TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

List of Tables

List of Figures

13 FOLLOW-UP MONITORING AND COMPLIANCE REPORTING

13.1 Introduction

This section provides a description of the reporting structure as identified in the Environmental Management Plans (EMPs) (**Section 12.2.1**), monitoring plans, and commitments.

Environmental protection through adherence to applicable legislation and Best Management Practices (BMPs) is considered an essential component of constructing, operating, and reclaiming the Project. Proper planning and implementation contributes to ongoing environmental site protection and greatly reduces the potential for adverse environmental effects. Mitigation measures such as delineation of environmentally and culturally sensitive areas, establishment of communications and reporting protocols, and implementation of environmental compliance monitoring and reporting programs will be integral to the program. The Proponent is committed to conducting its operations and activities in a manner that protects the natural and social environments, protects the environmental health and welfare of its employees and contractors, meets or exceeds requirements of all applicable environmental acts, regulations and permitting requirements, and keeps employees and the public informed about its environmental plans through its internal and external communication programs. An Environmental and Sustainable Resource Management department will be established and a manager and staff appointed prior to construction of the Project. The department will be active through all phases of the Project to the extent required by the level of activities, legal requirements and Proponent commitments to environmental protection, and worker and public safety. The manager will report directly to the mine general manager and also to the Proponent's corporate offices. Environmental management at the Project is discussed in detail in **Section 12**.

The Proponent acknowledges the management of risks and preparation for unexpected and unforeseen events (e.g., accidents and malfunctions, unexpected Project effects) are integral to effective governance of the organization. The Proponent's Health, Safety, Environment and Corporate Social Responsibility Committee is responsible for ensuring that principal areas of health, safety, environmental, and community risk and impacts are identified and that sufficient resources are allocated to ensure that environmental and social impacts are moderated for the entire company.

The Proponent will initiate a program of reporting to support the Environmental Assessment (EA) for the Project which will be carried out over the life of the mine. Reporting activities will address general legal requirements and will include specific compliant reporting requirements under provincial and federal authorizations.

Follow-up programs are used to verify the predictions of environmental effects made during the EA of the Project and to confirm whether mitigation measures have achieved the desired outcomes. A follow-up program is essential in identifying whether mitigation or monitoring methodologies need to be modified or adapted as the Project proceeds in order to continue to be effective and to address previously unanticipated adverse environmental effects. Follow-up

programs a can also help to support the overarching Environmental Management System (EMS) used to manage the environmental effects for the Project.

13.2 Compliance Monitoring and Reporting

The goal of a monitoring program is to ensure that proper measures and controls are in place in order to decrease the potential for environmental degradation during all phases of project development, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety.

The key tool that will be used by mine and corporate management to ensure compliance with commitments, regulations, and corporate environmental policy will be the EMS established for the Project and the EMPs subsumed under the EMS. **Section 12.1.5** details methods and procedures that will be incorporated into the Project EMS and the daily activities of Project personnel that will ensure the Project operates sustainably and in compliance with the EMS.

The Proponent will apply for and obtain necessary authorizations for Project activities and components as required under federal and provincial legislation. The Proponent will maintain required permits for the life of the Project. **Table 13.2-1** lists the main reporting requirements and this list will be updated throughout the EA approval process. A system will be in place to identify and access all applicable environmental laws, regulations, approvals, licenses, permits, and other requirements. These will be documented through a compliance register that is reviewed and kept up-to-date by the environmental department.

The environmental department will be involved with new on-site projects and project reviews to ensure environmental requirements are considered during decision-making. Through reviewing legal and other commitments, the environmental department will be able to assess and mitigate any potential risks that may arise through all phases of the Project.

Environmental records will document environmental performance history, which may include incidents, non-conformance, near misses (accident or environmental incident-related) and compliance records. These records will provide the data for monitoring performance and for continual improvement.

Environmental metrics are required for both proponent and regulatory agency tracking and reporting. Environmental personnel will report environmental metrics to the Environmental Coordinator on a weekly basis, and the Environmental Coordinator will compile and distribute results via regular environmental reports to the Environmental and Sustainable Resources Manager. Reports will be metric-specific and may vary from daily to less frequently. The report will include an updated rolling incident tracking log to be discussed regularly with the Environmental and Sustainable Resources Manager.

Table 13.2-1: Preliminary List of Anticipated Compliance Monitoring and Reporting Obligations

Legislation	Responsible Authority	Permit / Authorization / Program	Anticipated Compliance Monitoring and Reporting Obligations	Required Environmental Management Plan
MMER under *Fisheries Act*	EC	Compliance and Reporting	The Metal Mine Effluent Regulations requires an environmental effects monitoring (EEM) program when there is a principal discharge from a mine site. While there will be a small amount (2 L/s) of seepage that is not recaptured during operations and closure phases, a surface water discharge from the TSF will not occur until post closure.	• aquatic resources management plan • mine water management plan
Fisheries Act (last amended on 25 November 2013)	DFO	Authorizations under s.35(2) – Approval of final Fisheries Mitigation and Offsetting Plan	Success of the mitigation and offset plans will require monitoring of the constructed works (negotiated as part of permit conditions and expected to occur for 5 years). Reports will be prepared and submitted within (6 months) of completion of the monitoring.	• aquatic effects management plan • fisheries mitigation and offsetting plans (TSF and Section 35(2))
	DFO and EC	Authorization under s.36(3) – Schedule 2 Amendment under the MMER		
Explosives Act Explosives Regulations	NRCan	Licenses under s.7(1)(a)	No reporting requirements; license held by explosives contractor	• hazardous materials management plan
Explosives Act Ammonium Nitrate and Fuel Oil Order Regulation	NRCan	Assemble and Blend Ammonium Nitrate & Fuel Oil	No reporting requirements; license held by explosives contractor	• hazardous materials management plan
Explosives Act Explosives Regulations	NRCan	Mechanical Ammonium Nitrate & Fuel Oil Certificate	No reporting requirements; license held by explosives contractor	• hazardous materials management plan
Radio Communication Act	Industry Canada	Licenses	No reporting requirements	• not applicable
Transportation of Dangerous Goods Act Transportation of Dangerous Goods Regulations(1)	TC	Transportation of Dangerous Goods Permit	No reporting requirements	• emergency response and spill preparedness plan • hazardous materials management plan • transportation and access management plan
Navigable Waters Protection Act	TC	Order in Council is required for Proclamation of exemption under Section 23 of the Navigation Protection Act	No reporting requirements	• not applicable
Environmental Management Act	BC MOE	Effluent Discharge Permit	Monitoring of effluent streams and the receiving environment at specified locations. Annual reports required for air, solid and liquid effluent streams	• air quality and emissions management plan • mine water management plan • water quality and liquid discharges management plan • industrial and domestic waste management plan
Mines Act Section 10	BC MEM	Mine and Reclamation Permit	Annual reclamation reports submitted to MEM together with cost estimate for final reclamation; reclamation plans will be updated every 5 years.	• reclamation and closure plan • mine waste management plan • landscape, soils and vegetation management and restoration plan
Mineral Tenure Act	BC MEM	Mining Lease	No reporting requirements	• not applicable
Forest Act	BC MFLNRO	Occupant Licence to Cut – Sec 47.4	Volume of merchantable and non-merchantable timber cut	• landscape, soils and vegetation management and restoration plan
Forest Practices Code (FPC) Act, *Provincial Forest Use Regulations*, *Forest and Range Practice Act*	BC MFLNRO	Special Use Permit	Volume of merchantable and non-merchantable timber cut	• vegetation • landscape, soils and vegetation management and restoration plan
FPC Act, *Provincial Forest Use Regulations, Forest and Range Practice Act*	BC MFLNRO	Road Use Permit	No reporting requirements	• transportation and access management plan
Water Act, Water Regulation	BC MFLNRO	Approval or Notification of “changes in or about a stream” (s.8/s.9)	No reporting requirements	• aquatic resources management plan • sediment and erosion control plan
Water Act, Water Protection Act	BC MFLNRO	Water Licence	Annual water use	• mine water management plan
Heritage Conservation Act	BC MFLNRO	s. 14 Inspection Permit required for an AIA for a chance find	report to Heritage Branch for AIA permit	• heritage resources management plan
Heritage Conservation Act	BC MFLNRO	s. 12 Site Alteration Permit	report to Heritage Branch for permit to remove artifacts	• heritage resources management plan
Environmental Management Act	BC MOE	Liquid Discharge Permit (sediment control ponds; TSF seepage; TSF discharge post closure)	Annual report	• sediment and erosion control plan; mine water management plant

Legislation	Responsible Authority	Permit / Authorization / Program	Anticipated Compliance Monitoring and Reporting Obligations	Required Environmental Management Plan
Environmental Management Act	BC MOE	Fuel Storage Permit	No reporting requirements	• hazardous materials management plan • emergency preparedness and spill response plan
Environmental Management Act - Hazardous Waste Regulation	BC MOE	Hazardous Waste Generator Number	Annual report	• hazardous materials management plan
Environmental Management Act	BC MOE	Air Discharge Permit	Annual report	• air quality and emissions management plan
Environmental Management Act	BC MOE	Refuse Permit	No reporting requirements	• industrial and domestic waste management plan
Environmental Management Act - Municipal Wastewater Regulation	BC MOE	Sewage System Registration	Biannual report	• water quality and liquid discharge management plan • operations and maintenance manual for STPs
Wildfire Act	BC MFLNRO	Burn registration number	No reporting requirements	• wildfire management plan
Wildlife Act	BC MFLNRO	Amendment to Closed Area Regulations	No reporting requirements	• wildlife management plan
Wildfire Act, Wildfire Regulation	BC MOE	Forest and Range Protection – Part 1, Authority of Government for Fire Prevention and Fire Control – Part 2	No reporting requirements	• wildfire management plan
Transportation Act, Motor Vehicles Act	BC MOTI	Access Permit (MOTI-A)	No reporting requirements	• transportation and access management plan
Motor Vehicles Act	BC MOTI	Approvals for oversize loads or bulk haul	No reporting requirements beyond initial registration	• transportation and access management plan
Drinking Water Protection Act and Regulation	NHA	Construction Permit - Sec 2	Quarterly drinking water quality report	• water quality and liquid discharges management plan
Drinking Water Protection Act and Regulation	NHA	Operating Permit - Part 2	Quarterly drinking water quality report	• water quality and liquid discharges management plan
Land Act	BC MFLNRO	Investigative Use Permit	No reporting requirements	• not applicable
Land Act	BC MFLNRO; BC Safety Authority	Part C #38 Lease of Crown Land (Lease of Crown Land subject to the terms and reservations the minister considers advisable, including an option to purchase the land) Part C #39 License of Occupation (Licence to occupy and use Crown land, called a "licence of occupation", subject to the terms and reservations the minister considers advisable) Part C #40 Right of way and easement: (a) grant or otherwise create a right of way or easement over Crown land, and (b) grant or otherwise create over Crown land, the title to which is not registered under the Land Title Act, an easement without a dominant tenement for any purpose necessary for the operation and maintenance of the grantee's undertaking, including a right to flood.)	Only applies to leased lands off the Mining Lease No reporting requirements	• not applicable
Mines Act	BC MEM	Explosives Storage and Use Permit	Annual report on explosives use	• hazardous materials management plan

