1300	1300	1600	1610	1370	1420	1540	1490	1410	895	1260
Manganese		mg/kg	21.9	6.22	15.6	5.97	25.1	2.9	4.18	6.96	19.2	10.2	20	21.9	27.8	34.3	18.4	6.67	9.11	9.35	8.52	9.57	4.55	8.55
Mercury		mg/kg	0.0815	0.166	0.19	0.207	0.143	0.212	0.206	0.234	0.188	0.232	0.173	0.242	0.17	0.185	0.346	0.184	0.156	0.131	0.152	0.134	0.194	0.138
Molybdenum		mg/kg	0.117	0.037	0.069	0.037	0.077	0.037	0.043	0.055	0.092	0.061	0.081	0.113	0.084	0.074	0.13	0.058	0.052	0.057	0.058	0.047	0.039	0.054
Nickel		mg/kg	0.805	<0.050	<0.050	<0.10	<0.10	<0.15	<0.10	0.298	<0.25	<0.10	<0.10	<0.35	<0.25	<0.25	<0.15	<0.30	<0.15	0.765	<0.35	<0.10	<0.10	<0.20
Phosphorus		mg/kg	23200	16700	16900	11800	11800	11500	14300	10800	12100	10500	12400	18900	18700	25600	28300	21700	23700	24200	23700	22600	10300	20900
Potassium		mg/kg	15400	13900	11500	12300	11100	12700	14000	13100	12400	11400	12900	16100	16800	16800	16000	16500	16100	16300	16400	14500	13200	14300
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Rubidium		mg/kg	6.5	8.33	22.2	20.9	20.6	14.4	20.1	20.8	21.9	22.6	24.3	18.9	10.2	9.7	18.9	12.6	10.7	9.28	12.6	10.1	20.7	10.5
Selenium		mg/kg	3.93	0.44	0.53	0.5	0.38	0.37	0.52	0.46	0.54	0.44	0.47	2.26	4.27	3.8	4.72	3.05	5.49	4.81	3.8	2.87	0.51	5.34
Silver		mg/kg	0.0374	0.0819	0.0897	0.0636	0.0822	0.107	0.0586	0.0704	0.147	0.0846	0.113	0.0946	0.0218	0.0196	0.102	0.0243	0.0304	0.0261	0.0212	0.0262	0.0791	0.03
Sodium		mg/kg	4000	2340	2480	2360	2260	2440	2560	2430	2270	2300	2510	3600	4000	4100	4100	3600	3900	4000	3800	3100	2480	3400
Strontium		mg/kg	21.5	39.5	67.2	42.7	56.5	17.4	45.2	32.4	45.3	35.2	57.8	20.6	15.5	24.3	40.4	17.9	20.5	22.4	21.2	22.8	29.7	17.3
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0145	0.0247	0.04	0.0336	0.039	0.0204	0.0306	0.0319	0.0412	0.0351	0.0359	0.022	0.0193	0.0207	0.0336	0.0146	0.0199	0.0193	0.018	0.018	0.0323	0.0194
Thorium		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		mg/kg	0.034	0.046	<0.020	0.046	0.025	0.021	<0.020	<0.020	0.02	<0.020	0.031	0.029	<0.020	0.038	<0.020	0.029	<0.020	0.085	0.021	<0.020	0.038	0.024
Titanium		mg/kg	3.6	<0.050	0.626	0.239	0.907	<0.050	0.092	0.15	0.666	0.348	0.844	2.12	4.72	6.08	1.8	0.397	0.365	0.375	0.126	0.744	0.206	0.601
Uranium		mg/kg	0.0262	0.0035	0.0147	0.0046	0.0167	0.0026	0.0041	0.0051	0.015	0.0092	0.0172	0.0208	0.0174	0.023	0.0316	0.0042	0.0051	0.0064	0.0061	0.0092	0.0043	0.0054
Vanadium		mg/kg	0.282	<0.020	0.059	<0.020	0.066	<0.020	<0.020	<0.020	0.054	0.029	0.067	0.219	0.313	0.375	0.173	0.069	0.112	0.131	0.086	0.089	<0.020	0.111
Yttrium		mg/kg	0.074	<0.010	0.033	0.012	0.04	<0.010	<0.010	0.011	0.03	0.019	0.04	0.042	0.08	0.106	0.055	<0.010	<0.010	<0.010	<0.010	0.021	0.011	<0.010
Zinc		mg/kg	163	104	77.2	81.9	97.8	83.9	72.9	101	80.8	42.2	98.3	111	107	129	114	107	114	139	137	117	103	106
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Whole Fish) Analytical Results for Metals, August 2012 Sampling Program

