
Appendix 9.2.2B Country Food Monitoring Plan

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ACRONYMS

Abbreviations and Units of Measure	Definition
ANOVA	Analysis of Variance
BACI	Before-After-Control-Impact
BC	British Columbia
BCEAA	<i>British Columbia Environmental Assessment Act</i>
BC MOE	British Columbia Ministry of Environment
CFMP	Country Foods Monitoring Plan
COPC	Contaminant of Potential Concern
EA	Environmental Assessment
EHBR	Environmental Health Baseline Report
EIA	Environmental Impact Assessment
<i>EMA</i>	<i>Environmental Management Act</i>
EMP	Environmental Management Plan
ER	Exposure Ratio
HC	Health Canada
HHBR	Human Health Baseline Report
HHRA	Human Health Risk Assessment
LSA	Local Study Area
MDL	Method Detection Limits
Project (the)	Blackwater Gold Project
PQRA	Preliminary Quantitative Risk Assessment
QA/QC	Quality Assurance/Quality Control
RAR	<i>Riparian Areas Regulation</i>
RISC	Resource Information Standards Committee
SLERA	Screening Level Ecological Risk Assessment
TRG	Tissue Residue Guideline
TRV	Toxicity Reference Value
Wwt	wet weight

1.0 INTRODUCTION

New Gold Inc. (the Proponent) has designed the proposed Blackwater Gold Project (the Project) to minimize the release of metals to the receiving environment. There will be no discharge of surface water from the facility during operations and early closure. However, it is important to track metals concentrations in the environment to ensure that no human health risks occur over time.

This document provides a conceptual plan for monitoring metals in areas downstream and downwind of the Project, where increases in metal concentrations from mine related-activities could potentially occur. It is anticipated that this plan will be reviewed by First Nations, community members, Health Canada (HC), and other agencies. The Proponent will make adjustments to this plan as appropriate based on First Nations, community members, and regulators comments prior to development of the Project and the onset of monitoring studies.

The principal classes of Contaminants of Potential Concern (COPCs) associated with the development of the Project are metals. The potential for increased metals levels exists through contamination of water, mobilization of mercury from flooding of Lake 01682LNRS (**Figure 6-1**), or through mine-dust fallout.

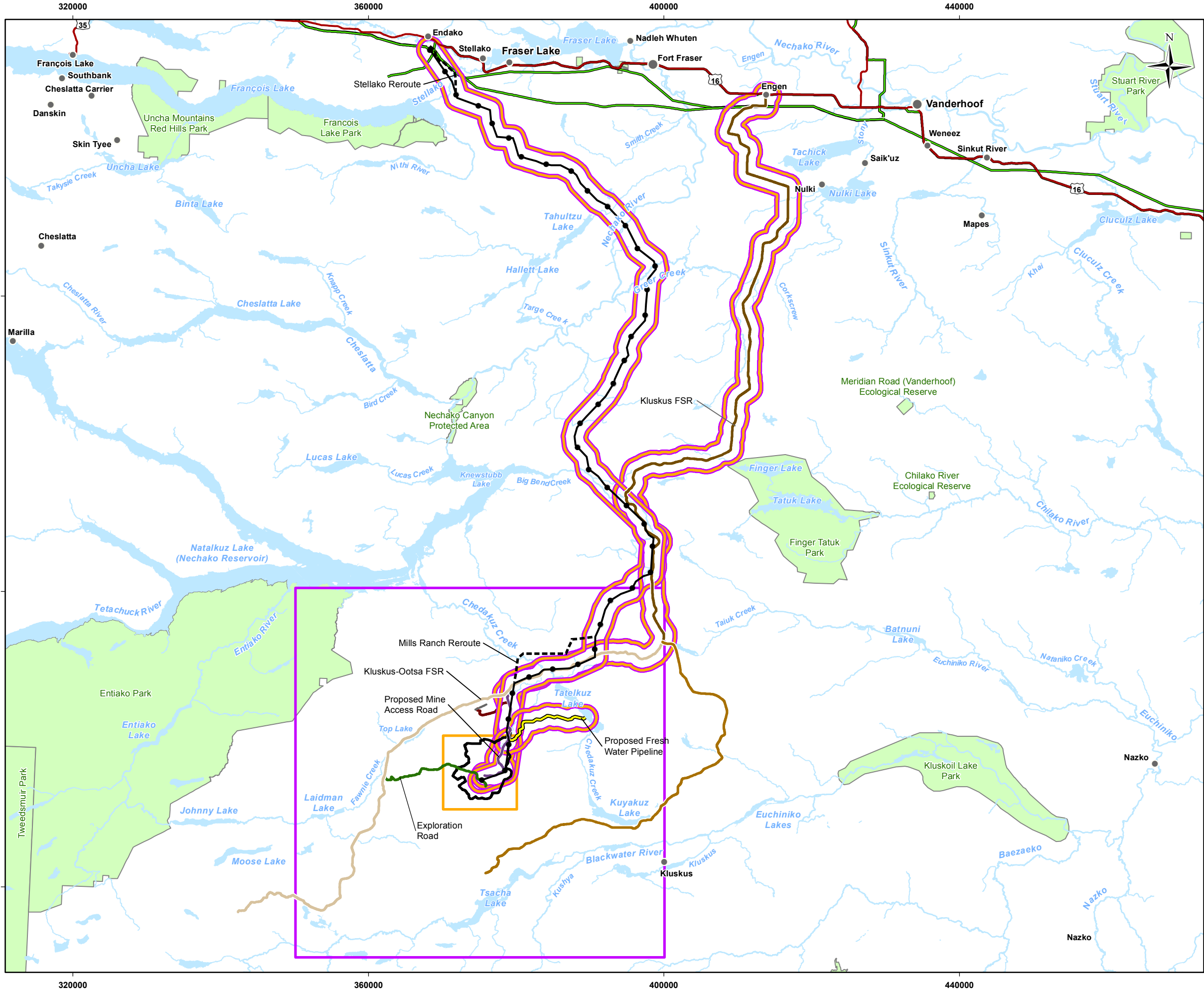
Monitoring of species that represent potential pathways for metals concentrations in country foods is proposed to track possible changes against baseline levels. Metal concentrations in a set of indicator plants, mammals, and fish will be analyzed to assess levels against existing baseline levels.