Note: (1) The Transportation of Dangerous Goods Permit will be required for any contractor transporting hazardous materials for the Project.
MMER = Metal Mining Effluent Regulations; EC = Environment Canada; DFO = Fisheries and Oceans Canada; NRCan = Natural Resources Canada; EA = Environmental Assessment; TC = Transport Canada; BC MOE = British Columbia Ministry of Environment; BC MEM = British Columbia Ministry of Energy and Mines; BC MFLNRO = British Columbia Ministry of Forests, Land and Natural Resource Operations; BC MOTI = British Columbia Ministry of Transportation and Infrastructure; NHA = Northern Health Authority; TSF = Tailings Storage Facility; STP = Sewage Treatment Plant; Project Phase: C (Construction), O (Operations), CL (Closure), PC (Post-Closure)

Examples of reports, records, and statistics to be collected and held by the Proponent are:

- Inspection reports and records of corrective actions taken;
- Incident investigation reports and corrective actions;
- Records of meetings and crew meetings;
- Supervisors' notes and logs of safety contacts;
- Records showing use of progressive discipline to enforce safety rules and written safe procedures;
- First aid records, medical certificates, and hearing tests;
- Forms and checklists showing requirements for safe work procedures;
- Records of spill response drills and any resulting improvement;
- Sampling and monitoring records for work around harmful substances; and
- Records of supervisor and worker orientations and training.

The Environmental and Sustainable Resources Manager will apprise the Environmental Coordinator of any new conditions with respect to permits, regulatory notifications, authorizations, approvals, and agreement clauses issued by a regulatory authority or any controlling body.

The Proponent will maintain copies of relevant environmental records, including incident reports. The Environmental Coordinator will keep these records on site and an electronic copy will be accessible to headquarters in Vancouver. Construction Contractors will also retain their own environmental records in a secure location. The Proponent will have access to Construction Contractor environmental records.

Records are to be kept electronically (using a scanner if necessary). The Environmental and Sustainability Manager will retain these records for audit purposes and to track trends in environmental performance. Records will be archived in an organized manner for the duration of the Project using a secure document management system consistent with that used by Project management. A Quality Assurance/Quality Control (QA/QC) process will be in place to ensure high quality data are maintained. In cases where legislation, licences or approvals dictate, retention requirements may be adapted. Records will be stored in an area which:

- Is accessible to designated personnel only;
- Is protected from the elements; and
- Is not at significant risk of fire.

As a back-up, duplicate copies of key environmental records will be stored in an area separate from the main storage location. The Environmental and Sustainable Resources Manager or designate will periodically check the quality of environmental records completed by Construction Contractors. The Environmental and Sustainable Resources Manager as required shall address any quality issues.

Project environmental personnel are responsible for the oversight and verification of Construction Contractor environmental compliance. Key responsibilities and strategies for environmental compliance involve both planning and disciplined field execution. Project environmental personnel will monitor Construction Contractor compliance through several mechanisms and structures. These include:

- Ongoing field monitoring and inspections conducted by dedicated, qualified personnel such as the Environmental Coordinator and designates;
- Periodic assessments by the Environmental Coordinator and/or Environmental and Sustainable Resources Manager of Construction Contractor work areas and contract deliverables to verify compliance and confirm corrective actions are being implemented for any areas identified for improvement;
- Monitoring and tracking of regulatory deliverables (data, reports, etc.) and environmental reporting by environmental personnel;
- Tracking leading indicators and Key Performance Indicators (KPIs);
- Benchmarking against comparable Projects where information is available; and
- Implementing and leading auditing and assurance programs.

Checking will be accomplished through formal and informal monitoring. Formal monitoring will follow a structured schedule and will result in periodic reporting to the Environmental and Sustainable Resources Manager and the Environmental Coordinator, and incident logging as necessary. Informal monitoring will be accomplished through day-to-day routine vigilance for correct application of procedures and timeliness in corrective action.

Site and updated corporate head office contact details will be provided prior to construction when the mine staff has been engaged and a mine satellite phone and data system have been installed. **Figure 13.2-1** shows the present corporate and mine management structure.

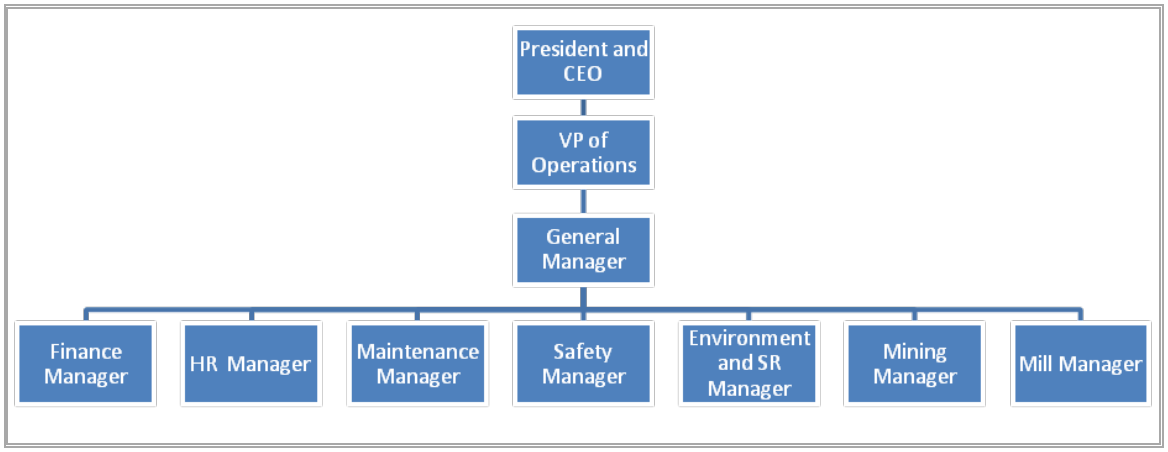


Figure 13.2-1: Corporate and Mine Management Structure

The Proponent will communicate openly and in a timely manner with stakeholders and government agencies regarding its health, safety, environmental and sustainability performance. The Proponent will employ a process of public consultation through the established Public Liaison Committee to communicate its performance in these areas and incorporate feedback into improving its management systems. The Proponent envisions the following as part of its environmental communication process:

- Official reporting of environmental incidents to government agencies will be facilitated by the Environmental and Sustainability Manager on behalf of the Mine Manager;
- the Proponent and Construction Contractor personnel will interact in a respectful and professional manner with local or regional governments regarding an environmental incident;
- The Proponent mine environmental staff will be available to escort regulatory agency staff through the portions of the site they wish to inspect;
- If the Project personnel receive an environmental concern from the public, they will provide the details of the concern to the Environmental Coordinator or Environmental and Sustainability Manager. Details of any substantive concern will be documented and immediately reported to the Environmental and Sustainability Manager;
- Sustainability reporting as part of voluntary initiatives e.g., Global Reporting Initiative (GRI) or Toward Sustainable Mining (TSM); and
- Use of traditional knowledge (TK) and interactive reporting with Aboriginal groups.

13.3 Follow-up Monitoring

The EA process produced several Valued Components (VCs) with effects assessed to be at least moderate, a low level of certainty associated with the significance determination or mitigation measures used in the assessment require monitoring to confirm the effectiveness of the performance. The effectiveness of the mitigation measures and determination of significance will be confirmed though the implication of follow-up programs. Several VCs detail contingency mitigation measures in **Sections 5, 6, 7,** and **8**.

Several VCs include proposed follow-up and monitoring programs in the environmental pillar.

13.3.1 Air Quality

The background concentrations are low compared to ambient air quality objectives (AAQO). This is expected as the Project is located in a remote area with no substantive nearby anthropogenic emission sources. Further, the only potentially significant emission source from the Project is expected to be particulate matter (**Section 5.2.4**).

The purpose of air quality monitoring is to document the efficacy of the mitigation measures implemented and to meet regulatory requirements at the Project site. The plan will ensure that

project activities are conducted according to applicable legislation and the conditions of all project approvals. In particular, monitoring results will be reviewed regularly to determine any emissions trends and to revise operating practices or monitoring protocols as required.

Monitoring will be carried out in order to meet permit and reporting requirements. It will also be used as a tool to determine the efficacy of the mitigation measures implemented. Monitoring will focus primarily on particulate, with permits dictating these requirements. Gaseous monitoring may occur periodically based on need, but gaseous emissions will primarily be estimated using emission factor calculations.

The legislation includes but is not limited to the following:

- Air Monitoring Guidelines: Volume 1 Particulate Non-continuous, March 1996 http://www.env.gov.bc.ca/air/codes/amgv1pnc.html; and
- British Columbia Field Sampling Manual: 2003 — For Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples; March 2004.

13.3.1.1 Monitoring Location

The goal of establishing ambient air monitoring stations is to provide the best assessment of air quality in the area that will be potentially affected by air emissions during long-term operations of the Project. While it is recognized that the regulatory authorities through the Air Emission Permit may specify terms, conditions, and requirements of ambient monitoring, it is proposed that particulate matter will be monitored in order to adequately assess ambient air quality based on the following criteria:

- Level of concern with reference to health effect (relates to ambient air quality objectives and targets);
- Probability of occurrence of the substance at higher concentrations in the mine and plant operation;
- Expected lowest ambient concentrations with reference to the monitor detection limit; and
- Availability of suitable monitors for contaminants in terms of cost, accuracy, detection limits, and suitability for site operation.

Throughout all Project phases, if stations indicate elevated levels of any parameter then the Proponent will determine whether (a) additional mitigation measures are required and (b) whether additional monitoring is required.