Elements	MDL	Sample ID	L1227117-105	L1227117-106	L1227117-107	L1227117-108	L1227117-109	L1227117-110	L1227117-111	L1227117-112	L1227117-113	L1227117-114	L1227117-115	L1227117-116	L1227117-117	L1227117-118	L1227117-119	L1227117-120	L1227117-121	L1227117-122	L1227117-123	L1227117-124	L1227117-125	L1227117-126	L1227117-127	L1227117-128
		Area																								
		Unit																								
Aluminum		mg/kg wwt	9.15	4.66	3	33	9.31	7.66	9.56	1.72	1.43	37.4	20.1	15.9	17	4.8	5.02	14.7	2.45	1.34	14	0.41	19.3	3.54	6.86	3.92
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0629	0.0709	0.0401	0.111	0.0417	0.0451	0.0492	0.0372	0.247	0.0305	0.0294	0.0319	0.0932	0.023	0.0385	0.0405	0.0286	0.0237	0.0508	0.0228	0.0385	0.04	0.0678	0.0616
Barium		mg/kg wwt	0.543	0.41	0.3	0.508	0.59	0.391	0.247	0.349	0.39	0.759	0.34	0.772	0.736	0.319	0.695	0.638	0.227	0.615	0.434	0.27	0.641	0.865	0.346	0.568
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	0.25	<0.20	1.43	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.28	<0.20	<0.20	<0.20	<0.20	<0.20	0.26	0.93	0.41	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	0.0206	0.0175	0.0169	0.0256	0.0279	0.0217	0.013	0.0107	0.0187	0.027	0.0089	0.0132	0.094	0.0143	0.0164	0.0271	0.0051	0.0086	0.0122	0.004	0.0145	0.0123	0.0115	0.0185
Calcium		mg/kg wwt	10500	9690	8940	8660	13200	7060	3900	9230	6320	6030	5830	8950	8250	8860	15800	8320	8290	8630	8200	9020	12700	10700	4750	7520
Cesium		mg/kg wwt	0.0105	0.0057	0.0053	0.0114	0.0128	0.0073	0.0038	0.0064	0.0086	0.0288	0.0082	0.0067	0.015	0.0116	0.0126	0.0158	0.0067	0.0079	0.0051	0.0041	0.0089	0.0078	0.006	0.0049
Chromium		mg/kg wwt	0.039	0.026	0.019	0.108	0.039	0.032	0.035	0.039	0.027	0.087	0.056	0.042	0.058	0.029	0.032	0.049	<0.010	0.035	0.023	<0.010	0.035	0.029	0.021	0.014
Cobalt		mg/kg wwt	0.0466	0.0449	0.0212	0.058	0.0262	0.0231	0.0188	0.0136	0.0252	0.0294	0.0267	0.0217	0.0793	0.0166	0.0164	0.0292	0.0072	0.0175	0.0379	0.013	0.0304	0.0125	0.0196	0.025
Copper		mg/kg wwt	0.959	0.868	0.521	0.916	1.05	0.914	0.784	0.569	0.843	0.984	0.625	0.862	1.4	0.653	0.833	0.856	0.546	0.693	1.04	0.488	0.976	0.775	0.807	0.69
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	0.014	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0113	0.006	0.0055	0.0047	<0.0040	<0.0040	0.0044	<0.0040	<0.0040	0.0043	<0.0040	0.0058	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	29.9	19.6	13.8	44.2	26.8	21.3	45.2	9.38	11.7	49.8	26.8	24.1	34.7	15.3	15.6	30.3	12.8	16.3	22.5	6.88	36	19.5	24.4	13.8
Lead		mg/kg wwt	0.0098	0.0111	0.0046	0.0283	0.009	0.0045	0.0052	<0.0040	0.005	0.0101	0.0074	0.0107	0.0093	0.0055	<0.0040	0.0066	<0.0040	<0.0040	0.008	<0.0040	0.052	<0.0040	<0.0040	<0.0040
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	442	429	429	418	492	357	300	388	352	303	294	400	404	428	573	415	316	369	400	407	487	385	345	375
Manganese		mg/kg wwt	6.98	6.45	4.68	6.86	8.01	2.83	2.35	2.36	1.65	6.55	2.49	8.38	5.33	1.92	5.18	3.25	2.07	5.11	3.58	2.55	6.26	4.63	12	9.3
Mercury		mg/kg wwt	0.081	0.0689	0.0988	0.086	0.0557	0.0761	0.0592	0.0942	0.0862	0.0713	0.0486	0.0451	0.0642	0.0675	0.0492	0.0557	0.0993	0.0379	0.0553	0.0461	0.0512	0.0696	0.0763	0.0666
Molybdenum		mg/kg wwt	0.0287	0.0192	0.0126	0.0251	0.0371	0.026	0.0292	0.015	0.0087	0.0146	0.0264	0.0137	0.0313	0.0142	0.0136	0.0372	0.0073	0.0164	0.0159	0.0094	0.0193	0.0164	0.0165	0.0153
Nickel		mg/kg wwt	0.035	0.051	0.028	0.039	0.028	0.017	0.025	0.016	0.032	0.083	0.029	0.023	0.098	0.042	0.036	0.025	0.015	0.058	0.058	0.03	0.038	0.069	0.04	0.189
Phosphorus		mg/kg wwt	7640	7310	6850	6740	8930	5740	4180	6710	5210	4770	4650	6460	6660	7150	10400	6510	6270	6910	6350	6700	8750	8220	4550	5940
Potassium		mg/kg wwt	4160	3820	4330	3840	3490	3820	4240	3550	3660	3330	2970	3550	3970	5370	3950	4970	3450	3150	3590	3490	3400	3290	4170	3630
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	3.61	2.63	2.11	3.43	2.55	2.84	1.47	2.08	2.05	2.86	1.69	1.6	3.02	1.94	2.15	2.67	1.27	3.08	2.01	1.82	2.75	1.98	1.65	1.78
Selenium		mg/kg wwt	1.25	0.841	0.67	0.894	0.806	0.83	0.648	0.606	0.575	0.782	0.397	0.347	0.835	0.798	0.706	0.927	0.544	1.1	0.773	0.454	0.675	0.767	0.879	0.765
Silver		mg/kg wwt	0.0073	0.0049	0.0072	0.0046	0.0065	0.0065	0.0025	0.0044	0.0037	0.0044	0.0026	0.0024	0.0058	0.0032	0.0118	0.0057	0.0056	0.0015	0.0018	<0.0010	0.0021	0.0022	0.0042	0.0033
Sodium		mg/kg wwt	1040	970	1160	970	990	890	1100	1060	750	580	650	500	1000	1440	1230	1170	910	834	860	840	910	1000	990	890
Strontium		mg/kg wwt	8.56	7.61	4.61	6.15	9.93	5.3	2.01	5.56	5.73	7.43	4.66	6.64	6.44	4.38	10.2	6.86	3.87	6.36	5.51	4.61	9.07	9.8	2.98	5.64
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00559	0.00445	0.0035	0.00556	0.00378	0.00396	0.00243	0.00347	0.00419	0.00504	0.00292	0.00312	0.00688	0.00317	0.00466	0.00566	0.00195	0.00436	0.00482	0.00414	0.0065	0.00285	0.00286	0.00329
Thorium		mg/kg wwt	<0.0020	<0.0020	<0.0020	0.0096	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.006	0.0021	<0.0020	0.0031	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0024	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.0472	0.0402	0.0126	0.0213	0.0218	0.0224	0.022	0.0235	0.0289	0.0192	0.0283	0.0272	0.0414	0.0113	0.0145	0.0232	0.008	0.0096	0.0323	0.0535	0.0298	0.0153	0.044	0.038
Titanium		mg/kg wwt	0.645	0.341	0.243	1.65	0.689	0.706	1.08	0.101	0.073	2.63	1.91	1.1	1.88	0.463	0.357	1.58	0.121	0.066	1.62	0.016	0.953	0.234	0.293	0.242
Uranium		mg/kg wwt	0.00631	0.00363	0.00509	0.00795	0.00713	0.00445	0.0032	0.00407	0.00255	0.00539	0.00335	0.00535	0.00845	0.00243	0.00338	0.00739	0.00115	0.00446	0.00402	0.00151	0.00659	0.0018	0.00177	0.00121
Vanadium		mg/kg wwt	0.0862	0.0565	0.0365	0.0939	0.0533	0.0471	0.0508	0.0425	0.0337	0.121	0.0857	0.132	0.0935	0.0256	0.0319	0.0759	0.0192	0.0257	0.0599	0.0263	0.0769	0.0316	0.0397	0.0367
Yttrium		mg/kg wwt	0.0108	0.0041	0.0028	0.0173	0.011	0.0057	0.0073	<0.0020	<0.0020	0.0161	0.0105	0.0112	0.0211	0.0047	0.004	0.0182	<0.0020	<0.0020	0.0125	<0.0020	0.0154	0.0032	0.0065	0.0026
Zinc		mg/kg wwt	42.2	35.9	21.3	31	39.9	28.4	20.9	29.6	25.3	31.4	22.4	31	31	27.5	35.4	31.9	21.6	47.5	31.1	28.8	53.1	52	29.1	30
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Sample ID	L1227117-105	L1227117-106	L1227117-107	L1227117-108	L1227117-109	L1227117-110	L1227117-111	L1227117-112	L1227117-113	L1227117-114	L1227117-115	L1227117-116	L1227117-117	L1227117-118	L1227117-119	L1227117-120	L1227117-121	L1227117-122	L1227117-123	L1227117-124	L1227117-125	L1227117-126	L1227117-127	L1227117-128
		Area																								
		Unit																								
Aluminum		mg/kg	30.7	16.9	11.6	122	33.6	28.7	42.9	6.7	5.8	143	64.4	74.2	61.4	18.2	15.7	61.4	7.1	4.7	49.8	<2.0	64.5	13.8	26.2	15.1
Antimony		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.211	0.257	0.155	0.408	0.15	0.169	0.221	0.145	1	0.116	0.094	0.149	0.336	0.087	0.12	0.169	0.083	0.082	0.18	0.084	0.129	0.156	0.258	0.238
Barium		mg/kg	1.82	1.49	1.16	1.87	2.13	1.46	1.11	1.36	1.58	2.9	1.09	3.61	2.66	1.21	2.17	2.66	0.658	2.14	1.54	0.991	2.15	3.38	1.32	2.19
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	<1.0	<1.0	<1.0	5.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.4	1.4	<1.0	<1.0	<1.0
Cadmium		mg/kg	0.069	0.064	0.066	0.094	0.101	0.081	0.058	0.042	0.076	0.103	0.028	0.062	0.339	0.054	0.051	0.113	0.015	0.03	0.043	0.015	0.048	0.048	0.044	0.071
Calcium		mg/kg	35100	35100	34700	31900	47500	26500	17500	36000	25600	23000	18600	41800	29800	33600	49300	34600	24000	30000	29100	33200	42400	41700	18100	29000
Cesium		mg/kg	0.0353	0.0208	0.0206	0.0419	0.0462	0.0274	0.0169	0.025	0.0348	0.11	0.0261	0.0312	0.0542	0.0441	0.0392	0.0659	0.0193	0.0276	0.0179	0.015	0.0299	0.0303	0.0227	0.019
Chromium		mg/kg	0.13	0.096	0.072	0.398	0.139	0.12	0.157	0.153	0.111	0.332	0.18	0.197	0.21	0.11	0.099	0.206	<0.050	0.121	0.082	<0.050	0.117	0.112	0.082	0.056
Cobalt		mg/kg	0.156	0.163	0.082	0.213	0.095	0.087	0.084	0.053	0.102	0.112	0.085	0.102	0.286	0.063	0.051	0.121	0.021	0.061	0.135	0.048	0.102	0.049	0.075	0.096
Copper		mg/kg	3.22	3.15	2.02	3.37	3.8	3.43	3.52	2.22	3.42	3.76	2	4.03	5.04	2.47	2.6	3.56	1.58	2.41	3.69	1.79	3.27	3.02	3.08	2.66
Gallium		mg/kg	<0.020	<0.020	<0.020	0.052	<0.020	<0.020	<0.020	<0.020	<0.020	0.043	<0.020	0.026	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Iron		mg/kg	100	71	53.4	163	96.6	79.9	203	36.6	47.5	190	85.7	113	125	58.1	48.8	126	37.2	56.5	79.8	25.3	120	76	93	53.5
Lead		mg/kg	0.033	0.04	<0.020	0.104	0.032	<0.020	0.023	<0.020	0.02	0.039	0.024	0.05	0.034	0.021	<0.020	0.027	<0.020	<0.020	0.028	<0.020	0.174	<0.020	<0.020	<0.020
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1480	1550	1660	1540	1770	1340	1350	1520	1430	1160	940	1870	1460	1620	1790	1730	915	1280	1420	1490	1630	1500	1320	1450
Manganese		mg/kg	23.4	23.4	18.1	25.2	28.9	10.6	10.6	9.21	6.67	25	7.97	39.2	19.2	7.29	16.2	13.5	5.99	17.8	12.7	9.38	21	18.1	45.7	35.9
Mercury		mg/kg	0.271	0.25	0.383	0.317	0.201	0.285	0.266	0.368	0.349	0.272	0.155	0.211	0.232	0.256	0.154	0.232	0.288	0.132	0.196	0.17	0.171	0.272	0.291	0.257
Molybdenum		mg/kg	0.096	0.07	0.049	0.093	0.134	0.097	0.131	0.059	0.035	0.056	0.084	0.064	0.113	0.054	0.043	0.155	0.021	0.057	0.056	0.035	0.065	0.064	0.063	0.059
Nickel		mg/kg	0.117	0.184	0.107	0.144	0.1	0.064	0.11	0.062	0.13	0.318	0.092	0.108	0.355	0.158	0.114	0.103	<0.050	0.2	0.204	0.109	0.128	0.271	0.154	0.73
Phosphorus		mg/kg	25600	26500	26600	24800	32200	21500	18800	26200	21100	18200	14900	30200	24000	27100	32600	27100	18200	24000	22500	24600	29300	32100	17400	23000
Potassium		mg/kg	13900	13900	16800	14100	12600	14300	19000	13900	14800	12700	9500	16600	14300	20300	12300	20700	10000	11000	12700	12800	11400	12900	15900	14000
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Rubidium		mg/kg	12.1	9.54	8.2	12.6	9.2	10.6	6.6	8.12	8.3	10.9	5.4	7.46	10.9	7.33	6.71	11.1	3.67	10.7	7.14	6.7	9.19	7.72	6.3	6.89
Selenium		mg/kg	4.2	3.05	2.6	3.29	2.91	3.11	2.91	2.37	2.33	2.99	1.27	1.62	3.02	3.02	2.21	3.86	1.58	3.82	2.74	1.67	2.26	2.99	3.35	2.95
Silver		mg/kg	0.0244	0.0178	0.0281	0.0169	0.0236	0.0243	0.0113	0.0174	0.0152	0.017	0.0084	0.011	0.0211	0.0122	0.0368	0.0238	0.0163	0.0053	0.0063	<0.0050	0.0071	0.0084	0.0161	0.0126
Sodium		mg/kg	3500	3500	4500	3600	3600	3400	4900	4100	3000	2200	2100	2300	3600	5400	3900	4900	2600	2900	3000	3100	3000	3910	3800	3400
Strontium		mg/kg	28.7	27.6	17.9	22.7	35.8	19.9	9.04	21.7	23.2	28.4	14.9	31	23.3	16.6	31.8	28.6	11.2	22.1	19.5	17	30.4	38.3	11.4	21.8
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0187	0.0161	0.0136	0.0205	0.0136	0.0149	0.0109	0.0135	0.017	0.0192	0.0093	0.0146	0.0248	0.012	0.0145	0.0236	0.0057	0.0151	0.0171	0.0152	0.0217	0.0111	0.0109	0.0127
Thorium		mg/kg	<0.010	<0.010	<0.010	0.035	<0.010	<0.010	<0.010	<0.010	<0.010	0.023	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		mg/kg	0.158	0.146	0.049	0.078	0.079	0.084	0.099	0.092	0.117	0.073	0.091	0.127	0.15	0.043	0.045	0.097	0.023	0.033	0.114	0.197	0.1	0.06	0.168	0.147
Titanium		mg/kg	2.16	1.24	0.943	6.06	2.48	2.65	4.86	0.395	0.297	10.1	6.09	5.13	6.78	1.75	1.11	6.57	0.349	0.23	5.76	0.06	3.19	0.913	1.12	0.935
Uranium		mg/kg	0.0211	0.0131	0.0197	0.0293	0.0257	0.0167	0.0144	0.0159	0.0103	0.0206	0.0107	0.025	0.0305	0.0092	0.0106	0.0308	0.0033	0.0155	0.0143	0.0056	0.0221	0.007	0.0067	0.0047
Vanadium		mg/kg	0.289	0.205	0.141	0.346	0.192	0.177	0.228	0.166	0.136	0.464	0.274	0.619	0.338	0.097	0.1	0.316	0.056	0.089	0.212	0.097	0.257	0.123	0.151	0.142
Yttrium		mg/kg	0.036	0.015	0.011	0.064	0.04	0.021	0.033	<0.010	<0.010	0.061	0.034	0.052	0.076	0.018	0.012	0.076	<0.010	<0.010	0.044	<0.010	0.051	0.013	0.025	0.01
Zinc		mg/kg	141	130	82.5	114	144	106	93.9	116	103	120	71.7	145	112	104	111	133	62.5	165	110	106	178	203	111	116
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (Whole Fish) Analytical Results for Metals, September 2012 Sampling Program

Elements	MDL	Area																			
		Sample ID	L1227117-1	L1227117-2	L1227117-3	L1227117-4	L1227117-5	L1227117-6	L1227117-7	L1227117-8	L1227117-129	L1227117-130	L1227117-131	L1227117-132	L1227117-133	L1227117-134	L1227117-135	L1227117-136	L1227117-137	L1227117-138	L1227117-139
		Unit																			
Aluminum		mg/kg wwt	1.13	2.32	8.44	3.02	1.89	1.26	8.15	22.1	1.44	3.53	1.29	8.61	4.54	6.82	2.11	21	8.26	0.55	1.58
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0022	0.0039	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0492	0.079	0.116	0.0861	0.0765	0.0716	0.129	0.179	0.0576	0.0639	0.0547	0.0696	0.0695	0.0974	0.0317	0.141	0.0804	0.0338	0.0609
Barium		mg/kg wwt	0.318	0.536	0.589	0.803	0.498	0.322	0.841	1.17	0.888	0.47	0.326	0.434	0.911	0.856	0.427	0.87	1.74	0.825	1.55
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.66	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	<0.0020	0.0049	0.0055	0.0049	0.0035	0.0047	0.0083	0.0061	0.0038	0.0045	0.0023	0.0034	0.0065	0.0069	0.0048	0.01	0.0028	<0.0020	<0.0020
Calcium		mg/kg wwt	2830	5520	5890	3810	3280	3120	5970	3840	12400	11500	8110	8940	13700	12300	4200	13700	5550	13000	8650
Cesium		mg/kg wwt	0.79	0.513	0.229	0.605	0.921	0.456	0.402	0.591	0.0057	0.0036	0.0034	0.004	0.0033	0.003	0.002	0.0043	0.102	0.056	0.106
Chromium		mg/kg wwt	0.014	0.019	0.029	0.036	0.036	0.021	0.036	0.054	0.025	0.119	0.074	0.04	0.014	0.062	0.062	0.093	0.027	0.102	0.05
Cobalt		mg/kg wwt	0.0172	0.0174	0.0263	0.0286	0.0246	0.0264	0.026	0.0346	0.0154	0.0244	0.0175	0.0244	0.0286	0.019	0.0188	0.0306	0.0183	0.0161	0.0155
Copper		mg/kg wwt	0.51	1.35	0.904	1.93	1.29	1.66	1.99	2.75	0.645	0.597	0.503	0.625	0.508	0.656	0.689	0.618	1.28	0.347	0.534
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.005	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0074	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	14.1	21.3	36	29.9	21	21.7	27	58.9	10.5	17.5	12.6	23.7	18.2	20.3	20.4	38.2	34	10.8	14.7
Lead		mg/kg wwt	0.0326	0.0245	0.0488	0.0245	0.017	0.0354	0.0272	0.0506	0.0127	0.0043	0.0045	0.005	<0.0040	0.0197	0.0213	0.0055	0.175	0.0799	0.0407
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	194	258	279	228	232	254	292	290	426	438	364	385	448	393	277	428	298	427	347
Manganese		mg/kg wwt	0.584	1.49	4.76	2.19	1.25	1.42	2.83	9.43	11.2	6.19	4.55	4.92	6.78	4.01	2.34	4.32	5.09	1.57	1.72
Mercury		mg/kg wwt	0.117	0.136	0.0882	0.116	0.155	0.11	0.0785	0.0789	0.0379	0.0425	0.0521	0.0475	0.0359	0.0482	0.0669	0.0475	0.0771	0.0656	0.0531
Molybdenum		mg/kg wwt	0.0083	0.0194	0.0214	0.0191	0.0152	0.0164	0.03	0.0381	0.009	0.0096	0.0098	0.0097	0.0086	0.0096	0.0089	0.0104	0.0216	0.009	0.0114
Nickel		mg/kg wwt	0.011	0.016	0.015	0.023	0.021	0.014	<0.010	0.192	0.032	0.07	0.055	0.032	0.076	0.03	0.062	0.028	0.015	0.042	0.029
Phosphorus		mg/kg wwt	2630	4330	4890	3690	3170	3340	4230	3370	8210	7950	6580	6250	8360	7540	3880	7990	4190	7910	6330
Potassium		mg/kg wwt	2480	2820	2610	2690	2800	2790	2750	2790	3540	3720	3310	3500	3390	3370	3250	3310	3040	3660	3000
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	5.94	4.71	3.65	6.19	7.18	4.67	4.39	4.65	2.61	2.41	2.27	2.35	1.49	1.76	1.23	1.56	3.66	2.41	4.37
Selenium		mg/kg wwt	0.146	0.249	0.251	0.249	0.26	0.323	0.281	0.274	0.28	0.289	0.32	0.33	0.385	0.405	0.396	0.341	0.182	0.142	0.132
Silver		mg/kg wwt	0.0042	0.0159	0.0115	0.0266	0.0147	0.0174	0.0136	0.0273	0.002	0.0034	0.0016	0.0015	0.0033	0.004	0.0037	0.0018	0.0112	<0.0010	0.0018
Sodium		mg/kg wwt	874	853	812	935	955	834	890	851	847	936	1020	873	1100	1430	1290	1550	948	1060	904
Strontium		mg/kg wwt	6.47	11.2	10.2	10.4	8.5	6.43	11.6	10.3	10.5	9.37	6.78	7.74	11.7	11.2	3.74	13.3	17.6	18.2	27.6
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00471	0.00655	0.00645	0.00946	0.00908	0.00691	0.00759	0.00899	0.00261	0.0041	0.00204	0.00272	0.00261	0.00322	0.00094	0.0036	0.0079	0.00731	0.0102
Thorium		mg/kg wwt	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	0.0045	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0023	<0.0020	<0.0020	<0.0020
Tin		mg/kg wwt	0.042	0.023	<0.020	0.023	<0.020	<0.020	0.038	0.026	0.116	0.075	0.0244	0.031	0.056	0.032	0.033	0.026	0.027	<0.020	0.029
Titanium		mg/kg wwt	-	-	-	-	-	-	-	-	-	-	0.086	-	-	-	-	-	-	-	-
Uranium		mg/kg wwt	0.00312	0.00834	0.0103	0.0155	0.00553	0.00366	0.0135	0.0191	0.00278	0.00275	0.00064	0.00166	0.00482	0.00381	0.00379	0.0061	0.0063	0.00132	0.00211
Vanadium		mg/kg wwt	<0.016	<0.016	0.022	<0.016	<0.016	<0.016	0.019	0.052	0.09	0.039	0.0112	0.088	0.051	0.152	0.078	0.249	0.022	<0.016	0.019
Yttrium		mg/kg wwt	<0.0020	0.006	0.0095	0.0072	0.0027	<0.0020	0.0198	0.0381	<0.0020	0.0025	0.0021	0.0058	0.0028	0.0031	<0.0020	0.0112	0.0119	<0.0020	0.0021
Zinc		mg/kg wwt	22.1	50.5	44.4	47.2	44.2	62.4	49.1	47.8	59.1	46.5	41	60.2	59.1	54.8	70.1	75.2	42.6	38.4	62.6
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.074