Country foods include those foods trapped, fished, hunted, harvested, and grown for food, social, ceremonial or medicinal purposes, or obtained from recreational activities such as sport fishing and/or game hunting and trapping. Country foods do not include foods produced in commercial operations (Health Canada, 2011).

Within the country foods monitoring study area (**Figure 1-1**), both First Nations and other residents consume a variety of wild plants and animals. Common country foods include wild berries, pine mushroom, grouse, deer, moose, small mammals, kokanee, and rainbow trout and various other fish species (AMEC, 2013a, 2013b, 2014a, 2014b).

Concentrations of metals in country foods can occur naturally through uptake from environmental media such as soil, water, and vegetation. This Country Foods Monitoring Plan (CFMP) will monitor metals concentrations within specific areas associated with the mine, and in reference sites away from the mine, to determine, what if any effects on country foods, for which the mine might be responsible. If mine related effects are verified, and they differ from those predicted, then adaptive management strategies will be developed to address avoidance or mitigation of the effects.

This CFMP proposes monitoring a set of indicator species throughout the life of the Project. The specific suite of indicator species is described in the following sections. For mammals and plants, the sampling area is contained within the anticipated dust fallout areas outlined in **Figure 6-1**. Fish will be sampled both within and outside of the aquatics LSA shown in **Figure 1-1**.

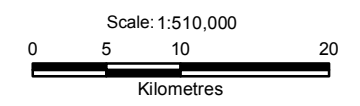


Legend

- Populated Place
- 16 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



Reference
BC Government GeoBC Data Distribution

CLIENT: **newgold**

PROJECT: **Blackwater Gold Project**

Environmental Health Study Areas

DATE: March, 2014	ANALYST: KA	Figure 1-1
JOB No: VE52277	QA/QC: JK	PDF FILE: 21-100-001_Environmental_Health_SA_v2.pdf
GIS FILE: 21-100-001_Environmental_Health_SA_v2.mxd		amec
PROJECTION: UTM Zone 10	DATUM: NAD83	

Y:\GIS\Projects\VE\VE52095_Richfield_Blackwater\Mapping\21_environmental_health\21-100-001_Environmental_Health_SA_v2.mxd

2.0 PURPOSE

The purpose of this CFMP is to determine if Project activities generate effects to country foods, such as a material increase in metal concentrations in key indicator species that represent potential contaminant pathways to humans. If such effects are determined to be occurring, the mine will undertake adaptive management strategies to avoid or mitigate the effects.

Given that many First Nations and other residents hunt and gather food in the study area, this CFMP aims to ensure that baseline levels of contaminants are understood, and that possible changes in these levels are monitored and reported over the life of the project.

Results of this CFMP will help determine if and/or prevent project-related human health risks occurring from consumption of country foods obtained from the study area.

The CFMP plan will monitor metals concentration levels against baseline conditions. If metal concentrations increase to levels of concern, further consultation and planning to address necessary mitigation measures would be undertaken with regulators and First Nations.

3.0 REGULATORY REQUIREMENTS

The CFMP has been developed in accordance with the policies and regulatory requirements of federal and provincial regulatory agencies. Legislation and policy considered in developing this plan include the following:

3.1 Federal Legislation

The federal *Fisheries Act* applies to protection of fish habitat.

- Section 22 regulates water management associated with instream obstruction;
- Section 32 regulates the destruction of fish unless authorized by the Minister;
- Section 35 states no person shall carry on any activity that results in the harmful alteration, disruption or destruction of fish habitat; and
- Section 36 regulates the introduction of deleterious substances in water frequented by fish, or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water, except where permitted by the Minister.

Other relevant federal legislation and guidelines applicable to the CFMP include:

- The *Canada Water Act* (defines waste, in the context of detriment to animals, fish, or plants, resulting from degradation or alteration of water quality);
- The Federal *Canadian Environmental Protection Act* (regulates disclosure of information regarding any substance that could potentially cause damage to fish or fish habitat); and

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- Canadian water quality guidelines, Canadian Council of Ministers of the Environment (CCME) (2007, 2012) (science-based targets for the protection of aquatic life).

3.2 Provincial Legislation

The BC *Water Act* regulates the flow of water within British Columbia. Requirements outlined in the Act are addressed in **Section 12**. The *Water Regulation* under the *Water Act* includes measures to protect water quality and fish habitat. The regulation shares a similar purpose with the *Fisheries Act*.

Fish are defined as wildlife for the provisions of the *Wildlife Act* (Government of BC, 1996), which includes provision for designating wildlife management areas and their protection.

The *Fish Protection Act* (Government of BC, 1997) provides authority to consider impacts to fish and fish habitat before approving new, or renewing existing water licenses, and before issuing approvals for working in or near a stream. The *Fish Protection Act* also ensures sufficient water for fish when making decisions about licenses or approvals under the *Water Act*, allows the listing of streams with recognized fish values as being sensitive to water withdrawals, and protects riparian areas through provisions of the *Riparian Areas Regulation (RAR)* (Government of BC, 2004).