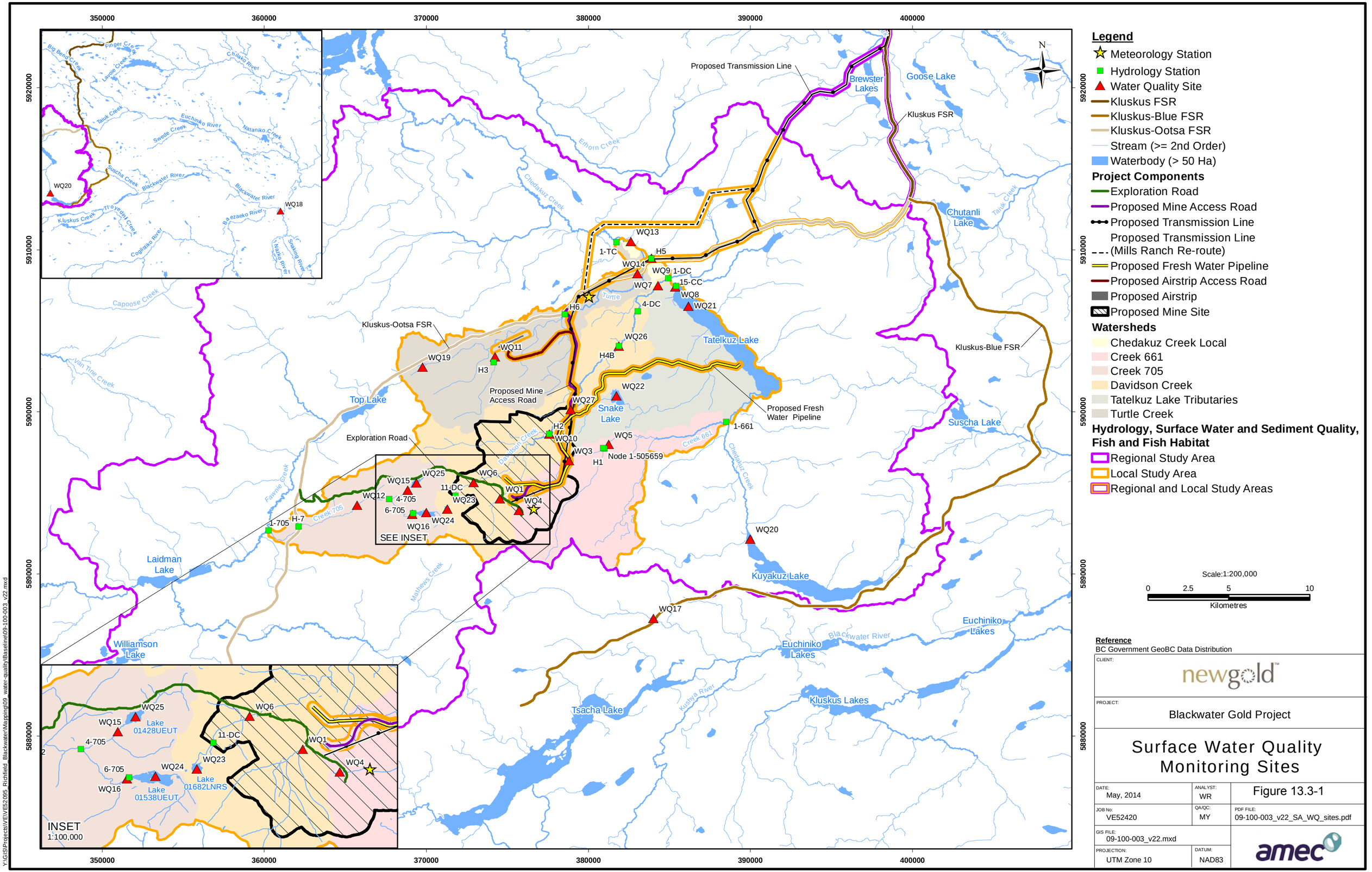
During the baseline assessment, meteorological data and particulate levels were monitored at a site location as shown in **Figure 13.3-1**. For continuity, it is therefore proposed that this location

continues to be used for air quality and meteorological monitoring provided that mine development allows for it.

As for the baseline assessment, particulate monitoring will be conducted using Thermo Scientific Partisol 2025i-D Dichotomous Sequential Air Samplers. These are used for simultaneous concentration measurement of fine ($PM_{2.5}$) and coarse (PM_{10}) ambient particulate matter. The sampler combines sequential filter exchange capabilities with dichotomous splitting technology to provide an automated split sample stream that offers long-term unattended operation. The sampler utilizes a virtual impactor to separate an incoming dust into its fine and coarse components. The sampler will be installed, as needed, inside a temperature controlled shelter. Any change in monitoring equipment or methodology would be discussed with BC Ministry of Environment (BC MOE).

A weather station will also operate at the same location. The station will be a self-contained, solar/battery-powered system and include instrumentation to measure hourly averages of temperature, wind speed, wind direction, relative humidity, solar radiation and rainfall. Wind speed and direction will be measured at a height of 10 m above grade.

The intent is that monitoring data will be used to provide feedback to modify the dust and air quality management procedures instituted at the site. However, it is noted that such sampling does not occur in “real time” and there will be a delay between the events that lead to any elevated concentrations and the receipt of monitoring results. For on-site dust monitoring, regular inspections are proposed and possible sources of dust emission which may be affecting on-site personnel or the off-site environment be noted and the appropriate mitigation measures implemented. The air quality monitor will carry a pre-calibrated continuous dust monitor such as a DustTrak or equivalent equipped with a PM_{10} head in order to quantify any observed emission impacts. Results of inspections, any short-term monitoring, and any mitigation required will be documented on site and made available for inspection by regulatory authorities as required.



Legend

- Meteorology Station
- Hydrology Station
- Water Quality Site
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Stream (>= 2nd Order)
- Waterbody (> 50 Ha)

Project Components

- Exploration Road
- Proposed Mine Access Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch Re-route)
- Proposed Fresh Water Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site

Watersheds

- Chedakuz Creek Local
- Creek 661
- Creek 705
- Davidson Creek
- Tatelkuz Lake Tributaries
- Turtle Creek

Hydrology, Surface Water and Sediment Quality, Fish and Fish Habitat

- Regional Study Area
- Local Study Area
- Regional and Local Study Areas

Reference
BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Surface Water Quality Monitoring Sites

DATE: May, 2014	ANALYST: WR	Figure 13.3-1
JOB No: VE52420	QA/QC: MY	PDF FILE: 09-100-003_v22_SA_WQ_sites.pdf
GIS FILE: 09-100-003_v22.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE52095 Richfield BlackwaterMapping\09_water-quality\Baseline\09-100-003_v22.mxd

13.3.1.2 Reporting

Reporting will be carried out to meet permit, regulatory and corporate requirements. Reporting may include but will not be limited to:

- Annual permit and licence reporting;
- Annual greenhouse gas (GHG) reporting;
- Annual National Pollutant Release Inventory (NPRI) reporting; and
- Corporate Sustainability Reporting.

NPRI and GHG reporting will be based on emissions estimation and annual permit reporting will be based around results from monitoring requirements.

Incidents related to air quality will also be reported as part of the corporate sustainability report, and any community reporting. This will also include any air quality complaints received.

The following items are to be included in the annual air quality monitoring report:

- Type of monitoring conducted;
- Monitoring location(s);
- Instrumentation used;
- Weather conditions during the air monitoring period (based on site meteorological data);
- Date, time, and duration of monitoring;
- Results of monitoring at each monitoring location;
- Measurement error analysis (statistical and systematic errors);
- Samplers calibration certificate;
- QA/QC data; and
- Statement outlining the compliance or non-compliance with the regulatory limits.

If concentrations approaching or exceeding regulatory limits are found, a summary of reason(s) for such non-compliance will be given, and strategies and concrete measures proposed to manage or prevent air quality exceedances in the future. Specific situations may suggest a different approach. Regulatory triggers will be discussed at permitting.

The annual report will summarize the monthly reports and provide annual arithmetic means as well as a statistical analysis (mean, 95th percentile, maximum, and trends when enough data are available).

13.3.2 Surface Water Flow

Surface water flows will be monitored as part of fish and fish habitat monitoring.

Trained environmental personnel will be employed to carry out environmental monitoring during construction, operations, and closure. Environmental monitoring will include but is not limited to:

- Surface water and groundwater quality;
- Water table and piezometric levels;
- Stream flows;
- Freeboards; and
- Any regulatory compliance monitoring.

Environmental staff will be responsible for compiling regulatory reports as required, reviewing baseline data against monitoring data, and reacting to unexpected changes in monitoring results.

It is the objective of the Project Mine Waste Management Plan (MWMP) to minimize interaction between the Project components or activities and surface water flow and Tatelkuz Lake levels during all phases of the Project (**Section 12.2.1.18.4.17**). Monitoring of surface water flows during construction, operations, closure, and post-closure phases of the Project could show changes to the volumes of water being directed to Davidson Creek and/or additional water management measures that differ from those presented in this EA. Surface water flows will be monitored in Davidson and Chedakuz creeks, Creek 661, and Creek 705 at hydrometric stations established during baseline studies. Continuous height recorders will be used and the stage-discharge relationships developed for baseline work used to provide a continuous discharge record for the subject creeks during ice free periods. Data will be analyzed with respect to EA predictions and presented in annual reports to BC MOE (with copies to other government agencies if requested). **Figure 5.1.2.2-1** shows the locations of baseline monitoring stations.

Regulatory triggers for further study or adaptive management will be discussed at permitting. Flow augmentation will be kept within the bounds determined by the in-stream flow needs studies. Potential effects on aquatic communities are discussed in **Section 5.3.8**. Effects of changes in flows in Creeks 661 and 705 will be monitored through aquatic effects monitoring studies discussed in **Section 13.3.8.2**.

Proposed monitoring locations are provided in **Table 13.5-1**.

13.3.3 Surface Water Quality

A surface water quality-monitoring program will be developed in support of *Environmental Management Act* permitting prior to mine construction. It is expected that many of the baseline water quality monitoring sites will be used for the construction and operational monitoring program. A total of 25 sites (19 streams and 6 lakes) have been monitored (**Figure 13.3-1**). Three stream sites and one lake site were dropped in consultation with BC MOE. Conceptually, water monitoring will be conducted on a monthly basis when streams are flowing and quarterly for lakes when accessible. The suite of parameters assayed for the baseline program would continue to be assayed (refer to Surface Water Quality Baseline Report, **Appendix 5.1.2.2A**, for

the parameter list). A water quality data report is expected to be required annually as part of permit conditions. The number and location of water quality sites, the analysis parameters, and nature of the annual report will be set out as a permit condition in consultation with BC MOE. Graphical presentations will be provided together with ranges and means of parameters. Once sufficient data have been amassed, trend analyses will also be included. Any variances from predicted results will be discussed, and if appropriate, plans to address exceedances provided (note: natural exceedances of BC protection of freshwater aquatic life guidelines occur which will be noted but no action to address proposed). Any exceedance of parameters not periodically exceeded in the baseline data will be investigated as to its cause and mitigation measures will be taken if appropriate; for instance, a spike in Total Suspended Solids (TSS) may cause exceedances due solely to that cause which may be easily correctable. Increasing trends that suggest guidelines or objectives are being approached on a sustained basis will be a trigger for investigation of cause and management changes to address.

13.3.4 Sediment Quality

Periodically (expected to be once every three years), sediments will be collected at water quality monitoring sites for analysis. A water quality and sediment data report is expected to be required annually as part of permit conditions (sediments to be discussed when monitored). The nature of the report will be set out as a permit condition in consultation with BC MOE. A suggested format is presented under Surface Water Quality, above.