Elements	MDL	Area																				
		Sample ID	L1227117-140	L1227117-141	L1227117-142	L1227117-143	L1227117-144	L1227117-145	L1227117-146	L1227117-147	L1227117-148	L1227117-149	L1227117-150	L1227117-151	L1227117-152	L1227117-153	L1227117-154	L1227117-155	L1227117-156	L1227117-157	L1227117-158	L1227117-159
		Unit																				
Aluminum		mg/kg wwt	0.69	2.86	0.85	8.03	0.54	0.73	0.92	0.95	0.92	5.31	0.74	2.52	1.57	7.18	3.33	0.71	0.66	28	7.01	1.86
Antimony		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Arsenic		mg/kg wwt	0.0251	0.0449	0.0235	0.0731	0.0508	0.0425	0.052	0.0418	0.0316	0.0781	0.0238	0.0709	0.0299	0.0505	0.0669	0.0595	0.0249	0.0678	0.0373	0.0366
Barium		mg/kg wwt	0.501	3.02	0.265	2.56	0.769	0.354	0.569	0.206	0.294	0.681	0.22	0.965	0.559	0.45	0.539	0.795	0.24	0.575	0.71	0.411
Beryllium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Bismuth		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.39	0.66
Cadmium		mg/kg wwt	<0.0020	<0.0020	0.0032	0.0021	0.0024	0.0095	0.0062	0.0099	0.0061	0.0069	0.0048	0.0038	0.005	0.0242	0.0056	0.0032	0.0041	0.0271	0.0204	0.0061
Calcium		mg/kg wwt	3880	7890	4390	6350	4840	7530	10600	4270	6680	12100	4540	5540	5170	9600	4150	3830	4810	3420	10400	3500
Cesium		mg/kg wwt	0.037	0.0636	0.0181	0.0808	0.0836	0.085	0.116	0.123	0.0712	0.0825	0.0667	0.674	0.0911	0.0074	0.494	0.105	0.0664	0.0245	0.0167	0.0021
Chromium		mg/kg wwt	0.026	0.021	0.04	0.044	0.08	0.105	0.038	0.06	0.074	0.043	0.055	0.058	0.048	0.039	0.04	0.111	0.035	0.053	0.016	0.079
Cobalt		mg/kg wwt	0.0062	0.0118	0.0129	0.0181	0.0113	0.0195	0.0144	0.0147	0.0127	0.0128	0.0048	0.0076	0.0043	0.0215	0.0184	0.015	0.0045	0.0286	0.0153	0.018
Copper		mg/kg wwt	0.49	0.606	0.858	1.16	0.636	0.499	0.495	0.591	0.935	0.608	0.592	1	0.438	0.913	1.43	0.854	0.593	0.897	1.51	0.703
Gallium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0093	<0.0040	<0.0040
Iron		mg/kg wwt	12.7	21.9	18.1	34.8	12.2	15.3	12.9	16.3	13.8	26.5	13.4	16.7	13.4	22.2	24.6	16.2	12.6	58.6	26.3	20.7
Lead		mg/kg wwt	0.0847	0.0744	0.115	0.0301	0.0794	0.0779	0.0526	0.22	0.0868	0.019	0.0368	0.0312	0.0257	0.0046	0.0388	0.111	0.0348	0.0111	<0.0040	0.0256
Lithium		mg/kg wwt	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Magnesium		mg/kg wwt	271	313	275	298	247	310	420	263	302	424	283	277	283	404	247	264	282	295	391	251
Manganese		mg/kg wwt	1.25	3.97	1.23	5.49	1.12	2.04	2.1	1.08	1.05	5.1	1.87	2.41	4.03	3.59	1.45	1.43	1.97	4.52	6.06	2.1
Mercury		mg/kg wwt	0.051	0.0801	0.12	0.0832	0.0361	0.0616	0.0629	0.0781	0.0772	0.0614	0.0381	0.0509	0.0282	0.0652	0.136	0.0391	0.0314	0.0597	0.0813	0.0641
Molybdenum		mg/kg wwt	0.0078	0.0102	0.0151	0.0189	0.0108	0.0091	0.0105	0.0111	0.0104	0.0165	0.0082	0.0206	0.0116	0.0288	0.0238	0.0127	0.0072	0.0196	0.0207	0.021
Nickel		mg/kg wwt	<0.010	0.018	<0.010	0.021	0.049	0.109	0.038	0.036	0.036	0.03	0.032	0.031	0.025	0.02	0.023	0.095	0.02	0.04	0.067	0.045
Phosphorus		mg/kg wwt	3620	6010	3880	4570	3970	5980	7130	3980	5500	7750	4150	5250	5180	7140	3600	3700	4260	3770	7560	3450
Potassium		mg/kg wwt	3170	3030	2980	2890	2460	2940	4010	2980	2940	3720	3010	2910	2890	3850	2810	2900	2820	4020	3780	3170
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	1.98	2.67	1.59	3.39	3.43	2.58	2.76	2.9	2.4	2.67	2.04	8.79	2.15	2.83	4.49	4.16	1.99	2.69	2.93	1.26
Selenium		mg/kg wwt	0.131	0.166	0.226	0.184	0.121	0.267	0.231	0.258	0.248	0.228	0.143	0.198	0.168	0.778	0.263	0.154	0.144	0.688	1.07	0.346
Silver		mg/kg wwt	0.0024	0.0036	0.0129	0.0099	0.0033	0.0047	0.0054	0.0021	0.0087	0.0046	0.0094	0.0088	0.0017	0.0061	0.0169	0.004	0.009	0.004	0.0062	0.0033
Sodium		mg/kg wwt	798	940	851	905	680	760	936	829	879	984	761	859	887	920	829	798	786	690	1000	1310
Strontium		mg/kg wwt	7.78	24.9	6.77	23.4	13.5	10.9	15.1	6.89	8.25	15.5	5.27	14.6	6.57	7.15	8.92	11.1	5.55	3.13	10.7	3.21
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00868	0.00992	0.00499	0.0104	0.0058	0.00579	0.00566	0.00435	0.00461	0.00597	0.00578	0.0101	0.00688	0.00402	0.00621	0.00632	0.00538	0.00379	0.00421	0.00102
Thorium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0175	<0.0020	<0.0020
Tin		mg/kg wwt	0.038	0.028	0.029	0.027	0.029	0.036	0.027	0.033	0.023	0.026	0.047	0.027	<0.020	0.0245	<0.020	0.029	0.037	0.022	0.0328	0.031
Titanium		mg/kg wwt	-	-	-	-	-	-	-	-	-	-	-	-	-	0.756	-	-	-	2.13	0.382	-
Uranium		mg/kg wwt	0.00134	0.00334	0.0007	0.00628	0.00152	0.00942	0.0112	0.00339	0.00301	0.0327	0.00625	0.00834	0.0184	0.00501	0.00911	0.00165	0.00686	0.00574	0.00349	0.00351
Vanadium		mg/kg wwt	0.017	0.032	0.06	0.042	0.018	0.02	0.045	<0.016	0.022	0.02	0.028	<0.016	0.019	0.0586	<0.016	0.021	0.024	0.164	0.0551	0.08
Yttrium		mg/kg wwt	<0.0020	0.0031	<0.0020	0.0106	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0107	<0.0020	0.0051	0.0023	0.0062	0.007	<0.0020	<0.0020	0.0256	0.0058	<0.0020
Zinc		mg/kg wwt	44.1	50.4	52.3	46.1	34.5	53.8	68.1	60.6	67.7	58.4	40.4	47.7	34.9	32.3	57.3	41.4	41.5	28.2	48.2	68.5
Zirconium		mg/kg wwt	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040