Other relevant provincial legislation and guidelines applicable to the CFMP include:

- *BC Mines Act*;
- *BC Environmental Management Act (EMA)*, Waste Discharge Regulation;
- *BC Water Protection Act*;
- BC Approved Water Quality Guidelines, British Columbia Ministry of Environment (BC MOE) (2006a, 2006b, 2008, 2009, 2011, 2012, 2013a, 2013b); and
- *BC Environmental Assessment Act (BCEAA)*.

3.3 Guidelines

HC guidelines for mercury in fish tissue, proposed BC guidelines for selenium in fish tissue, and COPC guidelines for mammals and plants will be followed.

4.0 LINKED ENVIRONMENTAL MANAGEMENT PLANS

The CFMP is linked to several other monitoring plans developed for the Project, either through a shared focus on water quality, air quality, or dust. These include Environmental Management Plans for construction, operation, and closure phases of the Project that are presented in Section 12 of the Application. These plans provide information on management strategies for air quality and emissions management, water quality and liquid discharges management, and other topics. The reporting structures identified within the environmental management plans, monitoring plans, and commitments are presented in Follow Up Monitoring and Compliance Reporting (Section 13) and Summary of Mitigation (Section 20) of the Application). Section 2.6 Reclamation

and Closure Plan addresses the proposed monitoring program for biophysical parameters in the mine site and downstream during closure and post-closure phases.

5.0 OBJECTIVES AND SCOPE

5.1 Objectives

- To provide assurance to country foods users and regulators that metals levels in country foods utilized in the Project study area are not changing unexpectedly during the life of the project due to project activities.
- To consult with First Nations and work with a harvester/elder advisory committee on the CFMP, that will result in additional user information being considered, and ensure that timely information is shared with the First Nations about the state of Country Foods
- To identify any Project effects and prevent adverse human health effects
- To secure baseline data for small mammals within the study area. This will complement existing baseline metals concentration data already acquired for fish and plants.
- To implement a valid metals monitoring study design and sampling program over the life of the Project that enables tracking of changes in metals concentrations in select species of fish, small mammals, and plants.
- To ensure that the study design includes reference sites (control sites) to determine when a change in metal levels is the result of mining activities, or of natural variation and/or sampling error.

5.2 Indicators

This monitoring plan will collect samples for contaminant testing from a select group of mammal, fish, and plant species within the study area. Samples will be tested for a full range of metals.

Sampling of the following species will be conducted to determine whether substantive changes in COPC levels can be detected:

- Rainbow trout (*Oncorhynchus mykiss*);
- Mountain whitefish (*Prosopium williamsoni*);
- Snowshoe hare (*Lepus americanus*);
- Mice (*Mus* sp.) and voles (*Microtus* sp.);
- Black huckleberry (*Vaccinium membranaceum.*);
- Willow (*Salix* sp.);
- Dwarf blueberry (*Vaccinium caespitosum*);
- Kinnikinnick (*Arctostaphylos uva-ursi*); and
- Moose (*Alces alces*).

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These species were chosen on the following rationale:

The hare is a suitable mammal to consider for potential human effects of increased metals concentrations, as this species is relatively common in the study area and consumed by humans. The hare also has a limited range that ensures that those tested within the study area have fed there. The concentrations of metals in muscle tissue and organs (e.g., liver) is required to model health risks to humans that consume small game.

Voles and mice were chosen for sampling as they have the potential to assimilate metals concentrations that could flow up food chains to higher species of predators that would subsequently be subject to increased metal concentrations. Voles and mice have very limited ranges, which ensures those sampled would have fed within the study area.

Rainbow trout were chosen as they are one of the primary fish food sources for people catching food fish in the monitoring study area. Large rainbow trout are targeted in Lower Chedakuz Creek and Tatelkuz Lake. Rainbow trout were sampled in the metals baseline assessment for the Project.

Whitefish were chosen for sampling as they are another large-bodied fish in the study area and are used for human consumption. Whitefish were sampled in the metals baseline assessment for the Project.

Black huckleberry, dwarf blueberry, and kinnikinnick were chosen as they are common, easily identified food plants that are most likely to occur in all areas of the Project and at reference sites, and are traditionally consumed by First Nations and community members. Black huckleberry was sampled in the metals baseline assessment for the Project.

Willow was chosen as they are also common in the study area, are browsed by ungulates, and serve as a pathway for metal to these animals. Willows were sampled in the metals baseline assessment for the Project. However, sampling willows is problematic because they can be difficult to identify. Proper identification is critical to any willow sampling program because metal uptake is known to differ substantially among willow species. The particular target willow species will be determined in the field.

First Nations requested that large mammals such as moose be sampled since they represent an important food source. However, interpretation of data obtained from such a mobile species can be difficult since they would be expected to spend only a limited time in the LSA. The Proponent will discuss the details of a proposed sampling program for moose and interpretation of results with First Nations, community members, and relevant government officials prior to the initiation of any monitoring.

All sampling will be conducted under required BC Government permits and in consultation with First Nations.

6.0 METHODOLOGY

The study design of the CFMP is a Before-After-Control-Impact (BACI) approach for fish, small mammals, and plants. This is achieved through the use of reference sites that would be known to not be potentially affected by the mine. Without a reference site, only a Before-After (BA) study design can be used. A BA design is considered statistically weak because it cannot distinguish between mine effects and natural effects.