13.3.5 Groundwater Quantity

A seepage and groundwater monitoring program will be developed in support of the *Environmental Management Act* and *Mines Act* permitting prior to mine construction. Seepage will be monitored from the Tailings Storage Facility (TSF), waste dumps, and low-grade ore (LGO). Pit water will also be monitored during operations and closure. It is expected that many of the baseline groundwater monitoring well sites will be used for the construction and operational monitoring program; additional monitoring well sites may be selected if indicated from the planned monitoring. Conceptually, groundwater monitoring will be conducted on a quarterly basis. A groundwater flow and quality report is expected to be required annually as part of permit conditions. The number and location of groundwater well sites to be monitored, the analysis parameters, and the nature of the annual report will be set out as a permit condition in consultation with the BC MOE. Groundwater flow directions and the data used for determination are discussed in **Section 5.1.2.3**. Report format will be discussed with BC MOE prior to Project construction.

There are no regulations governing groundwater flow and thus no regulatory triggers. The key issue for management action will be an increase in seepage from the TSF main dam (D) above that predicted in the EA. Management actions will include investigating the seepage source and addressing the cause directly which could include increasing or relocating pump back wells or reducing the seepage.

13.3.6 Groundwater Quality

A groundwater monitoring program will be developed in support of *Environmental Management Act* permitting prior to mine construction. It is expected that many of the baseline groundwater monitoring well sites will be used for the construction and operational monitoring program. As per the mitigation strategy, additional monitoring well sites may be selected. Conceptually, groundwater monitoring will be conducted on a quarterly basis. A groundwater quantity and quality report is expected to be required annually as part of permit conditions. The number and location of groundwater well sites to be monitored, the analysis parameters, and the nature of the annual report will be set out as a permit condition in consultation with BC MOE. **Section 5.1.2.4** lists the baseline monitoring sites and parameters monitored. Groundwater quality reports are expected to have a similar structure as surface water quality reports. Report format will be discussed with BC MOE prior to Project construction; a starting format for discussion with be that used in **Section 5.1.2.4**. The groundwater well network will be monitored quarterly when wells are not dry or frozen; data will be compiled and reported annually similar to surface water quality.

Triggers for investigation and/or adaptive management will be based on seepage quality from mine facilities exceeding estimates provided in the Application. The contaminant source(s) will be determined and addressed through changes in source control and/or reduction in source flows.

13.3.7 Wetlands

The Wetland Management Plan (WMP) (**Section 12.2.1.18.4.3**) provides information on existing wetland monitoring, establishing wetland buffers, and following standard BMPs that protect wetland functions.

Wetlands management is designed to minimize and prevent potential effects to wetland functions during the construction, operations, and closure phases of the Project. Soil disturbances, vegetation clearing, grading, and facility installation activities caused by construction activities can reduce wetlands' ability to provide biochemical functions, habitat functions, and hydrological functions. Wetlands management provides information on implementing an adaptive management strategy based on wetland monitoring, establishing wetland buffers, and following BMPs that protect wetland functions. This section presents the WMP for the construction phase.

Due to the nature of the Project and its inherent opportunity to negatively affect wetland functions within the Project boundaries, management and protection of remaining existing wetlands will be sustained throughout the construction, operations, and closure phases of the Project. Wetland creation on site will also be monitored for success in establishing the target wetland ecosystems during the closure, and post-closure phases. Monitoring of off-site wetland restoration areas is addressed in the Wetlands Compensation Plan for the Project (**Section 12.2.1.18.4.3.6**, **Appendix 5.3.7A**).

13.3.7.1 General Practices – Monitoring of Effects

The purpose of wetland monitoring programs is to verify EA-predicted effects to wetland functions from site construction and operations and to systematically address changes in wetland functions that may trigger the need for mitigating actions to prevent further negative effects. A separate wetland monitoring program associated with off-site wetland restoration activities prior to construction will be implemented under the Wetland Compensation Plan (**Appendix 5.3.7A**). The goal of the monitoring program under the WMP will be to measure potential changes in existing wetlands in terms of hydrological, habitat, and biochemical functions over the life of the mine. Details about monitoring the created wetlands around the TSF during operations and closure phases are provided in the management plans specific to those phases.

13.3.7.2 Monitoring Methods

The wetland monitoring program will utilize the baseline sampling data from wetlands within the mine site not impacted by the mine site footprint (discussed in **Section 5.1.2.5**). The data collected at these locations will be used to compare wetland characteristics before and during mine construction and during operations. Additional monitoring locations will be established around the mine site as necessary. Data on water quality, hydrologic regime, and vegetation species and habitat will be recorded through photographic documentation, in situ water quality monitoring, and visual inspections. A monitoring network will be established to document changes to wetlands at sites that are proximate to development and are reference locations utilized during baseline studies.

13.3.7.3 Photographic Documentation

Photographic documentation will be used to monitor wetland habitat and hydrological functioning. Photo-points will be established to obtain representative photographs of specific wetlands during each monitoring event. Photographs will be taken from the same location, at the same height, and in the same direction each time from year to year. The photo-points will be used to evaluate changes in vegetation composition and structure, and general site characteristics over time. Photo-point monitoring will occur on approximately the same day each year to control for seasonal changes in vegetation cover.

Conceptually the wetlands monitoring program would be included in the overall mine provincial environmental effects monitoring program as one element of that plan.

13.3.7.4 Water Quality Monitoring

Water quality monitoring will be used to monitor wetland biochemical functioning. Water quality in wetlands will be monitored using both in situ and surface water sample collection methods. Water quality monitoring will be conducted in concert with the Aquatic Resources Management Plan (ARMP) as necessary to monitor for effects to water quality in aquatic resources beyond the

Project footprint. Water collection guidelines and laboratory protocols will follow those described in the Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE, 2012). The following water quality parameters will include, but not be limited to: turbidity, major ions, nutrients (e.g., ammonia, nitrogen, phosphorous), total and dissolved metals, cyanide, organic carbon, pH, conductivity, dissolved oxygen, and temperature. All site water quality monitoring efforts will be coordinated with the ARMP and other management plans, which will determine the number and timing of sampling events.

13.3.7.5 Visual Inspections

Visual inspections will occur with each monitoring event to monitor wetland ecosystems, including hydrological conditions and wetland extent. Visual inspections will include meandering transects through wetlands and within wetland buffers to identify accidental filling, pollutant discharges, or other stresses on wetland ecosystem functioning and vegetation cover. Visual inspections of wetland buffers are intended to identify developing threats or sources of pollution to prevent impacts to wetlands before they occur, such as:

- Erosion and rill formation;
- Materials storage;
- Active construction or operations; and
- Invasive species establishment.

Transects through wetland interiors will identify existing impacts to wetlands and wetland functions, such as:

- Stressed or “burned” vegetation;
- Sediment runoff;
- Invasive species establishment;
- Changes in hydrologic regime (e.g., seasonal flooding, drawdown); and
- Litter.

Plant species will be recorded along transects through wetland interiors and buffers to identify invasive species. Visual monitoring will occur annually at a minimum.

13.3.7.6 Data Analysis, Reporting, and Adaptive Management Process

Data collected during wetland monitoring will be documented and the results assessed in as part of reports required under the environmental effects monitoring program. The results will be compared between monitoring years and the baseline report, and recommendations regarding management practices, monitoring frequency, and corrective actions will be provided, if necessary. The reports will address any adverse effects to wetland habitat, biochemical, hydrological, and ecosystem functions. The frequency of monitoring will be negotiated with BC

MOE. As a starting point monitoring every three to five years will be proposed. Changes to wetlands are unlikely to be rapid enough for a shorter periodicity. In the event that obvious degradation is occurring between monitoring periods, a root cause analysis and corrective action will be initiated immediately.

Data analysis and reporting is the first step in the adaptive management process. Adaptive management includes monitoring, assessing the results, identifying adverse effects to wetland functions, and developing corrective measures to stop the disturbance or restore wetland functioning to pre-disturbance levels. This approach is consistent with the overall EMS for the site, which promotes responsible environmental management and continual improvement.

Effects on wetland area will be determined by comparing aerial extent between monitoring periods. A qualitative comparison of habitat quality will be undertaken and professional judgement used to determine whether significant effects have occurred between monitoring periods. Water quality is amenable to quantitative measure and any negative trends in water quality parameters will be a trigger for root cause analyses and corrective action.

13.3.7.7 Constructed Wetlands

The 26 ha TSF seepage treatment wetland to be constructed in the former ECD and water reservoir is to be constructed in closure/post-closure, as needed. The final spatial extent of this area will depend on engineering and water quality control requirements. The created treatment wetlands are anticipated to be riparian swamp wetland habitat, which would provide the water quality treatment and biochemical functions needed.

Since constructed wetlands will only be required on closure of mine facilities, plans for their development will be included in annual reclamation plans to BC Ministry of Energy and Mines (BC MEM) as the time for wetland construction approaches.

13.3.8 Fish

Three separate aquatic monitoring programs with fish components will be required for this Project:

- Aquatic Resources Management Plan (ARMP) (**Section 12.2.1.18.4.2**);
- Aquatic Effects Monitoring Program (AEMP); and
- Fisheries Authorization compliance monitoring.

These programs will be developed based on regulatory requirements associated with federal and provincial legislation including the provincial *Environmental Management Act*, the federal *Metal Mining Effluent Regulations (MMER)* and the federal *Fisheries Act*. They will also be based on BMPs and the current scientific literature. For example, the monitoring plan for potential flow effects on fish will be partly based on Lewis et al. (2004) that developed recommendations for

monitoring of hydroelectric projects in BC and Yukon. Guidelines on monitoring frequency and intensity are provided by Lewis et al. (2004) and were reviewed by Connors et al. (2014).

This section presents preliminary monitoring plans for fish, and **Section 5.3.9** presents preliminary monitoring plans for fish habitat. **Sections 5.3.2** to **5.3.7** describe preliminary AEMP components for hydrology, groundwater, water temperature, water quality, and sediment quality. Final versions of monitoring programs will be developed by New Gold in consultation with regulatory agencies and taking into account public and Aboriginal concerns.

13.3.8.1 Aquatic Resources Management Plan

The purpose of the ARMP (**Section 12.2.1.18.4.2**) will be to test the predictions of the EA regarding the efficacy of mitigation measures proposed to protect fish and fish habitat during the construction phase. One component of that plan that is directly relevant to fish will be salvage methods appropriate for fish and the habitat being salvaged from the mine site.

Fish salvage during construction of the mine site is one of the mitigation measures that will reduce direct fish mortality. Live capture methods appropriate for fish and fish habitat being salvaged will be used to capture fish live. Resource Inventory Standards Committee (RISC) standards will be followed for live capture. All live fish will be re-located to reaches in middle and lower Davidson Creek, or as approved by Fisheries and Oceans Canada (DFO).

13.3.8.2 Aquatic Effects Monitoring Program

The purpose of the AEMP will be to test predictions of the EA regarding potential Project effects on water flows, water quality, sediment quality, fish and fish habitat during operations, closure and early post-closure phases. The AEMP will integrate all monitoring of aquatic resources into a single program, thereby providing a single instrument for regulatory review of aquatic effects and reducing costs of sampling, administration and reporting.