Elements	MDL	Area																			
		Sample ID	L1227117-1	L1227117-2	L1227117-3	L1227117-4	L1227117-5	L1227117-6	L1227117-7	L1227117-8	L1227117-129	L1227117-130	L1227117-131	L1227117-132	L1227117-133	L1227117-134	L1227117-135	L1227117-136	L1227117-137	L1227117-138	L1227117-139
		Unit																			
Aluminum		mg/kg	3.4	8	27.7	10.4	6.3	4.1	27	75.6	4.9	13.4	5.2	31.3	18.9	35.2	9.4	108	33.7	2	5.2
Antimony		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.149	0.27	0.38	0.298	0.256	0.232	0.427	0.613	0.194	0.242	0.219	0.253	0.29	0.503	0.142	0.721	0.328	0.125	0.2
Barium		mg/kg	0.963	1.83	1.93	2.78	1.67	1.04	2.78	4	2.98	1.78	1.3	1.58	3.79	4.42	1.91	4.46	7.08	3.04	5.11
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010
Boron		mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	<0.010	0.017	0.018	0.017	0.012	0.015	0.027	0.021	0.013	0.017	<0.010	0.012	0.027	0.036	0.021	0.051	0.011	<0.010	<0.010
Calcium		mg/kg	8560	18900	19300	13200	11000	10100	19800	13100	41700	43600	32400	32500	57100	63700	18800	70100	22600	48000	28500
Cesium		mg/kg	2.39	1.76	0.754	2.09	3.09	1.47	1.33	2.02	0.0192	0.0138	0.0137	0.0147	0.0139	0.0155	0.0091	0.0221	0.417	0.207	0.349
Chromium		mg/kg	<0.050	0.066	0.096	0.125	0.12	0.068	0.118	0.186	0.084	0.45	0.297	0.146	0.057	0.321	0.278	0.476	0.111	0.375	0.165
Cobalt		mg/kg	0.052	0.059	0.087	0.099	0.083	0.086	0.086	0.118	0.052	0.093	0.07	0.089	0.119	0.098	0.084	0.157	0.075	0.059	0.051
Copper		mg/kg	1.54	4.63	2.97	6.69	4.31	5.36	6.57	9.37	2.17	2.27	2.01	2.27	2.12	3.39	3.09	3.17	5.21	1.28	1.76
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.038	<0.020	<0.020	<0.020
Iron		mg/kg	42.8	72.9	118	104	70.5	70.1	89.3	201	35.3	66.2	50.3	86.3	75.6	105	91.4	196	139	39.9	48.2
Lead		mg/kg	0.099	0.084	0.16	0.085	0.057	0.115	0.09	0.173	0.043	<0.020	<0.020	<0.020	<0.020	0.102	0.096	0.028	0.714	0.294	0.134
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	588	882	917	788	779	822	967	988	1430	1660	1460	1400	1860	2030	1240	2200	1220	1570	1140
Manganese		mg/kg	1.77	5.11	15.6	7.59	4.19	4.58	9.36	32.2	37.8	23.5	18.2	17.9	28.2	20.7	10.5	22.1	20.8	5.79	5.65
Mercury		mg/kg	0.353	0.466	0.29	0.4	0.519	0.356	0.26	0.269	0.128	0.161	0.208	0.173	0.15	0.249	0.3	0.244	0.314	0.242	0.175
Molybdenum		mg/kg	0.025	0.066	0.07	0.066	0.051	0.053	0.099	0.13	0.03	0.036	0.039	0.035	0.036	0.049	0.04	0.053	0.088	0.033	0.037
Nickel		mg/kg	<0.050	0.054	0.05	0.078	0.069	<0.050	<0.050	0.654	0.107	0.264	0.22	0.118	0.316	0.156	0.276	0.144	0.062	0.156	0.097
Phosphorus		mg/kg	7960	14800	16000	12800	10600	10800	14000	11500	27600	30200	26300	22700	34800	39000	17400	41000	17100	29100	20800
Potassium		mg/kg	7500	9660	8560	9300	9400	9040	9100	9540	11900	14100	13200	12700	14100	17400	14600	17000	12400	13500	9860
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010
Rubidium		mg/kg	18	16.1	12	21.4	24.1	15.1	14.5	15.9	8.78	9.16	9.07	8.54	6.19	9.1	5.51	7.98	14.9	8.87	14.4
Selenium		mg/kg	0.44	0.85	0.83	0.86	0.87	1.04	0.93	0.93	0.94	1.09	1.28	1.2	1.6	2.09	1.78	1.75	0.74	0.52	0.43
Silver		mg/kg	0.0128	0.0543	0.0378	0.0921	0.0495	0.0561	0.0449	0.0932	0.0068	0.013	0.0063	0.0055	0.0139	0.0206	0.0165	0.0094	0.0456	<0.0050	0.0059
Sodium		mg/kg	2640	2920	2670	3230	3210	2700	2950	2900	2850	3550	4080	3170	4570	7370	5800	7940	3870	3920	2970
Strontium		mg/kg	19.6	38.4	33.6	35.9	28.5	20.8	38.4	35.3	35.4	35.5	27.1	28.1	48.6	57.9	16.8	68	71.9	67.3	90.7
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0143	0.0224	0.0212	0.0327	0.0305	0.0224	0.0251	0.0307	0.0088	0.0156	0.0082	0.0099	0.0109	0.0166	0.0042	0.0185	0.0322	0.027	0.0336
Thorium		mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010
Tin		mg/kg	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	0.39	0.29	0.098	0.11	0.23	0.16	0.15	0.13	0.11	<0.10	<0.10
Titanium		mg/kg	-	-	-	-	-	-	-	-	-	-	0.342	-	-	-	-	-	-	-	-
Uranium		mg/kg	0.0094	0.0285	0.0337	0.0536	0.0185	0.0118	0.0447	0.0651	0.0094	0.0104	0.0025	0.006	0.0201	0.0197	0.017	0.0313	0.0257	0.0049	0.0069
Vanadium		mg/kg	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	0.178	0.304	0.15	0.045	0.32	0.21	0.784	0.348	1.28	0.089	<0.080	<0.080
Yttrium		mg/kg	<0.010	0.021	0.031	0.025	<0.010	<0.010	0.066	0.13	<0.010	<0.010	<0.010	0.021	0.012	0.016	<0.010	0.058	0.049	<0.010	<0.010
Zinc		mg/kg	66.8	173	146	163	148	202	163	163	199	176	164	219	246	283	314	386	174	142	206
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.24

Elements	MDL	Area																				
		Sample ID	L1227117-140	L1227117-141	L1227117-142	L1227117-143	L1227117-144	L1227117-145	L1227117-146	L1227117-147	L1227117-148	L1227117-149	L1227117-150	L1227117-151	L1227117-152	L1227117-153	L1227117-154	L1227117-155	L1227117-156	L1227117-157	L1227117-158	L1227117-159
		Unit																				
Aluminum		mg/kg	3	11.8	3.3	29.2	<2.0	2.6	3.1	3.7	2.9	16.9	2.7	7.8	6	26.3	11.7	2.1	2.3	113	23.3	8.7
Antimony		mg/kg	<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	<0.010	<0.010	<0.010	<0.010
Arsenic		mg/kg	0.107	0.185	0.09	0.265	0.172	0.15	0.174	0.162	0.1	0.249	0.087	0.219	0.113	0.185	0.236	0.175	0.086	0.275	0.124	0.172
Barium		mg/kg	2.15	12.4	1.02	9.28	2.61	1.25	1.91	0.795	0.929	2.17	0.804	2.98	2.12	1.65	1.9	2.34	0.827	2.33	2.36	1.93
Beryllium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010
Bismuth		mg/kg	<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	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.3	3.1
Cadmium		mg/kg	<0.010	<0.010	0.012	<0.010	<0.010	0.034	0.021	0.038	0.019	0.022	0.018	0.012	0.019	0.089	0.02	<0.010	0.014	0.11	0.068	0.029
Calcium		mg/kg	16600	32500	16900	23000	16400	26700	35500	16500	21100	38700	16600	17100	19600	35200	14600	11300	16600	13900	34600	16400
Cesium		mg/kg	0.159	0.262	0.0695	0.293	0.284	0.301	0.39	0.477	0.225	0.263	0.244	2.08	0.345	0.027	1.74	0.309	0.229	0.0991	0.0555	0.0101
Chromium		mg/kg	0.112	0.085	0.154	0.16	0.272	0.372	0.129	0.232	0.235	0.138	0.201	0.18	0.183	0.145	0.141	0.327	0.119	0.213	0.053	0.37
Cobalt		mg/kg	0.026	0.048	0.05	0.066	0.038	0.069	0.048	0.057	0.04	0.041	<0.020	0.024	<0.020	0.079	0.065	0.044	<0.020	0.116	0.051	0.084
Copper		mg/kg	2.1	2.5	3.3	4.2	2.16	1.77	1.66	2.28	2.96	1.94	2.16	3.09	1.66	3.35	5.05	2.51	2.05	3.63	5.03	3.3
Gallium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.038	<0.020	<0.020
Iron		mg/kg	54.4	90.2	69.7	126	41.3	54.3	43.1	63	43.8	84.5	48.9	51.6	50.9	81.5	86.6	47.5	43.4	237	87.5	96.9
Lead		mg/kg	0.363	0.306	0.443	0.109	0.269	0.276	0.176	0.852	0.274	0.061	0.134	0.096	0.097	<0.020	0.137	0.327	0.12	0.045	<0.020	0.12
Lithium		mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium		mg/kg	1160	1290	1060	1080	839	1100	1410	1020	956	1350	1030	855	1070	1480	869	776	972	1190	1300	1170
Manganese		mg/kg	5.34	16.3	4.71	19.9	3.82	7.22	7.05	4.19	3.33	16.2	6.82	7.45	15.3	13.2	5.11	4.2	6.78	18.3	20.2	9.86
Mercury		mg/kg	0.219	0.33	0.46	0.302	0.123	0.218	0.211	0.302	0.244	0.196	0.139	0.157	0.107	0.239	0.481	0.115	0.108	0.242	0.27	0.301
Molybdenum		mg/kg	0.033	0.042	0.058	0.069	0.037	0.032	0.035	0.043	0.033	0.052	0.03	0.064	0.044	0.106	0.084	0.038	0.025	0.079	0.069	0.098
Nickel		mg/kg	<0.050	0.074	<0.050	0.075	0.166	0.385	0.127	0.139	0.115	0.096	0.118	0.097	0.095	0.072	0.082	0.279	0.069	0.162	0.223	0.213
Phosphorus		mg/kg	15500	24800	14900	16600	13500	21200	23900	15400	17400	24700	15200	16200	19600	26200	12700	10900	14700	15300	25100	16200
Potassium		mg/kg	13600	12500	11500	10500	8340	10400	13400	11500	9300	11800	11000	8980	11000	14100	9910	8530	9710	16300	12600	14800
Rhenium		mg/kg	<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	<0.010	<0.010	<0.010	<0.010
Rubidium		mg/kg	8.49	11	6.12	12.3	11.6	9.14	9.24	11.2	7.58	8.49	7.45	27.1	8.17	10.4	15.8	12.2	6.85	10.9	9.75	5.88
Selenium		mg/kg	0.56	0.68	0.87	0.67	0.41	0.94	0.77	1	0.78	0.73	0.52	0.61	0.64	2.85	0.93	0.45	0.5	2.79	3.55	1.62
Silver		mg/kg	0.0101	0.0147	0.0494	0.0358	0.0112	0.0168	0.018	0.0083	0.0274	0.0148	0.0342	0.0272	0.0066	0.0224	0.0595	0.0117	0.031	0.016	0.0206	0.0152
Sodium		mg/kg	3420	3870	3270	3280	2310	2690	3140	3210	2780	3130	2780	2650	3360	3400	2920	2350	2710	2800	3300	6130
Strontium		mg/kg	33.3	103	26	84.8	46	38.4	50.7	26.6	26.1	49.4	19.2	44.9	24.9	26.2	31.4	32.6	19.1	12.7	35.4	15
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0372	0.0409	0.0192	0.0379	0.0197	0.0205	0.019	0.0168	0.0146	0.019	0.0211	0.0312	0.0261	0.0147	0.0219	0.0186	0.0185	0.0153	0.014	0.0048
Thorium		mg/kg	<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	<0.010	0.071	<0.010	<0.010
Tin		mg/kg	0.16	0.11	0.11	<0.10	<0.10	0.13	<0.10	0.13	<0.10	<0.10	0.17	<0.10	<0.10	0.09	<0.10	<0.10	0.13	0.089	0.109	0.14
Titanium		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	2.77	-	-	-	8.63	1.27	-
Uranium		mg/kg	0.0057	0.0138	0.0027	0.0228	0.0052	0.0333	0.0376	0.0131	0.0095	0.104	0.0228	0.0257	0.0698	0.0184	0.0321	0.0049	0.0236	0.0233	0.0116	0.0164
Vanadium		mg/kg	<0.080	0.13	0.231	0.153	<0.080	<0.080	0.15	<0.080	<0.080	<0.080	0.102	<0.080	<0.080	0.215	<0.080	<0.080	0.082	0.665	0.183	0.376
Yttrium		mg/kg	<0.010	0.013	<0.010	0.038	<0.010	<0.010	<0.010	<0.010	<0.010	0.034	<0.010	0.016	<0.010	0.023	0.025	<0.010	<0.010	0.103	0.019	<0.010
Zinc		mg/kg	189	207	201	167	117	190	228	234	214	186	148	147	132	118	202	122	143	114	160	321
Zirconium		mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Table 1-21: Fish (BMI) Analytical Results for Metals, September 2012 Sampling Program