6.1 Summary of Baseline Assessment of Contaminants in the Ambient Environment

During 2011 and 2012 sampling of water, soils, plants, and terrestrial and aquatic species was undertaken to establish a baseline of metals occurring in the environment prior to development of the Project. Assessments of these samples led to a determination of COPC. The details of these sampling and baseline assessments of contaminants are provided in the 2011–2012 Environmental Health Baseline Report (EHBR), Version 4.0, **Appendix 9.1B**. (AMEC, 2013c) Baseline Data.

In specific relation to monitoring for the CFMP, baseline levels of metals have been determined for certain fish and plants. Additional sampling is required, and will be undertaken prior to onset of the Project, to establish a baseline for metals concentrations in small mammals, large mammals, and plants not yet sampled.

6.2 Monitoring Approach

The following monitoring program is proposed for the Project's operation and post-closure management. Monitoring will determine metals concentrations in specific indicator plants, small mammals, large mammals, and fish. Sampling will be undertaken during the beginning of Year -2 of mine construction (no emissions but dust would be monitored), and then at operations Years 3, 8, and 15, and Year 24 during the closure phase. This proposed schedule reflects the belief that there will be minimal change if any to baseline levels. If testing determines that levels are changing in a material way, then the testing schedule will be revised. The monitoring plan proposed here will be discussed (and amended if required) through consultation with First Nations prior to Project construction.

Sampling and metals monitoring will include the following.

6.2.1 Plants

Food plants are a vector for contaminant exposure in people. Even if people do not directly consume food plants, animals consume them and transport contaminants off-site (Health Canada, 2012). Fugitive dust derived from mining activities at the Project has the potential to elevate the concentrations of trace metals in soils and plants (Health Canada, 2012). A properly designed and

implemented plant-tissue monitoring program will determine if Project activities are introducing levels of metals into the local food chain via terrestrial food plants.

6.2.1.1 Objectives

- To determine the concentrations of metals in food plants in the study area.
- To test the null hypothesis that variations in metals concentrations in plant tissue and soil from the study area are unrelated to mining activity, and no greater than what would be expected by chance or sampling error.

6.2.1.2 Sampling and Analysis Methodology

Plant-tissue metal concentrations will be monitored under a statistically sound sampling methodology, and compared to baseline and reference (control) site values to assess if any material changes are the result of activities associated with the Project.

It is important to acknowledge that there is natural variation in metal levels in soils and plants through time. A BACI repeated measures experimental design will be used for this monitoring program because it is commonly used to determine if an observed change in metal levels over time is the result of mining activities or simply a reflection of natural variation (BC MOE, 2012; Environment Canada, 2012; Gotellie & Ellison, 2013). This will avoid the scenario of a false positive within the study area.

A minimum of 10 permanent sites will be established in the Project area along the principal plume of fugitive dust predicted by the atmospheric dispersion model (BC MOE, 2012; Health Canada, 2010). No less than 10 reference (control) sites will be established outside of the area predicted to receive fugitive dust (Health Canada, 2010). Reference sites have not yet been finalized but candidate sites near those that were used for wetlands monitoring are being considered. Sites will be chosen prior to the onset of sampling that are similar in soil profiles to sites in the Project. Reference sites will improve understanding of natural variability over time, control for sampling error, and allow for meaningful statistical interpretation of metal levels (Health Canada, 2010a,b,c); BC MOE, 2012; Environment Canada, 2012b). All sites will be established in areas that are easily accessible.

The null hypothesis will be tested using an analysis of variance (ANOVA; Environment Canada, 2012) and a Tukey's significant difference test (Gotelli & Ellison, 2013). However, depending on the normality of the data and the statistical power, other statistical methods may be used, such as regression analyses and randomized intervention analysis (Gotelli & Ellison, 2013). A Pearson correlation matrix will be generated to determine if metal levels in soils and leaves co-vary (Kandziora-Ciupa et al., 2013). If effects are observed, sampling frequency may be increased (Environment Canada, 2012).

The proposed methodology was developed from "A Bestiary of Experimental and Sampling Designs," in *A Primer of Ecological Statistics 2nd Edition* (Gotelli and Ellison, 2013) and

“Supplemental Guidance on Human Health Risk Assessment for County Foods” (Health Canada, 2010c).

6.2.1.3 Sample Species

Dwarf blueberry (*Vaccinium caespitosum*), kinnikinnick (*Arctostaphylos uva-ursi*), and black huckleberry (*Vaccinium* spp.) were chosen to sample for metals because they are common, easily identified food plants that are most likely to occur in all areas of the Project, and at reference sites. Willows (*Salix* spp.) will be sampled because they are an important food source for moose (*Alces alces*).