The preferred study design for the AEMP is a Before-after-control-impact (BACI) monitoring designs. BACI monitoring designs are used elsewhere in Canadian mines (e.g., EKATI Diamond Mine of the Northwest Territories). BACI designs are preferred for situations where appropriate control sites (also called reference sites) are available (Lewis et al., 2004). BACI designs control for potential confounding effects of temporal variability by measuring simultaneous change at both study and control (also called reference) sites. As much as possible, statistical criteria will be used to make that determination.

Fish components of the AEMP will be developed from the results of baseline sampling conducted from 2011 and 2013 (**Appendix 5.1.2.6A** and **Appendix 5.1.2.6B**). As much as possible, sampling sites, sampling methodology, sampling frequency and sample sizes will follow those used for baseline studies so that the monitoring data and baseline data can be compared directly. Final versions of the AEMP programs will be developed by New Gold in consultation with regulatory agencies and taking into account public and Aboriginal concerns.

Fish components of the AEMP may include the following:

- Rainbow trout densities, body size and age at sites in Davidson Creek, Creek 661, lower Chedakuz Creek, and Creek 705, measured once each year in early July after the rainbow trout spawning migration is completed but before the kokanee spawning migration begins;
- Rainbow trout and kokanee spawner surveys in Davidson Creek, conducted once each year in June (rainbow trout) and July-August (kokanee);
- Rainbow trout spawner surveys in the stream that will be diverted from Lake 01538UEUT into Lake 01682LNRS, conducted once each year in June;
- Rainbow trout gillnet catch per unit effort (CPUE) in Tatelkuz Lake (also mountain whitefish CPUE) and lakes 01682LNRS and 01538UEUT, measured once every 5 years in mid-summer; and
- Rainbow trout fish tissue metals concentrations in Davidson Creek, Creek 661, Tatelkuz Lake (also mountain whitefish), and lakes 01682LNRS and 01538UEUT, measured once every 5 years in mid-summer (this sampling should be co-ordinated with the fish tissue sampling component of the country foods monitoring program).

Section 5.3.9 lists possible fish habitat components of the AEMP.

Standard methods of comparing monitoring and baseline data will be used. Examples include *MMER* protocols (Environment Canada (EC), 2011). BACI study designs lend themselves to multi-way analysis of variance (MANOVA). Principal component analysis (PCA), which was also used to analyze baseline data, will be used to identify trends over time in fish tissue metals concentrations.

The AEMP will include adaptive management protocols for dealing with change over time in measured Project effects and responses of fish populations.

13.3.8.3 Fisheries Authorization Compliance Monitoring

The third monitoring program will be compliance monitoring required under a Fisheries Authorizatio*n* that will be sought from DFO to allow permanent alteration and destruction of fish habitat on the mine site. The Fisheries Mitigation and Offsetting Plan (FMOP) describes that monitoring plan (**Appendix 5.1.2.6C**). Compliance monitoring will be continuous throughout a monitoring period to be defined by consultation with DFO. It will focus on waterbodies created for the FMOP that are not already monitored by the AEMP. Components normally include water quality, habitat area and quality, and fish species, densities, age and size; the permit conditions will be negotiated with DFO and EC.

13.3.9 Fish Habitat

Monitoring will be required to determine if physical habitat effects occur in Davidson Creek downstream of the TSF.

Monitoring of flows during the construction, operations and closure phases will be required to validate habitat model predictions and to assess whether adverse effects may occur at post-closure. Any potential effects during post closure would occur after 35 years when a large amount of physical and biological monitoring data will be available to determine if a biological effect is expected, and to determine any required action.

The three separate aquatic monitoring programs for fish will also be required for fish habitat (see previous discussion).

13.3.9.1 Aquatic Resources Management Plan

The purpose of the ARMP will be to test the predictions of the EA regarding the efficacy of mitigation measures proposed to protect fish and fish habitat during the construction phase. One component of that plan that is directly relevant to fish habitat will be daily water quality monitoring at sites downstream of the mine site in Davidson Creek, Creek 661, and Lake 01538UEUT when sediment control ponds (SCPs) are discharging. Turbidity will be the key variable of concern for fish habitat because it can be measured rapidly with electronic meters, unlike TSS which requires sending water samples to an analytical laboratory. Turbidity will be compared to baseline ranges measured in Davidson Creek, Creek 661 and Lake 01538UEUT and to provincial and federal water quality guidelines for protection of freshwater aquatic life.

13.3.9.2 Aquatic Effects Monitoring Program

Fish habitat components of the AEMP will be developed from the results of baseline sampling conducted from 2011 and 2013 (**Appendix 5.1.2.6A** and **Appendix 5.1.2.6B**). As much as possible, sampling sites, sampling methodology, sampling frequency and sample sizes will follow those used for baseline studies so that the monitoring data and baseline data can be compared directly. Final versions of the AEMP programs will be developed by the Proponent in consultation with regulatory agencies and taking into account public and Aboriginal concerns.

Fish habitat components of the AEMP may include the following:

- Stream flows and water temperatures in Davidson Creek, Creek 661, lower Chedakuz Creek, and Creek 705, measured continuously at the same locations as in 2011, 2012 and 2013. Temperature data loggers will be attached to all hydrology stations;
- Stream habitat quality (e.g., water depth and velocity, substrate composition, stream bank erosion, etc.) at sites in Davidson Creek, Creek 661, lower Chedakuz Creek, and Creek 705, measured once per year in the low-flow period of mid-summer;

- Stream periphyton and benthic macroinvertebrate (BMI) sampling at sites in Davidson Creek, Creek 661, lower Chedakuz Creek, and Creek 705, measured once per year in mid- August – the time of maximum density, biomass and taxonomic diversity;
- Vertical profiles of temperature, conductivity and dissolved oxygen measured from Tatelkuz Lake, Lake 01682LNRS, and Lake 01538UEUT on a quarterly basis (as part of current water quality sampling protocol);
- Water surface elevation of Tatelkuz Lake measured continuously;
- Littoral zone fish habitat quantity and quality in Tatelkuz Lake, measured at transects around the lake once per year in the low-flow period mid-summer; and
- Lake phytoplankton, zooplankton and BMI sampling in Tatelkuz Lake, Lake 01682LNRS, and Lake 01538UEUT, once per year in mid-August – the time of maximum density, biomass and taxonomic diversity.

Section 5.3.8.6.2 lists possible fish components of the AEMP.

Standard methods of comparing monitoring and baseline data will be used. Examples include *MMER* protocols (EC, 2011) and Canadian Aquatic Biomonitoring Network (CABIN) comparison of stream BMI communities with reference BMI communities (CABIN, 2011, 2012). BACI study designs lend themselves to multi-way analysis of variance (MANOVA). Multivariate statistics such as multidimensional scaling (MDS) that were used to analyze baseline data on plant and animal populations will be used to compare community composition of periphyton, phytoplankton, BMI and zooplankton between baseline and post-baseline periods (Clarke and Warwick, 2001). Principal component analysis (PCA), which was also used to analyze baseline data, will be used to identify trends over time in fish tissue metals concentrations.

The AEMP will include adaptive management protocols for dealing with change over time in measured Project effects and responses of fish habitat.

13.3.9.3 Fisheries Authorization Compliance Monitoring

Fisheries authorization compliance monitoring was previously discussed. It will encompass both fish populations and habitat.

13.3.10 Surficial Geology and Soil Cover

Planning and implementation of monitoring will be carried out throughout all phases of the Project life cycle, particularly with respect to erosion and slope stability. These will consist of monitoring the soil and vegetation to ensure that erosional losses and reclamation activities are proceeding as planned, so that the land can return to a functioning ecosystem. Typical soil monitoring activities include site surveys for evidence of erosion and lack of vigorous plant growth. For a description of the monitoring programs conceived for the proposed Project, refer to the Reclamation and Closure Plan (RCP) in **Section 2.6**.

The reclamation goal for the post-closure environment will support recreation and wildlife targets through a functional landscape that resembles the baseline condition to the extent feasible. Adaptive management techniques may be implemented during the Project lifespan to respond to reclamation requirements. Annual reclamation reports will be required by the Projects *Mines Act* permit. Reclamation progress for the year and a reclamation cost estimate will be included in these reports.

Loss of soil due to erosion may be most problematic during the construction phase. In recognition of disturbed sites to erosion, a Sediment and Erosion Control Plan (SECP) (**Section 12.2.1.18.4.1**) has been developed to specifically address the construction phase. The plan is discussed in **Section 2.2.3.5.2.1** and **Appendix 2.2A-5**. In summary, BMPs for construction will be practiced to prevent erosion from occurring where practical. A series of seven sediment control ponds will be constructed to treat water containing suspended sediments before release; two of these will discharge to water bodies, the others to land.

Visual assessment will be used to determine whether erosion is occurring and corrective action taken immediately to address to prevent soil loss.

13.3.11 Geohazards

The footprints of the proposed facilities are generally outside the identified areas of ‘potentially unstable’ and ‘unstable’ terrain, with the exception of the proposed tailings embankment footprints. These footprints include local areas of moderately steep to steep terrain adjacent to Davidson Creek and Creek 505659 that were mapped as ‘potentially unstable’ terrain. In addition, a local area of ‘potentially unstable’ terrain was identified in a gully on the north side of Davidson Creek, which lies within the footprint area of the proposed TSF. The limited localized areas of unstable terrain in the TSF area will be addressed by stabilizing slopes by grading, dewatering and buttressing as necessary during construction of the facility.

All works to stabilize terrain in the mine footprint will be monitored by environmental staff on a routine basis and the stability of all waste management facilities will be inspected by an independent geotechnical engineer on a frequency required by the Mining License.

13.3.12 Soil Quality

Planning and implementation of monitoring will be carried out throughout all phases of the Project life cycle. These programs will consist of monitoring the soil and vegetation to ensure that erosional losses are minimized and reclamation activities are proceeding as planned so that the land can return to a functioning ecosystem. Monitoring with respect to soil quality will include erosion and slope stability, as well as vegetation monitoring. Health and vigour of vegetation will be indicative of potential soil problems such as unsuitable soil structure and nutrient deficiency, and identified issues can be followed up by more detailed soil assessments to determine suitable mitigation activities. Soil monitoring will also include a metal and trace element analysis.

Reclamation, including revegetation success and soil conditions, will be reported to BC MEM annually under the Project's *Mines Act* permit.

Background soil quality and metals levels were obtained for baseline reporting (see **Section 5.1.3.2**). A soil survey will be conducted at the end of major construction (Year 1) and every five years thereafter until closure to determine if changes have occurred. Surveys will encompass all areas sampled for baseline studies except active mine area until after closure when a general survey of the mine footprint will be undertaken for metals. Hydrocarbons will be assayed where petroleum contamination is suspected. Routine petroleum spills will be cleaned up as they occur.