Elements	MDL	Sample ID	L1217247-1	L1217247-2	L1217247-3	L1217247-4	L1217247-5	L1217247-6	L1217247-7	L1217247-8	L1217247-9	L1217247-10	L1217247-11	L1217247-12	L1217247-13	L1217247-14	L1217247-15	L1217247-16	L1217247-17	L1217247-18	L1217247-19	L1217247-20	L1217247-21	L1217247-22	L1217247-23	L1217258-1	L1217258-2	L1217258-3	L1217258-4	L1217258-5	L1217258-6	L1217258-7	L1217258-8
		Area																															
		Unit																															
Aluminum		mg/kg wwt	118	88.8	372	166	232	170	104	289	78.7	186	480	287	89.0	89.5	99.0	120	55.1	67.2	70.8	303	84.5	99.3	87.4	9.94	2.87	10.5	3.66	10.4	14.4	4.58	14.3
Antimony		mg/kg wwt	0.0057	0.0034	0.0072	0.0186	0.0098	0.0083	0.0069	0.0079	0.0059	0.0052	0.0061	0.0032	0.0026	0.0064	0.0047	0.0044	0.0039	0.0024	<0.0020	0.0106	0.0031	0.0060	0.0040	0.0025	<0.0020	0.0116	0.0020	0.0039	0.0131	0.0034	0.0070
Arsenic		mg/kg wwt	0.190	0.144	0.726	0.329	0.555	0.308	0.228	0.389	0.165	0.312	0.794	0.0541	0.0761	0.216	0.139	0.146	0.324	0.145	0.134	0.445	0.221	0.179	0.110	0.215	0.170	1.05	0.253	0.371	1.22	0.161	0.328
Barium		mg/kg wwt	2.43	1.71	7.02	2.95	3.39	3.82	2.39	4.66	1.18	8.88	10.6	4.65	1.57	3.60	3.09	4.64	2.30	4.37	1.27	5.36	4.32	3.05	3.20	31.2	6.14	10.5	7.48	6.56	11.4	4.95	12.8
Beryllium		mg/kg wwt	0.0108	0.0065	0.0483	0.0093	0.0127	0.0100	0.0064	0.0152	0.0048	0.0092	0.0320	0.0174	0.0056	0.0071	0.0083	0.0127	0.0044	0.0021	0.0048	0.0204	0.0040	0.0074	0.0072	<0.0020	<0.0020	0.0119	<0.0020	0.0039	0.0120	<0.0020	0.0026
Bismuth		mg/kg wwt	<0.0020	<0.0020	0.0032	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0037	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Boron		mg/kg wwt	0.58	0.20	0.23	0.32	0.86	0.59	0.50	0.51	0.52	0.28	0.30	0.32	0.59	0.75	0.37	<0.20	0.58	0.96	0.38	0.62	0.20	0.92	0.37	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Cadmium		mg/kg wwt	0.107	0.0960	0.171	0.0717	0.0720	0.0977	0.0507	0.0348	0.0848	0.0484	0.107	0.0672	0.0405	0.0533	0.0821	0.0720	0.0352	0.239	0.0777	0.0681	0.0327	0.0563	0.0568	0.0189	0.0322	0.0275	0.0379	0.0308	0.0517	0.0110	0.0182
Calcium		mg/kg wwt	413	252	343	429	770	663	568	1220	372	19000	7100	331	543	875	564	294	443	221	193	804	8820	837	449	25100	21600	23500	21100	20900	22400	13200	15900
Cesium		mg/kg wwt	0.0203	0.0237	0.0551	0.0130	0.0143	0.0152	0.0089	0.0154	0.0084	0.0161	0.0455	0.0251	0.0192	0.0111	0.0186	0.0339	0.0053	0.0116	0.0263	0.0262	0.0082	0.0123	0.0176	0.0207	0.0599	0.0557	0.0665	0.0560	0.0985	0.0494	0.114
Chromium		mg/kg wwt	0.251	0.164	0.327	0.354	0.437	0.345	0.329	0.629	0.152	0.467	0.892	0.185	0.105	0.210	0.201	0.178	0.065	0.146	0.162	0.519	0.179	0.213	0.135	0.431	0.107	0.137	0.138	0.104	0.192	0.109	0.454
Cobalt		mg/kg wwt	0.138	0.0623	0.208	0.285	0.324	0.227	0.193	0.246	0.0695	0.193	0.281	0.0644	0.0541	0.250	0.0948	0.129	0.138	0.0438	0.0631	0.341	0.117	0.266	0.0708	0.0147	0.0050	0.0266	0.0072	0.0201	0.0305	0.0056	0.0104
Copper		mg/kg wwt	4.47	2.76	9.27	2.80	7.37	4.82	4.06	4.30	3.24	2.83	3.06	3.07	4.65	4.89	4.79	2.56	4.36	2.08	1.96	3.82	2.16	4.61	2.74	6.45	3.90	3.36	4.58	4.11	5.30	4.69	8.47
Gallium		mg/kg wwt	0.0324	0.0198	0.0952	0.0500	0.0712	0.0463	0.0260	0.0764	0.0175	0.0560	0.117	0.0572	0.0225	0.0243	0.0240	0.0278	0.0108	0.0176	0.0205	0.0783	0.0253	0.0265	0.0234	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Iron		mg/kg wwt	226	139	700	427	553	334	220	492	134	433	840	184	105	232	145	238	485	99.1	132	606	237	257	119	34.5	11.6	370	31.1	182	638	14.5	29.2
Lead		mg/kg wwt	0.0719	0.0881	0.916	0.0975	0.0877	0.0707	0.0743	0.105	0.0566	0.0922	0.133	0.0662	0.0855	0.0379	0.0839	0.0517	0.0210	0.107	0.0573	0.111	0.0466	0.0392	0.0443	0.0439	0.0616	0.0376	0.0775	0.0593	0.0932	0.0227	0.0584
Lithium		mg/kg wwt	0.046	0.042	0.165	0.110	0.092	0.070	0.038	0.093	0.023	0.094	0.349	0.099	0.041	0.037	0.042	0.051	<0.020	0.031	0.032	0.143	0.043	0.039	0.044	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.022
Magnesium		mg/kg wwt	240	149	201	220	378	328	219	350	155	278	297	152	175	506	345	143	203	172	126	509	184	416	305	324	380	351	342	338	360	234	282
Manganese		mg/kg wwt	60.9	18.9	172	82.6	160	107	79.6	159	21.0	231	175	18.4	14.2	90.8	42.3	89.3	33.6	11.2	16.5	163	112	95.9	37.9	13.8	4.33	94.5	8.85	25.4	49.5	3.44	8.23
Mercury		mg/kg wwt	0.0176	0.0061	0.0124	0.0031	0.0159	0.0131	0.0111	0.0094	0.0101	0.0098	0.0222	0.0115	0.0066	0.0117	0.0083	0.0088	0.0081	0.0032	0.0034	0.0108	0.0043	0.0097	0.0167	<0.015	<0.015	<0.040	<0.015	<0.010	<0.020	<0.0050	<0.0050
Molybdenum		mg/kg wwt	0.160	0.138	0.161	0.122	0.129	0.140	0.136	0.126	0.104	0.175	0.168	0.0741	0.105	0.135	0.209	0.169	0.188	0.0944	0.0883	0.126	0.111	0.150	0.151	0.158	0.0766	0.302	0.100	0.101	0.252	0.0457	0.0960
Nickel		mg/kg wwt	0.248	0.099	0.256	0.215	0.385	0.296	0.220	0.332	0.102	0.255	0.477	0.153	0.132	0.435	0.157	0.099	0.129	0.088	0.095	0.409	0.166	0.464	0.123	0.238	0.015	0.027	0.025	0.025	0.053	0.036	0.039
Phosphorus		mg/kg wwt	1230	970	985	990	1270	1320	1120	1390	987	1180	1130	1020	1020	1620	1280	980	1080	983	940	1360	1030	1440	1170	2170	1990	1990	1860	1960	1990	1400	1690
Potassium		mg/kg wwt	1330	590	690	810	1220	1430	1420	1280	1080	950	870	1010	960	1090	940	860	1070	890	580	1150	1010	1260	970	970	1290	<1600	1280	1210	1250	570	690
Rhenium		mg/kg wwt	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Rubidium		mg/kg wwt	0.450	0.449	0.853	0.392	0.433	0.397	0.299	0.415	0.459	0.410	0.585	0.365	0.443	0.389	0.324	0.779	0.612	0.573	0.437	0.536	0.283	0.364	0.267	1.28	0.992	0.941	1.11	0.955	1.64	0.574	1.14
Selenium		mg/kg wwt	0.390	0.271	0.053	0.292	0.338	0.240	0.217	0.208	0.119	0.091	0.308	0.062	0.078	0.163	0.359	0.058	0.067	0.292	0.277	0.222	0.073	0.170	0.227	0.081	0.044	0.046	0.053	0.038	0.067	0.054	0.089
Silver		mg/kg wwt	0.0399	0.0247	0.0518	0.0283	0.0406	0.0418	0.0408	0.0417	0.0381	0.0189	0.0286	0.0194	0.0291	0.0254	0.0285	0.0337	0.0255	0.0152	0.0217	0.0330	0.0182	0.0290	0.0199	0.156	0.0461	0.0453	0.0496	0.0402	0.0671	0.0752	-
Sodium		mg/kg wwt	690	<400	230	<400	670	790	820	690	570	420	410	350	540	600	560	330	610	340	<400	610	390	700	560	780	1090	<1600	1040	1030	1050	450	550
Strontium		mg/kg wwt	3.41	1.32	3.51	2.57	4.04	3.89	3.13	5.84	2.76	19.1	21.2	1.94	3.28	5.76	3.02	1.85	3.00	0.755	0.984	5.35	6.72	4.80	1.89	138	43.1	53.9	49.0	42.5	71.4	33.6	87.5
Tellurium		mg/kg wwt	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Thallium		mg/kg wwt	0.00326	0.00181	0.00900	0.00237	0.00479	0.00283	0.00205	0.00320	0.00187	0.00219	0.00606	0.00196	0.00147	0.00201	0.00210	0.00315	0.00199	0.00174	0.00169	0.00432	0.00124	0.00187	0.00196	0.00660	0.00202	0.00394	0.00257	0.00220	0.00542	0.00284	0.00692
Thorium		mg/kg wwt	0.0410	0.0101	0.0651	0.0273	0.0289	0.0487	0.0223	0.0617	0.0127	0.0308	0.106	0.0280	0.0179	0.0140	0.0156	0.0202	0.0079	0.0060	0.0101	0.0744	0.0147	0.0154	0.0256	<0.0020	<0.0020	<0.0020	<0.0020	0.0142	<0.0020	<0.0020	0.0028
Tin		mg/kg wwt	0.0056	<0.0040	0.0131	0.0047	0.0064	0.0054	<0.0040	0.0045	<0.0040	0.0053	0.0062	0.0046	0.0042	0.155	0.260	0.276	0.0347	0.0507	0.0057	0.0069	<0.0040	0.210	0.361	2.14	0.133	0.142	0.366	0.307	0.618	0.728	<0.0040
Titanium		mg/kg wwt	7.26	3.43	12.4	9.81	10.1	12.5	8.14	9.45	3.38	13.9	18.9	7.06	3.65	5.44	5.09	5.92	3.13	5.66	2.95	11.9	8.26	6.29	3.44	0.330	0.073	0.132	0.123	0.789	0.206	0.144	0.450
Uranium		mg/kg wwt	0.0748	0.0511	0.0704	0.0973	0.120	0.0863	0.0826	0.109	0.0484	0.0444	0.129	0.0558	0.0482	0.0477	0.0806	0.0962	0.0350	0.0152	0.0410	0.163	0.0251	0.0532	0.0528	0.0292	0.0260	0.0984	0.0325	0.0527	0.148	0.0185	0.0464
Vanadium		mg/kg wwt	0.491	0.208	0.789	0.943	0.935	0.783	0.464	1.03	0.242	0.759	1.49	0.361	0.187	0.413	0.289	0.334	0.372	0.265	0.170	1.07	0.393	0.482	0.188	0.0342	0.0131	0.0805	0.0204	0.0693	0.120	0.0176	0.0439
Yttrium		mg/kg wwt	0.201	0.136	0.345	0.224	0.241	0.193	0.144	0.239	0.0901	0.214	0.794	0.285	0.0829	0.159	0.154	0.190	0.0853	0.0495	0.108	0.447	0.106	0.159	0.112	0.0301	0.0112	0.107	0.0193	0.0500	0.135	0.0176	0.0639
Zinc		mg/kg wwt	44.7	27.0	67.6	32.1	45.5	50.1	40.0	61.7	45.0	22.1	15.2	34.0	40.3	39.9	43.3	30.4	32.7	37.0	18.7	39.5	15.7	37.6	31.8	8.67	4.78	5.73	5.31	5.33	8.00	4.21	6.76
Zirconium		mg/kg wwt	0.148	0.057	0.271	0.201	0.221	0.202	0.204	0.205	0.072	0.218	0.602	0.153	0.096	0.119	0.089	0.132	0.086	0.041	0.069	0.330	0.122	0.120	0.085	<0.040	<0.040	<0.040	<0.040	0.051	<0.040	<0.040	<0.040