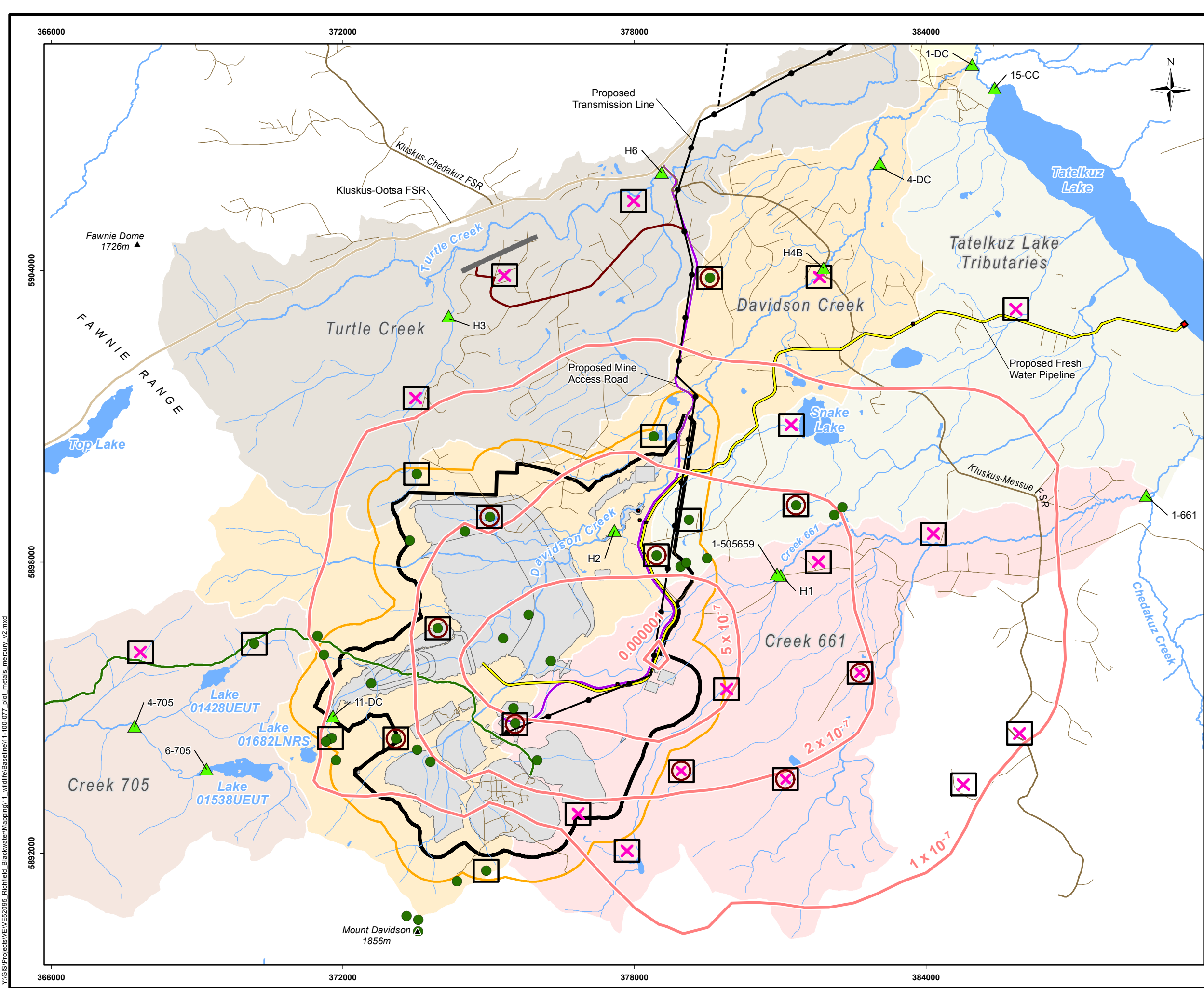
Ideally, each plot will contain each of these species. Metal levels in plants are known to differ substantially among species, organs (Kuzovkina et al., 2004), and even within the same individual throughout a single growing season and among tissue types (Kandziora-Ciupa et al., 2013). Micro-climate (e.g., sun versus shade), developmental stage, and health also affect metal levels in plants. To control for variation caused by these factors, only recently matured, dust-free, healthy leaves will be collected from the uppermost part of plants. Plants will be in the same developmental stage, and collections will be made during the same time of year and in the same micro-habitat whenever possible (Health Canada, 2012). Young, emerging leaves, dusty leaves, older mature leaves, mechanically damaged leaves, and leaves from unhealthy individuals will not be collected.

Bulk leaf tissue from each species will be pooled in separate paper envelopes in silica gel. Berries will be collected and pooled in the same way. However, because they may not always be available at all sites during each year of the monitoring program, it is important that leaves will always be collected, regardless of whether or not berries are available. Because leaves should always be available, collecting leaves from each plot and year ensures that results can be compared across all sites and years.

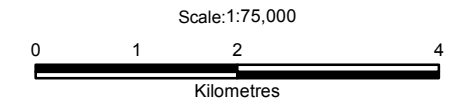
Soils will be collected from the root zone of target species, and pooled in a bag for each site. Leaves, berries, and soils will be assessed for a full range of metals at a certified laboratory.

6.2.1.4 Sampling Locations

Figure 6-1 identifies the proposed sampling locations. Sampling sites may change pending on input from First Nations and confirmation of appropriate species composition of the proposed sites. The specific locations of reference sites will be established prior to sampling.



- Legend**
- Sampling Sites**
- ▲ Hydrology Node
 - Hare Sampling (N=10 Sites)
 - Metal Sampling Plots
 - ✕ Vegetation & Soil Sampling
 - Small Mammal Sampling (N=30 Sites)
- Metals**
- Mercury (kg/m²/yr)
- Forestry Service Roads**
- Kluskus-Ootsa FSR
 - Other FSRs
 - Existing Road
- Waterbodies**
- Stream
 - Waterbody
- Watersheds**
- Chedakuz Creek Local
 - Creek 661
 - Creek 705
 - Davidson Creek
 - Tatelkuz Lake Tributaries
 - Turtle Creek
- Project Components**
- Exploration Road
 - Proposed Mine Access Road
 - Proposed Transmission Line
 - Mills Ranch Reroute
 - Proposed Fresh Water Pipeline
 - Proposed Airstrip Access Road
 - Proposed Airstrip
 - Pump Stations
 - Proposed Mine Site
 - Proposed Mine Site Facilities
- Wildlife**
- Local Study Area



Reference
BC Government GeoBC Data Distribution

CLIENT:
newgold

PROJECT:
Blackwater Gold Project

Proposed Plant and Small Mammal Tissue Sampling Sites

DATE: March, 2014	ANALYST: WR	Figure 6-1
JOB No: VE52095	QA/QC: BM	
GIS FILE: 11-100-077_plot_metals_mercury_v2.mxd		PDF FILE: 11-100-077_plot_metals_mercury_v2.pdf
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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6.2.2 Small Mammals

The Proponent will collect game (i.e., small mammal) baseline data to augment other baseline data for contaminants in water and soil. Baseline sampling of small mammals will provide background concentrations of COPC in small game (i.e., snowshoe hare) and small mammal tissue (i.e., mice and voles) within the study area of the proposed mine. These data will allow for the estimation of baseline COPC concentrations in game meat that is being consumed by humans hunting/trapping within the study areas, and in small mammals that are being consumed by wildlife. All small mammal collection will follow BC Resource Information Standards Committee (RISC) standard protocols.