Field surveys will include the following:

- Based on the Standards for Terrestrial Ecosystem Mapping in British Columbia (RIC, 1998), Three different Survey Intensity Levels (SILs) were used to characterize the baseline (mine footprint – SIL1, LSA – SIL2, RSA – SIL3. However, for repeat surveys SIL2 will be used and surveys confined to the LSA;
- The LSA requires an SIL2, or 51% to 75% of identified polygons sampled. This equates to approximately 20 ha to 29 ha per inspection at the same mapping scale;
- Baseline mapping (amended as required by mine developments) will be used to identify survey polygons; and
- For soil metals, the litter and organic layers will be used for this analysis, as they are the topmost soil layer, and potentially affected by deposition of metals. They are also the source for the introduction of the elements into the food chain. Samples from both the A and B horizons will be analyzed to determine assumed natural soil concentrations. Sampling will follow BC monitoring and laboratory analysis guidelines (BC MOE 2012, BC MOE 2009, respectively).

13.3.13 Progressive Reclamation and Vegetation Monitoring

Progressive reclamation will allow for a certain amount of implementation and testing of reclamation activities prior to closure (RCP, **Section 2.6**). Stockpiles can be used for testing a variety of reclamation strategies: for example, fertilizer and organic amendment application rates, successful reclamation of native species, seeding and planting densities, and propagation of native propagules from forest floor material.

Vegetation will be monitored long term by visual assessment and biomass assessment, to quantify species composition and abundance, total percent cover, and plant health (**Section 2.6**). Plots will be located in the reclaimed TSF (wetland, upland beach, and upland slope), waste rock dumps, open pit south overburden slope, and environmental wetlands and control sites. Special measures to research and reclaim whitebark pine will be implemented with a strong emphasis on establishing rust-resistant trees, including rust screening. Should any parameters be unsatisfactory, measures such as plant species substitution; additional planting

and seeding, soil amending, weed control, or grazing control will be implemented. Whitebark pine is further discussed in **Section 13.3.14**.

Post-closure, vegetation will be monitored to quantify species composition and abundance, total percent cover, and plant health by visual assessment and biomass assessment (RCP, **Section 2.6**). The plots will be located in the reclaimed TSFs (wetland, upland beach, and upland slope), waste rock dumps, and mine buildings and infrastructure. Revegetation success will be assessed and reported in annual reclamation reports.

13.3.14 Whitebark Pine

Measures to address and minimize Project effects on whitebark pine pertinent to monitoring will include population inventory, rust screening, reclamation trials, and off-site transplanting. Additional discussion can be found the Landscape, Soils and Vegetation Management and Restoration Plan (LSVMRP), **Section 12.2.1.18.4.4**).

13.3.14.1 Population Inventory

As part of baseline studies the extent of whitebark pine was delineated and transects were conducted to support an estimate of stem density, tree health (level of rust infection) and extent of population. During construction, an inventory following standards identified by the whitebark pine committee will be conducted on the mine site prior to overburden stripping. Areas of potential non-direct effects (e.g., dust deposition) and areas where other mitigation might be applied (e.g., cone collection, transplanting, or stand enhancement) will also be identified and inventoried. The inventory will include transects to assess tree health and identify the level of infection by blister rust. The white bark pine population inventory results will include estimates of rust infection rates in white bark pine near Mt. Davidson. On-site inventories are expected to be updated every 3 to 5 years throughout mine operations.

13.3.14.2 Rust Screening

The Proponent commits to supporting the research into other factors affecting the viability of whitebark pine during the Project's construction and operations phases. There are a number of approaches to rust screening to obtain an effective and applicable screening program aligned with provincial priorities. The Proponent will work with regulatory agencies and Aboriginal groups in supporting research initiatives related to rust screening.

Rust screening typically involves blister rust transect surveys within the extent of the Mt. Davidson whitebark pine population. Cones will be collected from phenotypically rust resistant parent trees that occur a minimum of 50 m apart. The target for rust screening is a minimum of 50 seedlings from 100 trees. Following cone collection a portion of seeds will be submitted to various research facilities to conduct further rust screening. The remaining portion of seeds collected from the apparent rust resistant trees will be germinated in a nursery to produce

transplants. Excess seed will be stored at the BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO) Surrey Seed Centre.

On-going visual monitoring of newly planted areas on-site will occur every five years to assess the success of seedling establishment and overall health of each tree. All parent trees involved in this process are permanently marked to facilitate future seed collections should their progeny demonstrate rust resistance. The majority of healthy parent trees will not produce rust resistant seedlings.

13.3.14.3 Reclamation Trials and Progressive Reclamation

Reclamation trials using whitebark pine seedlings will be undertaken during progressive reclamation stages to develop expertise in using whitebark pine during the final reclamation phases. Whitebark pine occurs naturally on very rocky sites including what appear to be old exploration roads on Mt. Davidson. Although observations of whitebark pine in coarse, poor substrates are common, reclamation trials will be structured to maximize survival and growth of seedlings.

Monitoring of reclamation trials and progressive reclamation success will be concurrent with any updates to the reclamation plan for the site. It is anticipated the reclamation plan will be updated during project permitting and through the mine life as the mine plan develops. At this time, white bark pine monitoring is proposed to be conducted 1 year after planting and then every 3-5 years. However, successful reestablishment of whitebark pine may be limited by factors beyond the control of the Proponent. The Proponent's support for research into these factors affecting the species (e.g., blister rust screening, and data on tree health documenting blister rust infection levels) as well as activities such as transplanting, cone collection, and reclamation trials all support reaching the end land use objectives for this species.

13.3.14.4 Off-Site Transplanting

The Proponent initiated off-site transplanting during exploration activities and will continue the practice through the mine life. Using results from the population inventory, individual plants/trees will be relocated to prevent loss. However, this will be limited by the ability to physically move individual specimens, the presence of suitable transplant relocations, the health of the specimen (i.e., no sign of blister rust), and approval of applicable permits. Individuals will only be moved if they show no sign of blister rust.

The identification of locations to which individuals or groups of individuals may be transplanted to will be determined through the Mt. Davidson whitebark pine population inventory. Subsequent monitoring will be concurrent with the timing of ongoing population inventories (i.e., every 3 to 5 years throughout operations) with the intention that results will guide reclamation trails and planting of seedlings.

13.3.15 Wildlife

Wildlife monitoring procedures will follow those used in baseline surveys. For further discussion that incorporates baseline data, compliance data (such as established benchmarks, regulatory documents, standards or guidelines) and real time data (such as observed data gathered in the field), reporting methods to be used, including frequency, methods and format, see **Table 13.5-1** and wildlife and wildlife habitat baseline summary in **Section 5.1.3.4**. Baseline survey methodology followed RISC standards where they had been established for a particular species group or survey type. Several surveys without RISC standards followed established methodologies as determined by a primary literature review. Surveys on birds also followed the Canadian Wildlife Services (CWS) technical report framework for the scientific assessment of potential project impacts on birds (Hanson et al., 2009).

In addition to species at risk identified federally, provincially, and regionally, species of management concern were included in the baseline assessment that had been identified by local naturalists and interest groups and Aboriginal groups.

Five categories of assessment were addressed to examine the following potential Project effects on wildlife and wildlife habitats:

- Change in habitat availability (habitat loss and alteration);
- Change in wildlife population dynamics;
- Change in wildlife mortality risk associated with physical hazards and attractants (physical hazards);
- Change in wildlife movement patterns (including assessment of possible sensory disturbance causing wildlife attraction or deterrence); and
- Change in wildlife health (including assessment of possible chemical hazards and attractants for wildlife).

Monitoring and reporting will occur at the end of major construction (Year 1) and a minimum of every five years through the operation period with reduced frequency at closure determined by operations phase results. Qualitative criteria and professional judgement will be used; criteria are listed in **Table 13.3-1**.

The effects predictions, assumptions and mitigation actions that are to be tested in the follow-up program will be converted into field-testable monitoring objectives for quantitative objectives based on the significance thresholds identified in the effects assessment for each wildlife VC for the categories of assessment. The monitoring design will be based on the wildlife RISC standards for sampling and include a statistical evaluation of the adequacy of existing baseline data to provide a benchmark against which to test for significant project effects for quantitative measures consistent with the statistical confidence associated with the RISC sampling methodology.

Monitoring of potential Project effects on the Tweedsmuir-Entiako Northern Caribou herd is discussed in the Wildlife Management Plan (WLMP), **Section 12.2.1.18.4.6**. Included in the report will be:

- An assessment of consistency of mining activities with the plan and recommendations for improvement; and
- Assessments of the effects and risks to the Northern Caribou population and habitat of implementing, or failing to implement, the plan.

13.3.15.1 Amphibians

Water quality monitoring will be used to monitor possible effects of the Project, as previously discussed.

13.3.15.2 Water Birds

Water quality monitoring will be used to monitor possible effects of the Project (monitoring was previously discussed). Since water birds depend on healthy riparian and aquatic habitats, the environmental effects monitoring program instituted as part of on-going aquatics monitoring will be used as well to assess effects on these birds.

13.3.15.3 Forest and Grassland Birds

Progressive and final reclamation success will be monitored which will provide a measure of restoration of habitat of forest and grassland birds. Annual reclamation reports including amount of areas rehabilitated and revegetated will be provided to BC MEM.

13.3.15.1 Clark's Nutcracker

Every five years during operations a breeding bird/nest survey (2-3 days duration) will be conducted to document numbers and nesting of Clark's nutcrackers on Mt. Davidson at the sites surveyed for baseline studies, or as modified in consultation with BC MOE and dictated by mine developments.

13.3.15.2 Other Mammals

Moose, caribou, grizzly bear, furbearers and bats measures and monitoring will be similar to forest and grassland birds.

13.3.15.3 Invertebrates

Project effects on invertebrates are predicted to be insignificant. Monitoring of aquatic and riparian areas as well as success of progressive and final reclamation will provide a measure of rehabilitation of habitat quality which may benefit invertebrates.

13.3.16 Valued Components Not Requiring Monitoring

Several VCs in the environmental pillar do not propose follow-up programs. Noise and vibration does not require follow-up monitoring unless a formal complaint is filed with the office of the Proponent or the BC MOE. In the event of such a case, the Proponent is committed to managing noise issues and responding promptly to any noise complaint: Noise Complaint Investigations (2009).

The Climate VC requires reporting of GHG emissions under provincial and federal legislation. There is no proposed monitoring or follow-up for climate change, other than GHG emissions reporting, because this is a global phenomenon which cannot be disaggregated into small areas and project-specific activities.

13.3.17 Closure and Post Closure Monitoring and Reporting

Section 2.6 is the RCP for this Project. Monitoring of the reclaimed mine site will be required to ensure that the reclamation objectives are met, along with environmental protection and quality of the natural resources in the Project area, including water, soil, wetlands, vegetation, wildlife, and fisheries. The closure period is defined as being from the cessation of mining until the pit lake overflows (about 18 years after the cessation of milling; year 35 from start of mining). The post-closure period is defined as starting with the overflow of the TSF after the pit lake is full. The proposed monitoring program for biophysical parameters in the mine site and downstream during closure and post-closure is shown later in **Section 13.5, Table 13.5-1**.