Elements	MDL	Sample ID	L1217247-1	L1217247-2	L1217247-3	L1217247-4	L1217247-5	L1217247-6	L1217247-7	L1217247-8	L1217247-9	L1217247-10	L1217247-11	L1217247-12	L1217247-13	L1217247-14	L1217247-15	L1217247-16	L1217247-17	L1217247-18	L1217247-19	L1217247-20	L1217247-21	L1217247-22	L1217247-23	L1217258-1	L1217258-2	L1217258-3	L1217258-4	L1217258-5	L1217258-6	L1217258-7	L1217258-8
		Area																															
		Unit																															
Aluminum		mg/kg	648	906	3270	1170	1260	939	608	1570	559	1020	3460	2270	498	526	712	1160	339	620	899	1830	572	593	631	72.3	18.3	63.6	22.5	66.1	83.5	41.9	124
Antimony		mg/kg	0.031	0.035	0.064	0.131	0.053	0.046	0.040	0.043	0.042	0.029	0.044	0.025	0.014	0.037	0.034	0.042	0.024	0.023	0.022	0.064	0.021	0.036	0.029	0.018	<0.010	0.070	0.012	0.025	0.076	0.031	0.060
Arsenic		mg/kg	1.05	1.47	6.36	2.31	3.00	1.70	1.33	2.11	1.17	1.71	5.73	0.427	0.425	1.27	0.996	1.41	1.99	1.34	1.70	2.69	1.49	1.07	0.793	1.56	1.08	6.36	1.55	2.36	7.11	1.47	2.83
Barium		mg/kg	13.4	17.5	61.6	20.7	18.3	21.1	13.9	25.3	8.36	48.6	76.8	36.8	8.80	21.1	22.2	44.9	14.1	40.4	16.2	32.4	29.2	18.2	23.1	227	39.0	63.5	46.0	41.7	66.1	45.3	110
Beryllium		mg/kg	0.060	0.066	0.424	0.065	0.069	0.055	0.037	0.083	0.034	0.050	0.231	0.137	0.032	0.042	0.059	0.123	0.027	0.020	0.061	0.123	0.027	0.044	0.052	0.011	<0.010	0.072	<0.010	0.025	0.070	0.014	0.023
Bismuth		mg/kg	<0.010	<0.010	0.028	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.026	0.014	<0.010	<0.010	<0.010	0.015	0.011	<0.010	0.015	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron		mg/kg	3.2	2.1	2.0	2.2	4.6	3.2	2.9	2.8	3.7	1.5	2.1	2.5	3.3	4.4	2.7	1.1	3.6	8.9	4.8	3.7	1.4	5.5	2.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium		mg/kg	0.592	0.980	1.50	0.504	0.390	0.539	0.295	0.189	0.603	0.265	0.775	0.531	0.227	0.313	0.590	0.696	0.216	2.21	0.987	0.412	0.221	0.336	0.410	0.138	0.204	0.166	0.233	0.196	0.300	0.101	0.157
Calcium		mg/kg	2280	2570	3010	3020	4170	3660	3310	6620	2650	104000	51200	2610	3030	5140	4050	2850	2730	2040	2450	4860	59700	4990	3250	183000	137000	142000	130000	133000	130000	120000	137000
Cesium		mg/kg	0.112	0.242	0.483	0.0917	0.0771	0.0839	0.0520	0.0837	0.0596	0.0884	0.328	0.198	0.107	0.0652	0.133	0.327	0.0324	0.107	0.334	0.158	0.0556	0.0736	0.127	0.151	0.380	0.336	0.409	0.356	0.572	0.452	0.984
Chromium		mg/kg	1.39	1.68	2.87	2.49	2.37	1.90	1.92	3.41	1.08	2.56	6.44	1.46	0.589	1.24	1.45	1.72	0.401	1.35	2.05	3.14	1.21	1.27	0.979	3.14	0.676	0.827	0.847	0.662	1.12	1.00	3.92
Cobalt		mg/kg	0.759	0.636	1.83	2.00	1.75	1.26	1.12	1.33	0.494	1.06	2.03	0.509	0.302	1.47	0.682	1.25	0.847	0.404	0.801	2.07	0.790	1.59	0.512	0.107	0.032	0.161	0.044	0.128	0.177	0.051	0.090
Copper		mg/kg	24.6	28.1	81.3	19.7	39.9	26.6	23.7	23.3	23.0	15.5	22.1	24.2	26.0	28.7	34.4	24.7	26.8	19.2	24.9	23.1	14.6	27.5	19.8	47.0	24.8	20.3	28.2	26.2	30.8	42.9	73.2
Gallium		mg/kg	0.179	0.203	0.835	0.352	0.385	0.255	0.152	0.415	0.124	0.307	0.844	0.452	0.126	0.143	0.172	0.269	0.067	0.162	0.260	0.474	0.171	0.158	0.169	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	<0.020	0.026
Iron		mg/kg	1250	1420	6140	3000	2990	1850	1280	2670	954	2380	6060	1450	589	1370	1040	2300	2980	914	1670	3670	1610	1530	856	251	73.4	2240	191	1160	3710	133	252
Lead		mg/kg	0.396	0.899	8.04	0.686	0.474	0.390	0.433	0.572	0.403	0.505	0.961	0.523	0.478	0.222	0.603	0.500	0.129	0.986	0.727	0.669	0.315	0.234	0.320	0.320	0.391	0.227	0.476	0.377	0.542	0.207	0.505
Lithium		mg/kg	0.25	0.43	1.44	0.77	0.50	0.39	0.22	0.50	0.17	0.52	2.52	0.78	0.23	0.22	0.30	0.49	<0.10	0.29	0.41	0.87	0.29	0.23	0.32	0.13	<0.10	0.10	<0.10	0.13	0.11	<0.10	0.19
Magnesium		mg/kg	1320	1520	1770	1550	2040	1810	1280	1900	1100	1520	2140	1200	977	2970	2480	1380	1250	1580	1600	3080	1250	2480	2210	2360	2420	2120	2100	2150	2090	2140	2440
Manganese		mg/kg	336	193	1510	581	866	591	464	863	149	1260	1260	145	79.1	533	304	863	207	103	209	984	757	572	274	100	27.5	571	54.4	162	288	31.4	71.1
Mercury		mg/kg	0.0968	0.062	0.109	0.022	0.0858	0.0724	0.0646	0.0513	0.0720	0.0537	0.160	0.0909	0.0371	0.0685	0.060	0.085	0.0499	0.0294	0.043	0.0651	0.0292	0.0578	0.121	<0.10	<0.10	<0.25	<0.075	<0.075	<0.13	<0.050	<0.55
Molybdenum		mg/kg	0.883	1.41	1.41	0.857	0.700	0.771	0.792	0.686	0.740	0.962	1.21	0.585	0.586	0.790	1.50	1.63	1.15	0.871	1.12	0.760	0.751	0.892	1.09	1.15	0.487	1.82	0.616	0.640	1.47	0.418	0.830
Nickel		mg/kg	1.37	1.01	2.25	1.51	2.08	1.63	1.28	1.80	0.725	1.40	3.44	1.21	0.736	2.56	1.13	0.953	0.796	0.810	1.21	2.47	1.12	2.77	0.887	1.73	0.096	0.165	0.152	0.161	0.307	0.329	0.339
Phosphorus		mg/kg	6770	9930	8640	7000	6890	7280	6540	7550	7020	6470	8180	8090	5680	9540	9170	9470	6640	9080	11900	8240	6930	8570	8460	15800	12700	12000	11400	12500	11600	12800	14600
Potassium		mg/kg	7300	6000	6100	5700	6600	7900	8300	7000	7700	5200	6300	8000	5400	6400	6800	8300	6600	8200	7400	7000	6800	7500	7000	7000	8200	<10000	7900	7700	7300	5200	6000
Rhenium		mg/kg	<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	<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
Rubidium		mg/kg	2.48	4.58	7.48	2.76	2.34	2.19	1.74	2.25	3.27	2.25	4.22	2.89	2.47	2.28	2.33	7.53	3.77	5.28	5.55	3.24	1.91	2.17	1.93	9.31	6.30	5.69	6.82	6.08	9.53	5.25	9.84
Selenium		mg/kg	2.15	2.77	0.47	2.06	1.83	1.33	1.27	1.13	0.84	0.50	2.22	0.49	0.44	0.96	2.58	0.56	0.41	2.70	3.51	1.34	0.49	1.02	1.64	0.59	0.28	0.28	0.32	0.24	0.39	0.50	0.77
Silver		mg/kg	0.220	0.253	0.455	0.199	0.220	0.230	0.238	0.226	0.271	0.104	0.206	0.153	0.163	0.149	0.204	0.326	0.157	0.141	0.275	0.200	0.123	0.173	0.144	1.14	0.293	0.274	0.305	0.256	0.390	0.688	-
Sodium		mg/kg	3800	2800	<2000	<3000	3600	4300	4800	3700	4100	2300	2900	2700	3000	3500	4000	3200	3700	3200	<4000	3700	2700	4100	4000	5700	6900	<10000	6400	6500	6100	4100	4700
Strontium		mg/kg	18.8	13.5	30.7	18.1	21.9	21.4	18.3	31.7	19.7	105	153	15.3	18.4	33.8	21.7	17.9	18.5	6.97	12.5	32.4	45.4	28.6	13.6	1000	274	326	301	270	415	307	756
Tellurium		mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium		mg/kg	0.0180	0.0185	0.0789	0.0167	0.0259	0.0156	0.0120	0.0174	0.0133	0.0120	0.0437	0.0155	0.0082	0.0118	0.0151	0.0305	0.0122	0.0161	0.0214	0.0262	0.0084	0.0112	0.0142	0.0480	0.0128	0.0238	0.0158	0.0140	0.0315	0.0260	0.0598
Thorium		mg/kg	0.226	0.103	0.571	0.192	0.156	0.269	0.130	0.335	0.090	0.169	0.768	0.221	0.100	0.083	0.112	0.195	0.048	0.056	0.128	0.450	0.099	0.092	0.185	0.014	<0.010	<0.010	<0.010	0.091	0.010	0.012	0.024
Tin		mg/kg	0.031	0.039	0.115	0.033	0.035	0.030	0.021	0.025	0.022	0.029	0.045	0.036	0.024	0.913	1.87	2.66	0.213	0.468	0.073	0.042	0.024	1.25	2.61	15.6	0.842	0.856	2.25	1.95	3.59	6.66	0.027
Titanium		mg/kg	40.0	35.0	109	69.0	54.7	68.9	47.5	51.3	24.1	76.0	136	55.8	20.4	32.0	36.6	57.2	19.2	52.3	37.5	72.3	55.9	37.5	24.9	2.40	0.463	0.797	0.756	5.02	1.20	1.32	3.89
Uranium		mg/kg	0.412	0.521	0.618	0.684	0.651	0.476	0.482	0.592	0.344	0.243	0.934	0.441	0.270	0.280	0.579	0.930	0.215	0.140	0.520	0.985	0.170	0.318	0.381	0.212	0.165	0.595	0.200	0.335	0.860	0.169	0.401
Vanadium		mg/kg	2.70	2.12	6.92	6.63	5.06	4.32	2.71	5.61	1.72	4.16	10.8	2.85	1.05	2.42	2.08	3.23	2.29	2.45	2.16	6.47	2.66	2.88	1.36	0.249	0.083	0.487	0.126	0.441	0.695	0.161	0.379
Yttrium		mg/kg	1.11	1.39	3.03	1.58	1.30	1.07	0.841	1.29	0.641	1.17	5.73	2.25	0.463	0.935	1.11	1.84	0.524	0.456	1.37	2.71	0.718	0.947	0.812	0.219	0.071	0.645	0.119	0.318	0.783	0.161	0.552
Zinc		mg/kg	247	275	593	226	246	277	233	335	320	121	109	269	225	234	311	294	201	341	238	239	106	224	230	63.1	30.4	34.6	32.6	33.9	46.5	38.5	58.5
Zirconium		mg/kg	0.82	0.58	2.37	1.41	1.19	1.12	1.19	1.11	0.51	1.20	4.34	1.21	0.53	0.70	0.64	1.28	0.53	0.38	0.87	2.00	0.82	0.72	0.62	0.26	<0.20	<0.20	<0.20	0.32	<0.20	<0.20	<0.20

Annex 2
Human Health Model Calculations

Example Calculations

1. Exposure Assessment

For the human health risk assessment, the potential dose of the COPC that a receptor may receive from each complete exposure pathway was estimated. The dose was a function of the COPC concentration in various environmental media, biological and life characteristics of the receptor, and chemical-specific parameters that influence COPC behaviour in the environment.

1.1. Receptor Characteristics

The receptors were assumed to be an adult Aboriginal resident accompanied by a young Aboriginal toddler resident who may participate in traditional (i.e., hunting) and recreational (i.e., hiking) activities within the study areas of the proposed Project. A summary of the exposure pathways that were considered complete for the human receptors and included in the exposure assessment were:

- Direct contact with soil (ingestion and dermal contact);
- Inhalation of re-suspended soil particles;
- Ingestion of surface water;
- Ingestion of vegetation (i.e., roots, and leaves);
- Ingestion of wild game; and
- Ingestion of fish (i.e., generic freshwater fish).

These assumptions provide the basis of the exposure assessment. **Tables 2-1** and **2-2** have been adapted from HC (2010) and provide a summary of the characteristics of potential receptors. With respect to dermal exposures, it was assumed that receptors would be exposed through direct dermal contact with an individual's hands, arms, and legs.

Table 2-1: Summary of Human Health Receptor Characteristics for the Proposed Project

Receptor Characteristic	Receptor Parameters		Source
	Toddler	Adult	
Age	7 months - 4 years	>20 years	HC 2010
Exposure duration (years)	4.5	60	Based on 80 year lifespan
Body weight (kg)	16.5	70.7	Richardson 1997
Soil ingestion rate (g/d)	0.08	0.02	CCME 2006
Surface water ingestion rate (L/d)	0.6	1.5	Richardson 1997
Inhalation rate (m^3/d)	8.3	16.6	Allan et al., 2008
Food ingestion (g/d)			
Roots and traditional below-ground plants	105	188	Richardson 1997
Traditional above-ground plants[1]	0.28	0.57	Chan et al 2011

Receptor Characteristic	Receptor Parameters		Source
	Toddler	Adult	
Fish[1]	55.02	174.67	Chan et al 2011
Wild Game[1]	50.85	161.42	Chan et al 2011
Skin surface area (cm^2)			
Hands	430	890	Richardson 1997
Arms (upper and lower)	890	2,500	Richardson 1997
Legs (upper and lower)	1,690	5,720	Richardson 1997
Total Area	3,010	9,110	Richardson 1997
Total Body	6,130	17,640	Richardson 1997
Soil loading to exposed skin (mg/cm^2)			
Soil adhesion to skin (based on hands)	0.1	0.1	Kissel et *al.* 1996; 1998
Soil adhesion to skin (other than hands)	0.01	0.01	Kissel et *al.* 1996; 1998

Note: [1]ingestion rates for First Nations Populations in BC;

CCME - Canadian Council of Ministers of the Environment; cm^2 - centimetres squared; g/d - grams per day; HC - Health Canada; kg - kilogram; L/d - litres per day; m^3/d - cubic metres per day; mg/cm^3 - milligrams per cubic centimetre

Table 2-2: Summary of Human Health Receptor Characteristics for the Proposed Project

Exposure Assumption	Aboriginal Receptors	
	Toddler	Adult
Hours per Day	24	24
Days per Week	7	7
Weeks per Year	52	52
Days per Year	365	365
Years	4.5	60
Life Expectancy	n/a	80

Source: Health Canada 2010: Table 4: Exposure Duration and Frequency for PQRA; n/a-not applicable

1.2. Exposure Point Concentrations

Exposure Point Concentrations (EPCs) were chemical concentrations in soil, surface water, and foods to which receptors were assumed to be exposed. For the purpose of the PQRA, EPCs in soil, surface water, and country foods were assumed to be equivalent to the 95th percentile concentration detected within the study areas of the proposed Project. The use of the 95th percentile concentration is consistent with (HC 2010) for evaluating a reasonably conservative concentration in the human health PQRA. A summary of the 95th percentile of baseline concentrations for soil, surface water, vegetation and fish data can be found in **Table A2-4**.