Small mammals within the study area will be sampled at the same frequency as plant tissue described previously.

6.2.2.1 Objectives

- To monitor metals concentrations in snowshoe hare that serve as direct pathways to human consumption.
- To establish a baseline and monitor metals concentrations in small rodents (i.e., mice and voles) that serve as pathways to other wildlife at higher levels in the food chain.
- To test the null hypothesis that variation in metals concentrations in small mammal tissue in the study area is unrelated to mining activity, and is no greater than what would be expected by chance or sampling error.

6.2.2.2 Sampling and Analysis Methodology

A one-way BACI repeated measures experimental design will be implemented for this monitoring program. Metal levels tissue samples collected outside of the area of influence of the proposed mine will be compared to those collected inside its study area.

6.2.2.3 Small Game Sampling

Ten samples of small game will be collected at locations within the 40 km x 40 km study area that centres on the mine site. The hare (*Lepus americanus*) is present within the study area and was selected as a representative species of small game. Hares will be opportunistically collected by using snares.

The procedure for collecting small-game samples will involve setting up wire snares at hare trail locations within the study area over the course of ten days, or until a maximum of ten small-game mammals have been captured. Snares will be checked a minimum of two times per day.

A Wildlife Research Permit and BC Animal Care Committee approval will be obtained, as well as consultation undertaken with First Nations having trapping areas near the Project prior to any

sampling. A harvester/elder advisory panel would be established to provide advice regarding potential sampling areas. Local First Nations research assistants would be trained and employed, with one person per crew being certified to conduct the trapping as per permit requirements.

6.2.2.4 Small Mammal Sampling

Target species include short-tailed shrew (*Blarina brevicauda*) and deer mice (*Peromyscus maniculatus*). The procedure for collecting small mammal samples will involve setting baited traps at each sample site and checking traps morning and evening. Five traps per site will be used until 2 to 4 individuals are caught (total wet weight (wwt) 50 g) over 2 to 3 trap nights. Traps will be tied together in pairs with a bright cord or flagging tape to assist in locating them.

A Wildlife Research Permit and BC Animal Care Committee approval will be obtained prior to sampling. One person per crew will be certified for the trapping and will be named on the permit.

The following procedures will be followed at each location:

- Traps will be set in locations of suitable small-mammal habitat, and in sites to minimize risk to non-target species such as small birds.
- Small mammals captured will be removed from the trap, placed in a Ziploc® bag, and weighed. In the unlikely event of non-lethal capture, animals will be dispatched with cervical dislocation.
- Samples will be identified to species, labelled, and documented.
- Field duplicates will not be collected for small mammal samples. However, lab analyses will be conducted on duplicate subsamples as part of QA/QC.
- Sample collection data will be recorded, including sample number, description, and identification of each specimen, date, location, and sampler.
- A photograph of each small mammal captured will be taken and checked by species specialists to confirm species.
- Small-mammal samples will be pooled to provide one composite sample per sampling site. Individual small-game samples will be analyzed.
- All carcasses will be sealed and placed into a cooler, with ice packs and protective packing materials for shipment to the lab. If not shipped immediately upon returning from the field, all animal carcasses will be frozen if possible.
- Vegetation, soil, and lichen will be sampled at the small mammal sampling sites.
- Samples will be submitted to a company such as ALS labs for metals, including mercury analysis.
- Laboratory chain of custody forms will be appropriately completed, signed, and submitted with the samples.

6.2.2.5 Sampling Location

Small-game and mammal sampling for metals concentration monitoring will be conducted within the study area at sites noted in **Figure 6-1**. As noted previously, these are proposed sampling sites that may alter after First Nations input. Reference sampling sites will be located within a 10 km radius outside of the study area, and will be selected based on representation of target plants (similar habitat) and accessibility.

6.2.3 Large Mammals

The Proponent will discuss details of a proposed sampling program for large mammals (such as Moose) with First Nations, community members, and relevant government officials prior to the initiation of monitoring. Viable samples of harvested muscle tissue and sampling processes will be determined to ensure required samples for metals testing are collected in a usable form. Collection will be undertaken by First Nations hunters (who will have received appropriate training) and provided to the Proponent under agreed handling methods.

6.2.4 Fish

Rainbow trout and mountain whitefish will be sampled to track metals concentrations in these species during the life of the Project. Results will be compared to baselines. Baseline metal concentrations were measured in 2011, 2012, and 2013 (AMEC, 2013a, 2013b) (**Figure 6-2**).