Reporting will be undertaken in the form and at the frequency required under the BC *Mines Act* and *Environmental Management Act* permits. Annual summary reports will also be prepared. All reports will be provided to, and discussed at, the Community Liaison Committee and with Aboriginal groups where requested.

Table 13.3-1 provides an outline of performance standards.

Table 13.3-1: Reclamation Performance Standards and Objectives during Construction, Operations, Closure, and Post-Closure Phases

Area	Reclamation Performance Standard
Construction and Operations	
Geotechnical stability of engineered structures and mine-related landforms	Geotechnical structures meet BC MEM requirements and CDA Guidelines
Soil quality and stability	473,000 m^3 of salvaged soil during construction and operations
	Adequate soil stability
	Adequate soil quality
	Minimum 30 cm depth capping of topsoil or overburden used for reclamation
Decommissioning of infrastructure	Construction camp removed (about Year 2) unless incorporated into operations camp, begins reclamation of pit by removing equipment and pipeline (Year 15)
Water quality and flow	Surface flow in Davidson Creek meets IFN
	Ground water quantity and quality within predictions
	ML minimized and mitigated / ARD prevented
	No discharge of surface water from mine into the environment during operations
Fish and fish habitat	Healthy fish, benthos, and periphyton
	Fish habitat compensation meets targets
Wetlands	Wetland functions maintained in remaining wetlands in mine footprint
	63 ha of swamp and marsh wetland habitat created around Pond in TSF Site C by end of Year 4 unless used for water reservoir
Vegetation	Total mine footprint does not exceed approximately 2,939 ha
	Maintain a viable population of whitebark pine by collecting cones, propagating and transplanting seedlings, rust screening
	Establish a new population of rust-resistant whitebark pine in designated reclaimed areas
	Identification of rare plants, salvaging and relocating during construction
	Prevention and management of invasive plants at mine site and along all linear corridors including transmission line
	Production of native plants for reclamation in the on-site plant nursery
	Production of rust-resistant whitebark pine seedlings in either the on-site nursery or a designated off-site nursery
	Establishment of plant communities on progressively reclaimed camp site, TSF Site C borrow area (experimental trials); whitebark pine on waste rock piles
	Avoid ecosystems at risk (Blue- and Red-listed) along transmission line
Wildlife	Habitat maintained and created for mammals including bats, moose, deer, black bear, and marten
	Habitat maintained and created for birds including waterfowl and Clark's nutcracker
	Habitat maintained and created for amphibians, especially western toad
	Habitat maintained and created for invertebrates
Closure	
Geotechnical stability of engineered structures and mine-related landforms	Geotechnical structures meet BC MEM requirements and CDA Guidelines
Soil quality and stability	Adequate soil stability and erosion control
	Adequate soil physical and chemical quality
	Minimum 30 cm depth capping of topsoil or overburden used for reclamation
Decommissioning of infrastructure	Operations camp decommissioned
Water quality and flow	Surface flow in Davidson Creek meets IFN
	Ground water quantity and quality within predictions
	ARD prevented / ML minimized and mitigated
	No discharge of surface water from mine into the environment during closure unless meets water quality requirements
Fish and fish habitat	Healthy fish, benthos, and periphyton
	Fish habitat compensation meets targets
Wetlands	Wetland functions maintained in remaining natural wetlands in mine footprint
	Approximately 232 ha of swamp and marsh wetland habitat created around pond of TSF Site D by end of Year 35
	11 ha of riparian swamp wetland habitat restored when converting freshwater reservoir to wetlands by end of Year 35
Vegetation	Maintain a viable population of whitebark pine by collecting cones, propagating and transplanting seedlings, rust screening
	204 ha revegetated with whitebark pine including rust-resistant vegetation
	Maintain plant species at risk
	Prevention and management of invasive plants at mine site and along all linear corridors including transmission line
	Establishment of plant communities on reclaimed operations camp, TSF facilities, waste rock dumps, and any other decommissioned on-site and off-site facilities
End land use objective of self-sustainable native plant communities, wildlife habitat and traditional land use by First Nations	Wildlife habitat created on the mine site and off-site facilities as described in the Conceptual Reclamation Plan and used by target species
	Gathering of traditional plants by First Nations on reclaimed mine site and off-site facilities
	Hunting opportunities on the former mine site and off-site facilities due to constructed wildlife habitats
	Continued use of Davidson Creek for fishing; fish habitat compensation targets met
Post-Closure	
Geotechnical stability of engineered structures and mine-related landforms	Geotechnical structures meet BC MEM requirements and CDA Guidelines
Soil quality and stability	Adequate soil stability and erosion control
	Adequate soil physical and chemical quality
Water quality and flow	Surface flow in Davidson Creek meets IFN
	Ground water quantity and quality within predictions
	Supernatant discharge from TSF meet standards
	ML minimized / ARD prevented
Fish and fish habitat	Healthy fish, benthos, and periphyton
Wetlands	Wetland functions maintained in remaining natural wetlands
Vegetation	Viable population of whitebark pine
	Minimal invasive plants along all linear corridors including transmission line
End land use objective of self-sustainable native plant communities, wildlife habitat and traditional land use by First Nations	Self-sustaining native plant communities established
	Wildlife habitat created on the mine site as described in the Conceptual Reclamation Plan and used by target species
	Gathering of traditional plants by First Nations on reclaimed mine site and off-site facilities
	Hunting opportunities on the former mine site due to constructed wildlife habitats
	Continued use of Davidson Creek for fishing

Note: BC MEM = BC Ministry of Energy and Mines; CDA = Canadian Dam Association; ML = metal leaching; ARD = acid rock drainage; IFN = instream flow needs; TSF = Tailings Storage Facility; m^3 = cubic metres; cm = centimetre; ha = hectare

13.3.18 Socioeconomic

The financial contributions of the Project in taxes and royalties to government will be reported in the Proponent's quarterly or annual financial reports.

No additional monitoring or follow-up activities are proposed. However, the Proponent, as part of its Health, Safety, Environmental, and Corporate Social Responsibility Policy, is committed to work with governments, host community representatives, and other organizations to promote local sustainable development both during and after mining operations. The Proponent prepares an annual sustainability report, and the 2012 report identifies community development and economic impacts as being one priority in support of community engagement and development (New Gold, 2012). As its target for 2013, the Proponent committed to working with the Blackwater Community Liaison Committee to identify opportunities for maximizing local economic and social impacts, and the Proponent plans to continue to work with the Community Liaison Committee over the life of the Project.

The Proponent will continue its comprehensive consultation program throughout the life of the Project. The consultation program will be designed to ensure that individuals and communities remain current in their knowledge of Project activities, and have opportunities to provide input.

The Proponent will monitor the effectiveness of Project design and mitigation measures that will be undertaken to limit any potential adverse Project effects. If a particular measure is found to be inadequate at mitigating a target effect, adaptive management techniques will be assessed and implemented, as appropriate.

In the regional context, the Proponent will continue to actively participate in regional organizations to address issues related to regional development and associated cumulative effects.

Specific follow-up actions likely to be implemented include:

- Establishing a Traditional Knowledge/Traditional Land Use (TK/TLU) monitoring group for the Project to include representatives from Lhoosk'uz Dené Nation (LDN) and Ulkatcho First Nation (UFN);
- Involving affected Aboriginal groups in the development and implementation of appropriate management plans; and
- Participation in regional working groups such as the Caribou Working Group and others, as required.

The effectiveness of visual resources management will be monitored for the duration of mine life through the following measures:

- Ongoing interaction with relevant managers in the Vanderhoof Forest District for coordination of effort in activities and areas of mutual interest; and

- Monitoring of visual effects at varying distances from the mine site near sensitive receptors. Monitoring will be carried out at specific stages during the construction and operations phases. Observations will be recorded on evaluation sheets and will include photographs for cataloguing effectiveness.

13.4 Aboriginal Rights and Interests

The Follow-up Program will be designed to monitor the implementation of mitigation measures resulting from Aboriginal consultation, including:

- Verifying predictions of environmental effects with respect to Aboriginal peoples, as well as residual impacts that could not be addressed within the context of the EA;
- Determining the effectiveness of mitigation measures as they relate to environmental effects with respect to Aboriginal peoples in order to modify or implement new measures where required;
- Supporting the implementation of adaptive management measures to address previously unanticipated adverse environmental effects with respect to Aboriginal peoples or unanticipated adverse impacts to Aboriginal rights;
- Verifying measures identified to prevent and mitigate potential adverse effects of the project on potential or established Aboriginal and Treaty rights; and
- Providing information that can be used to improve and/or support future EAs and Aboriginal consultation processes.

13.4.1 Country Foods Monitoring

The following monitoring program is proposed for the Project's operations and post-closure management. Monitoring will determine metals concentrations in specific indicator plants, small mammals, large mammals, and fish. Sampling will be undertaken during Year -2 of mine construction, 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 Aboriginal groups prior to Project construction.

Sampling and metals monitoring will include the following.

13.4.1.1 Plants

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

not have guidelines for plant metals levels. However, results of surveys will be discussed with Aboriginal groups and issues and concerns will be addressed.

13.4.1.2 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 contaminants of potential concern (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 RISC standard protocols. Health Canada only has guidelines for mercury in fish, but results of surveys will be discussed with Aboriginal groups and issues and concerns will be addressed.

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.

Small Mammal Sampling

Target species include short-tailed shrew *(Blarina brevicauda*) and deer mice (*Preomyscus 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.

13.4.1.3 Large Mammals

The Proponent will discuss details of a proposed sampling program for large mammals (such as Moose) with Aboriginal groups, community members, and Agencies 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 Aboriginal hunters and provided to the Proponent under agreed handling methods. In the absence of guidelines, results will be discussed with Aboriginal groups and issues and concerns will be addressed.

13.4.1.4 Fish

Rainbow trout and mountain whitefish will be sampled to track metals concentrations in these species during the life of the Project; sampling for metals will be part of the AEMP program, previously discussed. Results will be compared to baselines. Baseline metal concentrations were measured in 2011, 2012, and 2013. Mercury results will be compared to Health Canada guidelines. All results will be discussed with Aboriginal groups and issues and concerns will be addressed.

13.4.1.5 Community Consultation

Implementing the Country Foods Monitoring Plan will be responsive to public and Aboriginal concerns from planning through execution. Plans will be informed by meetings with regulators, Aboriginal groups, 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 Aboriginal groups, and discussed with the Community Liaison Committee or the Environmental Monitoring board for the Project.

Additional information on country foods monitoring is provided in **Appendix 9.2.2B**.

13.4.2 Beneficial Agreements

Beneficial agreements have been, or are anticipated to be, negotiated with Aboriginal groups with rights or interests in the Project area. There are three types of agreements negotiated:

- Exploration agreements covering the exploration phase activities of the Project;
- Capacity funding agreements providing funding for Aboriginal participation in the EA process; and
- Participation agreements which will cover Aboriginal employment and business opportunities throughout the mining phases.