Table 2-4: Human Health Exposure Point Concentrations – 95th Percentile of Baseline Concentrations

Metal COPC	95th Percentile Soil Concentration (mg/kg)	95th Percentile Surface Water Concentration (mg/L)	95th Percentile Plant Tissue Concentration (mg/kg)	95th Percentile Fish Concentration (mg/kg)	95th Percentile Wild Game Concentration (mg/kg)
Aluminium	n/a	0.42	7040	0.85	0.13
Arsenic	21.4	0.0014	0.41	0.067	0.00055
Cadmium	1.6	0.000081	1.52	0.015	0.00003
Molybdenum	5.1	0.00086	8.2	0.0076	0.0013

Note: COPC - Chemical of Potential Concern; mg/kg - milligrams per kilogram; mg/L - milligrams per litre; n/a – not available

1.3. Estimation of Potential Exposure via Incidental Ingestion and Dermal Contact with Soil

1.3.1. Soil Ingestion:

In general, for the incidental ingestion pathway, the exposure to soil depends on the amount of soil ingested on a daily basis (milligrams per day (mg/d)), and the number of days per year that exposures are likely to occur (i.e., the frequency and duration of exposure).

The general equation used to calculate the dose due to soil ingestion is as follows:

$$ADD = \frac{C_s \cdot IR \cdot F \cdot RAF_o \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

where:

ADD = Average Daily Dose (mg/kg/-d)
C_s = 95th percentile of baseline chemical concentration in soil (mg/kg)
IR = ingestion rate (mg/d)
F = fraction from site (unitless)
RAF_o = relative absorption factor - oral (unitless)
EF = exposure frequency (365 days per year)
ED = exposure duration (4.5 years for toddler, 60 years for adult)
CF = conversion factor (kg/mg)
AT = averaging time (365 days per year x 4.5 years for toddler or 60 years for adult)
BW = body weight (kg)

1.3.1.1. Example of Non-carcinogenic Calculation for Incidental Ingestion of Arsenic in Soil

$$ADD_{non-carcinogenic} = \frac{2.14 \times 10^{1} mg/kg \cdot 80 mg/d \cdot 1 \cdot 0.95 \cdot 365 d/y \cdot 4.5 y \cdot 1.0 \times 10^{-6} kg/mg}{1642.5 d \cdot 16.5 kg}$$

$$ADD_{non-carcinogenic} = 9.9 \times 10^{-5} mg/kg - d$$

1.3.1.2. Example of Carcinogenic Calculation for Incidental Ingestion of Arsenic in Soil

$$ADD_{carcinogenic} = \frac{2.14 \times 10^{1} mg/kg \cdot 20 mg/d \cdot 1 \cdot 0.95 \cdot 365 d/y \cdot 60 y \cdot 1.0 \times 10^{-6} kg/mg}{29{,}200 d \cdot 70.7 kg}$$

$$ADD_{carcinogenic} = 4.3 \times 10^{-6} mg/kg - d$$

1.3.2. Soil Dermal Contact:

In this assessment, dermal exposures were summed with oral exposures. Dermal exposures were calculated as follows:

$$ADD = \frac{(C_s \cdot SA_H \cdot SL_H) + (C_s \cdot SA_O \cdot SL_O) \cdot RAF_D \cdot F \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

where:

ADD = Average Daily Dose (mg/kg/-d)
C_S = 95th percentile of baseline chemical concentration in soil (mg/kg)
SA_H = skin surface area (hands) (cm^2)
SL_H = soil loading to exposed skin (hands) (mg/cm^2)
SA_O = skin surface area (other than hands) (cm^2)
SL_O = soil loading to exposed skin (other than hands) (mg/cm^2)
F = fraction from site (unitless)
RAF_D = absorption adjustment factor - dermal (unitless)
EF = exposure frequency (365 days per year)
ED = exposure duration (4.5 years for toddler, 60 years for adult)
CF = conversion factor (kg/mg)
AT = averaging time (365 days per year x 4.5 years for toddler or 60 years for adult)
BW = body weight (kg)

1.3.2.1. Example of Non-carcinogenic Calculation for Dermal Contact with Arsenic in Soil

$$ADD_{non-carcinogenic} = \frac{(2.14\times10^{1}mg/kg\cdot430cm^{2}\cdot0.1mg/cm^{2})+(2.14\times10^{1}mg/kg\cdot2580cm^{2}\cdot0.01mg/cm^{2})\cdot1\cdot0.03\cdot365d/y\cdot4.5y\cdot1.0\times10^{-6}kg/mg}{1642.5d\cdot16.5kg}$$

$$ADD_{non-carcinogenic} = 2.7\times10^{-6}mg/kg-d$$

1.3.2.2. Example of Carcinogen Calculation for Dermal Contact with Arsenic in Soil

$$ADD_{carcinogenic} = \frac{(2.14\times10^{1}mg/kg\cdot890cm^{2}\cdot0.1mg/cm^{2})+(2.14\times10^{1}mg/kg\cdot8220cm^{2}\cdot0.01mg/cm^{2})\cdot1\cdot0.03\cdot365d/y\cdot60y\cdot1.0\times10^{-6}kg/mg}{29{,}200d\cdot70.7kg}$$

$$ADD_{carcinogenic} = 1.2\times10^{-6}mg/kg-d$$

1.4. Estimation of Potential Exposure via Inhalation of Dust

The local Aboriginal receptors may inhale dust as a result of disturbance of the surface soil. The general equation used to estimate the dose to receptors via inhalation of dust was as follows:

$$ADD = \frac{C_s\cdot P_{air}\cdot IR\cdot F\cdot RAF_I\cdot EF\cdot ED\cdot CF}{AT\cdot BW}$$

where:

ADD	=	Average Daily Dose (mg/kg/-d)
C_s	=	95th percentile of baseline chemical concentration in soil (mg/kg)
P_{air}	=	particulate concentration of dust in a natural setting (0.00076 mg/m^3)
IR	=	inhalation rate (m^3/d)
F	=	fraction from site (unitless)
RAF_I	=	relative absorption factor - inhalation (unitless)
EF	=	exposure frequency (365 days per year)
ED	=	exposure duration (4.5 years for toddler, 60 years for adult)
CF	=	conversion factor (1.0 x 10^{-6} kg/mg)
AT	=	averaging time (365 days per year x 4.5 years for toddler or 60 years for adult)
BW	=	body weight (kg)

HC (2010) indicates that an average airborne concentration of respirable PM should be assumed to be 0.00076 mg/m.

1.4.1. Example of Non-carcinogenic Calculation for Inhalation of Arsenic in Particulate Matter

$$ADD_{non-carcinogenic} = \frac{2.14\times10^{1}mg/kg\cdot0.00076mg/m^{3}\cdot8.3m^{3}/d\cdot1\cdot1\cdot365d/y\cdot4.5y\cdot1.0\times10^{-6}kg/mg}{1642.5d\cdot16.5kg}$$

$$ADD_{non-carcinogenic} = 8.2\times10^{-9}\,mg/kg-d$$

1.4.2. Example of Carcinogenic Calculation for Inhalation of Arsenic in Particulate Matter

$$ADD_{carcinogenic} = \frac{2.14\times10^{1}mg/kg\cdot0.00076mg/m^{3}\cdot16.6m^{3}/d\cdot1\cdot1\cdot365d/y\cdot60y\cdot1.0\times10^{-6}kg/mg}{29{,}200d\cdot70.7kg}$$

$$ADD_{carcinogenic} = 2.9\times10^{-9}\,mg/kg-d$$

1.5. Estimation of Potential Exposure via Ingestion of Arsenic in Surface Water

The equation used to estimate potential exposures to the local Aboriginal receptors via ingestion of surface water is the following:

$$ADD = \frac{C_{sw}\cdot IR\cdot RAF_{o}\cdot F\cdot EF\cdot ED\cdot CF}{AT\cdot BW}$$

where:

ADD	=	Average Daily Dose (mg/kg/-d)
C_{sw}	=	95th percentile of baseline chemical concentration in surface water (mg/L)
IR	=	ingestion rate of water (µL/day)
RAF_O	=	relative absorption factor - oral (unitless)
F	=	fraction from site (unitless)
EF	=	exposure frequency (365 days per year)
ED	=	exposure duration (4.5 years for toddler, 60 years for adult)
CF	=	conversion factor (1.0 x 10^{-6} kg/mg)
AT	=	averaging time (365 days per year x 4.5 years for toddler or 60 years for adult)
BW	=	body weight (kg)

1.5.1. Example of Non-carcinogenic Calculation for Ingestion of Arsenic in Surface Water

$$ADD_{non-carcinogenic} = \frac{1.40\times10^{-3}mg/L\cdot600{,}000\mu L/d\cdot0.95\cdot1\cdot365d/y\cdot4.5y\cdot1.0\times10^{-6}L/\mu L}{1642.5d\cdot16.5kg}$$

$$ADD_{non-carcinogenic} = 4.8\times10^{-5}\,mg/kg-d$$

1.5.2. Example of Carcinogenic Calculation for Ingestion of Arsenic in Surface Water

$$ADD_{carcinogenic} = \frac{1.40\times10^{-3}mg/L\cdot1500000\mu L/d\cdot0.95\cdot1\cdot365d/y\cdot60y\cdot1.0\times10^{-6}L/\mu L}{29{,}200d\cdot70.7kg}$$

$$ADD_{carcinogenic} = 2.1 \times 10^{-5} mg/kg - d$$

1.6. Estimation of Potential Exposure via Dermal Contact with Surface Water

The equation used to estimate potential exposures to the local Aboriginal receptors via dermal contact with surface water is the following:

$$ADD = \frac{DA_{event} \cdot SA \cdot F \cdot EF \cdot ED \cdot t_1}{AT \cdot BW}$$

where:

ADD	=	Average Daily Dose (mg/kg/-d)
DA_{event}	=	dermal absorbed dose per event (mg/cm^2-event)
SA	=	Total body skin surface area (centimetres squared (cm^2) / event)
F	=	event frequency (event(s)/day)
EF	=	exposure frequency (365 days/year)
ED	=	exposure duration (4.5 years for toddler or 60 years for adult)
t_1	=	swimming event duration (hours)
AT	=	averaging time (365 days per year x 4.5 years for toddler or 60 years for adult)
BW	=	body weight (kg)

The value DA_{event} is found using the below formula:

$$DA_{event} = Kp \cdot (C_{sw}/1000) \cdot t_1$$

where:

DA_{event}	=	dermal absorbed dose per event (mg/cm^2-event)
Kp	=	permeability constant (cm/h)
C_{sw}	=	95th percentile of baseline chemical concentration in surface water (mg/L)
t_1	=	swimming event duration (hours)

$$DA_{event} = 0.001 cm/h \cdot (1.40 \times 10^{-3} mg/L \div 1000) \cdot 1h$$
$$DA_{event} = 1.40 \times 10^{-9}$$

1.6.1. Example of Non-carcinogenic Calculation for Dermal Contact with Arsenic in Surface Water

$$ADD_{non-carcinogenic} = \frac{1.40\times10^{-9} mg/cm^2 \cdot 6{,}130cm^2 \cdot 1 \cdot 365d/y \cdot 4.5y \cdot 1h}{1642.5d \cdot 16.5kg}$$

$$ADD_{non-carcinogenic} = 5.2\times10^{-7} mg/kg-d$$

1.6.2. Example of Carcinogenic Calculation for Dermal Contact with Arsenic in Surface Water

$$ADD_{carcinogenic} = \frac{1.40\times10^{-9} mg/cm^2 \cdot 17{,}640cm^2 \cdot 1 \cdot 365d/y \cdot 60y \cdot 1h}{29{,}200d \cdot 70.7kg}$$

$$ADD_{carcinogenic} = 2.6\times10^{-7} mg/kg-d$$

1.7. Estimation of Potential Exposure via Ingestion of Contaminated Food (i.e., Produce, Wild Game and Fish)

The equation used to estimate potential exposures to the local Aboriginal receptor via ingestion of contaminated foods is the following:

$$ADD = \frac{C_F \cdot IR \cdot RAF_o \cdot EF \cdot ED \cdot CF}{AT \cdot BW}$$

where:

ADD	=	Average Daily Dose (mg/kg/-d)
C_F	=	95th percentile of baseline chemical concentration in country foods (mg/kg)
IR	=	ingestion rate for food (mg/d)
RAF_O	=	relative absorption factor - oral (unitless)
EF	=	exposure frequency (365 days per year)
ED	=	exposure duration (4.5 years for toddler, 60 years for adult)
CF	=	conversion factor (1.0 x 10^{-6} kg/mg)
AT	=	averaging time (365 days per year x 4.5 years for toddler or 60 years for adult)
BW	=	body weight (kg)

1.7.1. Example of Non-carcinogenic Calculation for Ingestion of Arsenic in Wild Game

$$ADD_{non-carcinogenic} = \frac{5.45\times10^{-4} mg/kg \cdot 50{,}850mg/d \cdot 0.95 \cdot 365d \cdot 4.5y \cdot 1.0\times10^{-6} kg/mg}{1642.5d \cdot 16.5kg}$$

$$ADD_{non-carcinogenic} = 1.6\times10^{-6} mg/kg-d$$

1.7.2. Example of Carcinogenic Calculation for Ingestion Arsenic in Wild Game

$$ADD_{carcinogenic} = \frac{5.45 \times 10^{-4} mg/kg \cdot 161{,}420 mg/d \cdot 0.95 \cdot 365d \cdot 60y \cdot 1.0 \times 10^{-6} kg/mg}{29{,}200d \cdot 70.7kg}$$

$$ADD_{carcinogenic} = 8.9 \times 10^{-7} mg/kg - d$$

2. Risk Characterization

Risk characterization was the final step in the risk assessment process that integrated the results of the exposure assessment and the toxicity assessment for each COPC in order to estimate the potential for carcinogenic and non-carcinogenic human health effects from exposure to that COPC.

2.1. Non-Carcinogenic Risk Characterization

For the assessment of non-carcinogenic health effects, the calculated Average Daily Dose (ADD) was compared to the non-carcinogenic TRV. The non-carcinogenic TRV was defined as an estimate of compound intake that was unlikely to cause adverse health effects even if exposure occurred for an entire lifetime.

The potential for exposures to result in adverse non-carcinogenic health effects was estimated by comparing the daily intake with the TRV. The resulting ratio, which is unitless, is known as the Hazard Quotient (HQ) for that compound. The HQ was calculated using the following formula:

$$HQ = \frac{ADD}{TRV}$$

where:	HQ	=	Hazard quotient (unitless)
	ADD	=	Average Daily Dose (mg/kg-d)
	TRV	=	Toxicological Reference Value (mg/kg-d)

2.1.1. Example Non-carcinogen Calculation for oral ingestion of Arsenic in soil

$$HQ = \frac{9.95 \times 10^{-5} mg/kg - d}{3.0 \times 10^{-4} mg/kd - d}$$

$$HQ = 0.33$$

2.2. Non-Carcinogenic Risk Characterization

For carcinogenic chemicals, the Incremental Lifetime Cancer Risk (ILCR) was determined by the following equation:

$$ILCR = ADD\ x\ TRV$$

where:	ILCR	=	Incremental Lifetime Cancer Risk (unitless)
	ADD	=	Average Daily Dose (mg/kg bw-d)
	TRV	=	Toxicological Reference Value (mg/kg bw-d)

2.2.1. Example of Carcinogenic Calculation for Incidental Ingestion of Arsenic in Soil

$$ILCR = 4.3 \times 10^{-6} mg / kg bw - d\ x\ 1.8 mg / kg bw - d$$

$$ILCR = 7.74 \times 10^{-6}$$

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Annex 3
Chemical Profiles

1.0 ALUMINIUM

Aluminium is the most abundant metal and the third most abundant element, after oxygen and silicon, in the earth's crust. It is widely distributed and constitutes approximately 8.8% of the earth's crust. Aluminium is a very reactive element and is found combined with other elements, most commonly with oxygen, silicon, and fluorine. Small amounts of aluminium are found dissolved as ions in water. Aluminium occurs naturally in soil, water, and air. It is redistributed or moved by natural and human activities. High levels in the environment can be caused by the mining and processing of its ores and by the production of aluminium metal, alloys, and compounds. Small amounts of aluminium are released into the environment from coal-fired power plants and incinerators. Virtually all food, water, and air contain some aluminum. Aluminium metal is light in weight and silvery-white in appearance. Familiar uses of aluminium are for beverage cans, pots and pans, airplanes, siding and roofing, and foil. Aluminium is not accumulated to a significant extent in most plants or animals (ATSDR 2006).

Aluminium toxic effects can be divided into three categories, i.e., disturbance of the gastrointestinal tract, pulmonary effects and systemic toxicity. Results from human and animal studies suggest that the respiratory tract, particularly the lung is a sensitive target for airborne aluminium toxicity; human studies also suggest that the nervous system may also be a target of inhaled aluminium (ATSDR 2006). The gastrointestinal problems related to aluminium intake are often due to inhibition of the absorption of other elements like calcium and iron. It can also reduce intestine motility through inhibition of acetylcholine-induce muscle contractions.

ATSDR (2006) provided a chronic oral RfD of 1 mg/kg/d based on a LOAEL of 100 mg/kg/day for decreased forelimb and hindlimb grip strength and decreased thermal sensitivity in mouse identified in the Golub et al. (2000) study. The aluminium MRL of 1 mg/kg/day was calculated by dividing the LOAEL by an uncertainty factor of 300 (3 for use of a minimal LOAEL, 10 for extrapolation from animals to humans, and 10 for human variability) and a modifying factor of 0.3 to account for possible differences in the bioavailability of the aluminium lactate used in the Golub and Germann (2001) study.

RAIS (2013) provides a chronic inhalation RfC of 0.005 mg/m^3.

1.1 Arsenic

Arsenic is a natural element that is widely distributed throughout the earth’s crust. It is often found naturally in groundwater, through erosion and weathering of soils, minerals, and ores. Arsenic compounds are used commercially and industrially in the manufacture of a variety of products and may enter drinking water sources directly from industrial effluents and indirectly from atmospheric deposition (Health Canada 2006).

Trivalent (As^{+3}) arsenic compounds are generally more toxic than pentavalent (As^{+5}) compounds. Also, the more water soluble forms of arsenic compounds are usually more toxic and more likely to have systemic effects than the less soluble compounds which are more likely to cause chronic pulmonary effects if inhaled.

Arsine gas (AsH_3), one of the most toxic inorganic arsenic compounds causes acute effects like nausea, vomiting, shortness of breath and haemolytic reactions. It should be noted that laboratory animals are generally less sensitive than humans to the toxic effects of inorganic arsenic. In addition, the critical effects appear to be immunosuppression and hepato-renal dysfunction in rodents whereas in humans, the skin, vascular system, and peripheral nervous system are the primary target organs (Amdur *et al.,* 1991).

The skin is the most critical organ when it comes to toxic effects. For chronic exposure to arsenic in drinking water, skin lesions are common and there are many documented cases of skin cancer related to the consumption of arsenic in the drinking water (Amdur *et al.*, 1991). Sensory loss of the peripheral nervous system is one the most common effects of acute exposure to arsenic. Liver injury is more characteristic of chronic exposure which manifests as jaundice and may progress to cirrhosis and liver cancer.

US EPA IRIS (2013) listed an oral RfD of 0.0003 mg/kg/d based on the prevalence of skin cancer and blackfoot disease in an exposed population study (Tseng 1977). Health Canada (2010) provides an oral cancer slope factor of 1.8 $(mg/kg/d)^{-1}$, which was used for assessing carcinogenic risks.

California EPA (2013) also had a chronic inhalation Reference Exposure Level of 0.015 $\mu g/m^3$.

Health Canada (2010) provides an inhalation slope factor of 27 $(mg/kg/d)^{-1}$ and an inhalation unit risk of 6.4 $(mg/m^3)^{-1}$. The inhalation unit risk of 6.4 $(mg/m^3)^{-1}$ was used for assessing risks due to the inhalation of carcinogenic risks.

US EPA IRIS (2013) classified this chemical as Group A, known human carcinogen. The cancer weight of evidence classification is based on all routes of exposure

1.2 Cadmium

Cadmium is not at present believed to be an essential nutrient for animals or man. The main source of cadmium intake is food. In the population in general, most of the cadmium exposure is through food and water that is contaminated by cadmium. This is especially true for food ingestion because cadmium is more readily absorbed by vegetation than other metals. Cadmium is still a relatively rare element. It is uniformly distributed in the Earth's crust, where it is generally estimated to be present at an average concentration of between 0.15 and 0.2 mg/kg. (Fleischer *et al*. 1974).

An oral provisional TDI of 0.001 mg/kg/day for cadmium, recommended by Health Canada (2010), was used as the exposure limits for the assessment. The RfD value is based on kidney effects observed from occupational exposures in humans. TCEQ recommends an RfC of 0.00001 mg/m^3 for cadmium for human health. No studies are referenced.

Inhalation of high levels of cadmium may severely damage the lungs and can cause death. Acute exposure may induce flu-like symptoms called metal fever (ATSDR, 1999).

US EPA IRIS (2013) listed cadmium as Group B1; probable human carcinogen. For carcinogenic effects, Health Canada (2010) considers inhalation exposures to be carcinogenic and has listed an inhalation slope factor of 42 (mg/kg/d)$^{-1}$ and an inhalation unit risk of 9.8 (mg/m^3)$^{-1}$.

No inhalation exposure limit was available for non-carcinogenic effects. Therefore, the oral TDI was used as the inhalation TDI based on route extrapolation.

1.3 Molybdenum

Molybdenum is of relatively low toxicity, and is an essential cofactor with different enzyme systems. Molybdenum toxicity is often related to interactions with other metals such as copper. Low levels of copper can increase the intake and accumulation of molybdenum in different organs systems (e.g., bones, liver, kidney, endocrine glands, bloodstream). Other than a cattle disease known as Teart, there are no known effects of molybdenum toxicity on humans (Amdur *et al* 1991).

Health Canada (2010) provided a chronic oral RfD of 0.023 mg/kg/d, but no supporting studies were mentioned.

TCEQ (2013) had a chronic inhalation Reference Exposure Level of 0.005µg/m^3.

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newgold

Annex 4
Ecological Health Model Calculations

1.0 PREDICTION OF COPC CONCENTRATIONS IN ENVIRONMENTAL MEDIA

1.1 Calculation Of COPC Concentrations In Native Vegetation

There are no specific models available that specifically predict the concentration of COPCs into specific constituents of the plant *e.g.,* berries. Therefore, for the purpose of this assessment, it was assumed that the assimilation of COPCs in plants would be specific to all above ground produce. The human receptor would then consume the entire above ground produce.

The first step in this modeling was to predict the plant concentration due to three specific pathways – deposition on the plant, absorption from the air, and uptake/translocation from the root. The plant concentration due to direct deposition is presented as follows:

Calculation of COPC Root Uptake from Soil to Plant Tissue above Ground

$$\mathrm{Pr}_{ag} = Cs \cdot Br_{ag}$$

Where:

Pr_{ag} = Concentration of COPC in above-ground produce due to root uptake (mg/kg)

Br_{ag} = Plant-soil bioconcentration factor for above-ground produce (0.03752; COPC-specific from US EPA, 2005)

Cs = Average soil concentration over exposure duration (21.4 mg/kg; see above for arsenic)

Therefore:

$$\mathrm{Pr}_{ag} = 21.4\, mg/kg \cdot 0.03752 = 0.8\, mg/kg$$

1.2 Calculation of COPC Concentration in Invertebrates

Calculation of COPC Uptake from Soil to Invertebrates Tissue

$$\mathrm{C}_{\mathrm{inv}} = e^{(0.706*(\ln Cs)) - 1.4121}$$

Where:

Cinv = Concentration of COPC in invertebrate tissue (mg/kg)

Cs = Average soil concentration over exposure duration (21.4 mg/kg; see above for arsenic)

The equation is taken from US EPA Eco-SSI Arsenic (2005).

$$C_{inv} = e^{(0.706*(\ln 21.4 mg/kg)) - 1.4121}$$

$$C_{inv} = 2.1 mg/kg$$

1.3 <u>Calculation of COPC Concentrations In Wild Game</u>

Calculation of COPC Uptake from Soil to Small Mammals Tissue

$$C_{sm} = e^{(0.8188*(\ln C_s)) - 4.847}$$

Where:

C_{sm} = Concentration of COPC in small mammals tissue (mg/kg)

C_s = Average soil concentration over exposure duration (21.4 mg/kg; see above for arsenic)

The equation is taken from US EPA Eco-SSI Arsenic (2005).

$$C_{inv} = e^{(0.8188*(\ln 21.4 mg/kg)) - 4.847}$$

$$C_{inv} = 0.1 mg/kg$$