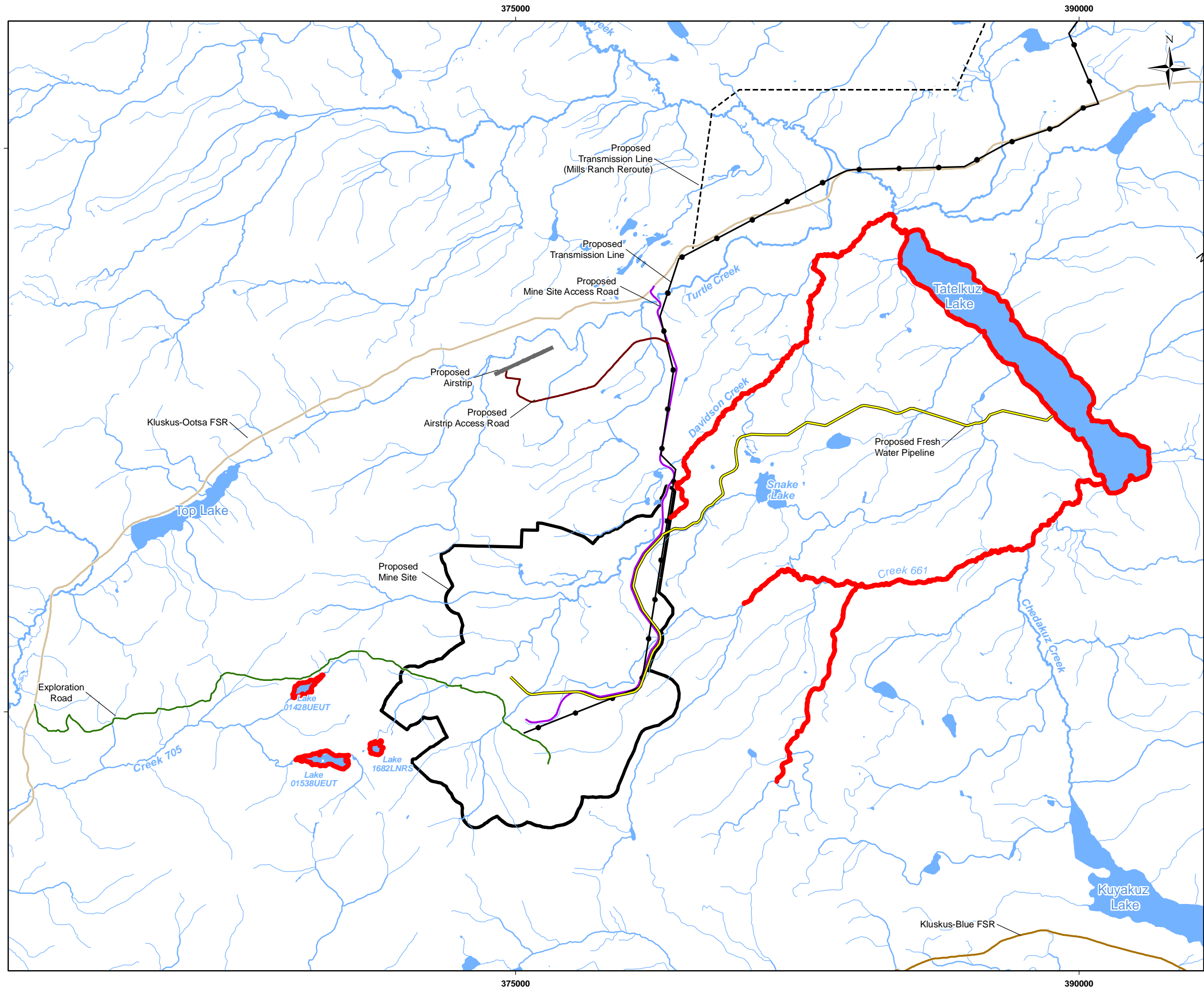
6.2.4.1 Objectives

To monitor metals concentrations in rainbow trout and mountain whitefish, which represent potential pathways to consumption by humans.

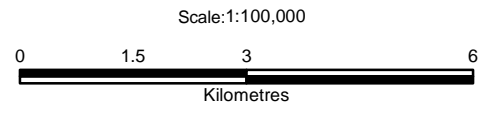
To test the null hypothesis that variation in metals concentrations in fish tissue in the study area is unrelated to mining activity, and is no greater than what would be expected by chance or sampling error.

6.2.4.2 Sample Locations and Methods

Rainbow trout will be collected for tissue metals analysis from three creeks in the study area: Davidson Creek, Creek 661, and lower Chedakuz Creek, from three headwater lakes (01428UEUT, 01538UEUT, and 01682LNRS), and from Tatelkuz Lake (**Figure 6-2**). (Note: Fixed sampling sites are not shown within these seven water bodies because baseline sampling was conducted throughout the lengths of the creeks, and was distributed over the surface areas of the four lakes, and because fish move within the creeks and within the lakes.) There will be consultation with First Nations to discuss these proposed sampling sites and determine if they suffice. Samples will also be taken from reference streams and lakes, the locations of which have yet to be determined. These will be sites that are determined to have no effects resulting from development and operation of the project.



- Legend**
- Fish Tissue Sampling Location
 - Kluskus FSR
 - Kluskus-Blue FSR
 - Kluskus-Ootsa FSR
 - Stream
- Project Components**
- Exploration Road
 - Proposed Transmission Line
 - - - Mills Ranch Reroute
 - Proposed Mine Access Road
 - Proposed Fresh Water Pipeline
 - Proposed Airstrip Access Road
 - Proposed Airstrip
 - Proposed Mine Site



Reference BC Government GeoBC Data Distribution		
CLIENT: 		
PROJECT: Blackwater Gold Project		
Contaminant Monitoring Locations for Rainbow Trout and Mountain Whitefish Tissue Samples		
DATE: March, 2014	ANALYST: MY	Figure 6-2
JOB No: VE52277	QA/QC: MY	PDF FILE: 10-200-142_MonitoringSites.pdf
GIS FILE: 10-200-142_MonitoringSites.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

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Rainbow trout from seven water bodies were sampled for baseline metal concentrations in 2011, 2012, and 2013. Rainbow trout in Davidson Creek, Creek 661, and lower Chedakuz Creek will be sampled as part of the CFMP, because those three creeks may potentially be directly affected by Project activities due to their locations downstream of the mine site. A yet-to-be-selected creek will also be sampled that is not directly affected by Project activities, and can serve as a reference site. This will allow the use of a BACI study design in analysis of fish tissue metal concentrations.