Monitoring will be conducted in consultation with Aboriginal groups and as required under these agreements.

13.5 Monitoring Summary

Table 13.5-1 summarizes proposed follow up monitoring for all Project phases.

Table 13.5-1: Proposed Project Follow-up Monitoring Program

Topic	Purpose	Location	Frequency	Parameters
Air quality	To confirm impact predictions	Project mine site	Continuous	PM_{-10}, $PM_{-2.5}$
Site water quality	To confirm predictions of source water quality	Sediment control ponds	Daily field measurements when ponds discharging	Turbidity; weekly lab TSS
Hydrogeology	To confirm impact predictions	Monitoring of relevant groundwater wells, and reporting, following the Water Management Plan.	Quarterly	Piezometric head for wells, pH, cond., SO_4, nutrients and dissolved metals.
Hydrology	To confirm impact predictions	Hydrology stations on Davidson, Chedakuz, 705 and 661 Creeks	Daily during non-frozen conditions	Flow
Receiving water quality	To ensure protection of downstream water quality	At established surface water quality sites	Monthly	Physical, nutrients, major ions, total and dissolved metals
Fish habitat	Protection of fish habitat from sedimentation	Davidson Creek, Creek 661, Lake 01538UEUT	Daily when sediment control ponds are overflowing	
Benthos	Aquatic environment health	Davidson Creek, Creek 661, Lake 01538UEUT	As required by the Project's *Environmental Management Act* permit; every 3 to 5 years commencing with construction anticipated	Presence-absence, species diversity
Soil	To minimize erosion of disturbed areas	All disturbed areas on the Project site and along linear facilities	Periodically as required by the Erosion and Sediment Control Plan	Soil erosion
Vegetation	To minimize vegetation loss	Project site, linear facilities	Continuous as part of construction monitoring	Disturbance area estimation; flagging of out-of-bounds areas
Wetlands	To minimize wetland loss	Project site	Continuous as part of construction monitoring	Disturbance area estimation; flagging out-of-bounds areas
Wildlife	To minimize habitat loss and to prevent to the extent possible wildlife mortalities from construction activities	Project site, linear facilities	Continuous as part of construction monitoring	Disturbance area estimation; mortalities from vehicle collisions or other Project construction activities
Socio-Economics	Consultation with interested third parties	Communities including Vanderhoof	To be determined through consultation with affected parties	Updates on construction progress
First Nations Rights and Interests	Monitoring potential effects of the project on First Nations rights and interests	Project LSA	Construction Year -1	Metals concentrations in specific indicator plants, small mammals, large mammals (dependent on discussions with First Nations to obtain samples), and fish. Participation by First Nations to be determined through beneficial agreements.
		Operations		
Air quality	To confirm impact predictions	Project mine site	Continuous	PM_{-10}, $PM_{-2.5}$
Site water quality	To confirm predictions of source water quality	Permanent sediment control ponds, TSF, waste dumps, open pit sump(s)	Monthly	Physical, pH, nutrients, major ions, total and dissolved metals
Hydrogeology	To confirm impact prediction	Monitoring of relevant groundwater wells, and reporting, following the Water Management Plan.	Quarterly	Piezometric head for wells, pH, cond., SO_4, nutrients and dissolved metals.
Hydrology	To confirm impact predictions	Hydrology stations on Davidson, Chedakuz, 705 and 661 Creeks	Daily during non-frozen conditions	Flow
Receiving water quality	To ensure protection of downstream water quality	At established surface water quality sites	Monthly	Physical, nutrients, major ions, total and dissolved metals
Fish (AEMP)	Monitor fish populations for Project effects	Rainbow trout in Davidson and Chedakuz creeks, Creeks 661, 705	Annually in early July	Density, body size, age
		Rainbow trout and kokanee spawners in Davidson Creek	Annually in June (rainbow trout) and July/August (kokanee)	Density, body size, age
		Rainbow trout spawners in diversion stream to lakes 01538UEUT and 01682LNRS	Annually in June	Density, body size, age
		Rainbow trout and in Tatelkuz Lake (including mountain whitefish) and lakes 01538UEUT and 01682LNRS	Mid-summer once every 5 years	Catch per unit effort
		Rainbow trout in Davidson Creek, Creek 661, Tatelkuz Lake (including mountain whitefish), lakes 01538UEUT and 01682LNRS	Mid-summer once every 5 years	Tissue metals levels
Fish habitat (AEMP)	Monitor fish habitat for Project effects	Davidson Creek, creeks 661 and 705, lower Chedakuz Creek	Continuously when streams flowing at hydrology stations	Stream flows and water temperatures
		Tatelkuz Lake, lakes 01538UEUT and 01682LNRS	Quarterly	Vertical profiles of temperature, conductivity and dissolved oxygen
		Tatelkuz Lake	Continuously when not frozen	Water surface elevation
		Tatelkuz Lake	Annually in mid-summer	Littoral zone fish habitat quantity and quality

Topic	Purpose	Location	Frequency	Parameters
Stream benthos and periphyton (AEMP)	Monitor for Project effects	Davidson Creek, Creeks 661 and 705, lower Chedakuz Creek	Annually in mid-August	Biomass and taxonomic diversity
Lake phyto and zooplankton and benthos		Tatelkuz Lake, lakes 01538UEUT and 01682LNRS	Annually in mid-August	Biomass and taxonomic diversity
Soil cover	Monitor for Project effects	Project LSA where there is/was disturbance	On-going; annual report during operations as part of reclamation report to MEM	Erosion, establishment success of temporary seeding
Soil quality			End of major construction (Year -1) and every 5 years until closure	Survey intensity level 2 for soil quality plots and metals levels. Metals from litter, A and B layers
Vegetation	Monitor revegetation success	Progressively reclaimed areas	Annual after vegetation established	Per cent cover and plant health
Invasive plants	Monitor for occurrence	Project LSA	Continuous	Occurrence of invasive species
Wetlands	Monitor effects of Project plus success of compensation	Project LSA	Annual	Compare with baseline data for wetland habitat and hydrological functioning. Water quality will be collected and analyzed for the same parameters as surface water
Wildlife	Monitor effects of Project on wildlife including species at risk and of interest to First Nations	Project LSA and linear facilities	One year after construction and every five years	Change in habitat availability, change in wildlife population dynamics, change in wildlife mortality risk associated with physical hazards and attractants, change in wildlife movement patterns, changes in wildlife health.
Socio-Economics	Consultation with interested third parties	Communities including Vanderhoof	To be determined through consultation with affected parties	Updates on mine activities
First Nations Rights and Interests	Monitoring potential effects of the project on First Nations rights and interests	Project LSA	Years 3, 8, 15, 24	Metals concentrations in specific indicator plants, small mammals, large mammals (dependent on discussions with First Nations to obtain samples), and fish. Participation by First Nations to be determined through beneficial agreements.
Site water quality	To confirm predictions of source water quality	Pit lake while filling (3 depths)	Annual	pH, cond., SO_4, total and dissolved metals, ammonia, nitrate and nitrite; total and WAD CN for all sites except East and West Dump
		Tailings pond embankment seepage	Annual	
		Tailings pond shell runoff	Annual	
		East and West Dump runoff and seepage	Annual	
		TSF and ECD/water reservoir and wetland discharge (post-closure)	Quarterly, except final wetland discharge (monthly)	
Hydrogeology	To confirm impact predictions	Monitoring of relevant groundwater wells, and reporting, following the Water Management Plan.	Quarterly (closure) annually (post-closure), unless circumstances require otherwise.	Piezometric head for wells, pH, cond., SO_4, nutrients and dissolved metals.
		ECD	Quarterly (closure)	
Hydrology	To confirm impact predictions	Hydrology stations on Davidson, Chedakuz, 705 and 661 Creeks	Daily during non-frozen conditions	Flow
		TSF and ECD/water reservoir wetland discharge (post-closure)		
Receiving water quality	To ensure protection of downstream water quality	Davidson Creek at compliance point[(1)] and 1-DC	Quarterly during closure and post-closure	pH, conductivity, SO_4, nutrients, total and dissolved metals and field temperature
		Chedakuz Creek at 15-CC and H5		
		Creeks 661 and 705 at H1 and 6-705		
Fish[(2)]	To ensure protection of aquatic species	Davidson Creek at compliance point[(1)] and 1-DC	Every three years during closure, and three years after closure (post-closure)	Species composition and abundance, metals in fish tissue (rainbow trout and white fish)
		Creeks 661 and 705		
		Lake 01682LNRS and Lake 01538UEUT.		
Benthos	To ensure protection of aquatic species	Davidson Creek at compliance point(1) and 1-DC	Annually for first three years after closure, then every three years for at least nine years (i.e., three events)	Species and abundance
		Creeks 661 and 705		
Soil	To ensure soil stability and adequate revegetation	Test plots in TSF wetland and upland	Annually for first three years after closure, then every three years for at least nine years (i.e., three events)	Erosion, organic matter, total and available nutrients, pH, EC, CEC
		Test plots on waste dumps		
		Test plots in selected locations of reclaimed natural landfoms		
Vegetation	To ensure adequate revegetation and protection of species and ecosystems at risk	Test plots in TSF, including wetlands and upland beach	Annually for first three years after revegetation, then every three years for nine years (or three events)	Species composition, diversity, abundance, plant cover, and metal content; establishment of whitebark pine and rust-resistant individuals
		Test plots on waste dumps		
		Test plots in selected locations of reclaimed natural landforms		

Topic	Purpose	Location	Frequency	Parameters
Invasive plants	Monitor for occurrence	Project LSA	Continuous until the end of closure	Occurrence of invasive species
Wetlands	To ensure adequate revegetation and protection of species and ecosystems at risk	Sampling sites in TSF and environmental wetlands, and selected natural wetlands in upper Davidson Creek and Creek 661	Annually for first three years after revegetation, then every three years for at least nine years (or three events during closure) and one event three years after closure (post-closure, Year 40)	Species composition, abundance, plant cover, and metal content; water quality and levels
Wildlife	To ensure adequate revegetation and protection of species and ecosystems at risk	Transects on reclaimed TSF, including environmental wetlands, waste rock dumps, and linear components (transmission line, mine road, airstrip road, and water pipeline)	Every three years after revegetation during closure phase, and one event three years after closure (post-closure Year 38)	Species composition, abundance, area utilization, mortality related to Project, habitat availability for wildlife such as migrating birds
Socio-Economics	Consultation with interested third parties	Communities including Vanderhoof	For the period when active closure takes place dependent on the level of activities; cease after post closure, depending on activities	Update on closure progress
First Nations Rights and Interests	Monitoring potential effects of the project on First Nations rights and interests	Project LSA	For the period of active closure dependent on the level of activities	Update on closure progress

Note: (1) compliance point is Davidson Creek at mine access road crossing
(2) other sites will be chosen if fish do not occur in sufficient numbers to provide an adequate sample.
AEMP = Aquatic Effects Monitoring Program; LSA = Local Study Area; TSF = tailings storage facility; ECD = environmental control dam;