Rainbow trout from Lakes 01682LNRS and 01538UEUT will also be sampled, because they will be downstream of Project activities and potentially affected, specifically the enlargement of Lake 01682LNRS and its diversion into Lake 01538UEUT. Lake 01428UEUT will also be sampled, even though it will not be affected by Project activities because it will be used as a reference site in a BACI analysis of fish-tissue metals concentrations from headwater lakes.

The principal reason for sampling rainbow trout tissue metal concentrations from Tatelkuz Lake is that it is the only site in the aquatics Local Study Area (LSA) (other than the three headwater lakes) from which large, adult fish can be reliably sampled to give an understanding of country food quality. The baseline database for rainbow trout from Davidson Creek, Creek 661, and lower Chedakuz Creek consists almost exclusively of juvenile rainbow trout less than 100 mm long and 0 to 3 years old. (BC MOE does not allow destructive sampling of spawning rainbow trout or kokanee). People do not eat these juvenile fish, while the large rainbow trout resident in Tatelkuz Lake are consumed. Hence, monitoring the metal concentrations of juvenile rainbow trout in creeks provides only an indicator of country food quality, not a direct measure.

A second reason for sampling fish from Tatelkuz Lake is that it is the only site in the aquatics LSA from which adult mountain whitefish can be reliably sampled. No mountain whitefish were ever sampled for baseline tissue metals concentrations in any creeks of the aquatics LSA, due to their scarcity.

A target of approximately 100 rainbow trout will be used for each tissue sampling period. As a general rule, 15 fish will be collected from each of the seven creeks and lakes. Ten of those fish will be sampled for both muscle and liver tissue, and the remaining five fish will be treated as whole fish samples. Electrofishing will be used to collect juvenile rainbow trout in creeks, and gillnetting will be used to collect rainbow trout in the three headwater lakes, and rainbow trout and mountain whitefish in Tatelkuz Lake. Analytical methods will follow those described in AMEC (2013a, 2013b).

6.2.5 Metals Analysis

Metal concentrations will be assessed for different parts of fish. Muscle and liver metal concentrations will be used to evaluate human health risks as both parts of the fish are eaten by humans. Whole-body metal concentrations are required for ecological risk assessment because piscivorous wildlife consumes the whole body, not just muscle or liver. Tissue samples will be analyzed for whole fish, muscle, and liver.

Each of the tissue samples will be analyzed for percent moisture and metal concentrations. Subsets of whole fish, liver, and muscle samples will also analyzed for methylmercury (MeHg⁺)

concentration. The metals analyzed and their method detection limits (MDL) will be consistent with the requirements of BC MOE (BC MOE, 2012).

Total metal concentrations can be measured accurately in plant and animal tissue. Some metals, such as mercury, bind permanently to protein and so serve as a permanent record of exposure. Also, some metals, such as mercury, are toxic to humans and there are tissue residue guidelines (TRG) established for human health by the federal and provincial governments. HC has established a total mercury guideline for human consumption of fish of 0.5 mg/kg wwt mercury (Health Canada, 2013). This guideline was established to protect people who consistently eat large amounts of fish.

The BC MOE and the BC Ministry of Health recommend (BC MOE, 2013b) that, where elevated selenium concentrations in aquatic environments are a concern, selenium concentrations in edible portions of consumed fish tissue be monitored and compared to the following screening values: 1.8 mg/kg wwt for 7 servings/week; 3.6 mg/kg wwt for 4 servings/week; and 12.6 mg/kg wwt for 1 serving/week (1 serving = 8 ounces). Exceeding any of the above screening values may prompt site-specific investigations to determine possible health risks.

7.0 COMMUNITY CONSULTATION AND ENGAGEMENT

Implementing this CFMP will be responsive to public and First Nations concerns from planning through execution. Plans will be informed by meetings with regulators, First Nations, and community members to ensure their issues and concerns are addressed in the plan. Adjustments to the plan will be accommodated where feasible.

Results of the monitoring program will be provided to regulatory agencies and First Nations, and discussed with the Community Liaison Committee or the Environmental Monitoring board for the Project.

8.0 TRAINING

Trained, certified personnel will be employed to carry out environmental monitoring and sampling, according to RISC and BC standards. First Nations will receive training as assistants and join the crews involved in the sampling.

9.0 AUDIT AND REVIEW

Regular review of CFMP results, and comparison with baseline data, will assist in identifying trends and potential areas of concern, leading to continual improvement.

Other incidents may trigger more frequent reviews of this plan including:

- Substantial change in receiving water quality in the study area;
- Higher than anticipated levels of dust deposition;

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- Unexpected escalation in COPCs in any indicator species tests; and
- Regulatory non-compliance.

Through monitoring and adaptive management, corrective and preventative actions will be implemented as necessary.

10.0 USE AND DISTRIBUTION OF THE CFMP

All employees and contractors involved with the final country-foods monitoring program will be issued the CFMP, and will be expected to understand its contents relevant to their responsibilities.

This plan will be updated prior to implementation and made available to stakeholders, relevant government agencies, and First Nations.

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