RED MOUNTAIN UNDERGROUND GOLD PROJECT
VOLUME 5 | CHAPTER 29
MANAGEMENT PLANS

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29.1.1 Introduction

IDM Mining Ltd. (IDM) intends to develop the proposed Red Mountain Underground Gold Project (the Project), an underground gold and silver mine located in northwest British Columbia (BC), approximately 15 kilometres (km) northeast of Stewart. The Project will have a production capacity of 1,000 tonnes per day and up to 365,000 tonnes per year.

The Environmental Management System (EMS), together with IDM's environmental policy, provides the framework within which the specific Environmental Management Plans (EMPs) are developed and implemented. The EMS forms the basis of how IDM intends to implement a range of environmental management and monitoring measures throughout the life of the Project. These measures demonstrate how IDM will avoid or minimize to an acceptable level the potential negative environmental and socio-economic effects during all phases of the Project identified in this Application for an Environmental Assessment Certificate / Environmental Impact Statement (the Application/EIS). The EMS and associated EMPs will be updated on an annual basis as necessary, with details added to each EMP prior to the Construction Phase. The EMS is the system through which IDM will ensure that the conditions set at the time of authorization and all legal requirements are met. They will also ensure that future Standard Operating Procedures (SOPs) reflect legal requirements pertaining to the Project.

The EMPs in this chapter outline:

- The relevant scope and objectives;
- Applicable legislation, best management practices (BMPs), and industry standards;
- Anticipated relevant Project components activities;
- Key protection and mitigation measures; and
- The monitoring, reporting, and responsibilities relevant to the implementation of the EMPs.

Each EMP is focused on a specific activity or issue, and these are provided as sections within this chapter. These plans will be used to provide the overarching direction for environmental, safety, and socio-economic management for the Project and form the basis for the ongoing development of further detailed environmental documentation throughout permitting and the life of the Project. These have been developed throughout the environmental assessment (EA) process and, where applicable, are in accordance with

regulatory requirements; in addition, they are designed to meet the expectations of regulators, agencies, Aboriginal Groups, and the community at large.

The EMS offers flexibility for each EMP to respond to changes in the regulatory regime, the mine execution plan, the biophysical and socio-economic environments, technology, research results, and the understanding of traditional knowledge or any other situations that may arise. Threshold values and indicators will be established prior to the Construction Phase, incorporated into each EMP, and will be used to trigger management actions. A system of accountability will also be established and implemented.

Future refinements to EMPs will include detailed construction-level environmental documentation for plans, processes, and procedures that will be prepared either directly by IDM or by specialist consultants and contractors in collaboration with IDM staff.

29.1.2 Scope

The scope of the EMS applies to all Project operations and consists of the following key issues as they relate to health, safety, and environmental management:

- Mining, including all aspects of the evaluation of the ore reserve, the design of mining approaches and considerations in the management of mine mill, crushing and processing of the ore, and maintenance and deposition of tailings;
- Finance, procurement, information technology, and administration;
- Site safety and security;
- Human resources, including employee recruitment and training, medical services, catering, and personnel;
- Environmental monitoring, waste management, and reclamation;
- Worker health, workplace exposures, and occupational health; and
- Community health, including community exposures and other socio-economic determinants of health and well-being.

29.1.3 Objectives and Targets

Project environmental and occupational health and safety objectives have been identified in the individual EMPs contained in this chapters. Key objectives will be to:

- Protect the health of all employees, contractors, and workers;
- Prevent incidents or workplace accidents and injuries;
- Maintain productivity by directly or indirectly enhancing social conditions to positively affect the well-being of workers;

- Provide a safe and healthy workplace for all workers and visitors;
- Ensure all workers understand that no task is so important that time cannot be taken to complete work safely;
- Identify and make provisions to address the needs of all individuals with respect to health and safety and in a manner that their ability to do work is not compromised;
- Recognize that social responsibility and environmental management are among the highest corporate priorities;
- Establish and maintain relationships with internal and external stakeholders;
- Maintain information on current legislative requirements and environmental and social aspects associated with the organization's activities;
- Assign clear accountability and responsibility for environmental protection and social responsibility to management and all workers;
- Facilitate environmental planning through the Project's life cycle;
- Provide a process for achieving targeted performance levels;
- Provide appropriate and sufficient resources, including training, to achieve targeted performance levels on an ongoing basis;
- Evaluate environmental performance and social responsibility against IDM's policies, objectives, and targets and seek improvement; and
- Establish a management process to audit and review the EMS and to identify opportunities for improvement of the system and resulting environmental performance.

Objectives will be reviewed regularly through the Operation Phase to ensure that there is continuous improvement in environmental performance.

29.1.4 Adaptive Management

IDM is committed to operating the Project in a safe and environmentally-responsible manner. Change is continual; therefore, an adaptive management approach is essential. The strategies and measures outlined in this chapter have been developed and anchored on an effective adaptive management philosophy (see Section 29.2).

As part of a continual improvement process, the management plans herein will be revised periodically to accommodate new and amended legislation, evolving industry standards, emerging community concerns, changes to the Project's design or schedule, or necessary changes to mitigations and management based on monitoring results. By taking an adaptive management approach, rigorous plans can be developed early, based on the best available information, and prior to detailed Project engineering and construction. After the completion of detailed engineering design, these plans can be adjusted, as needed, and

monitoring implemented to measure whether the actions in the management plans are working as intended.

29.1.5 Monitoring

Volume 5, Chapter 30 (Monitoring and Follow-up Programs) outlines the follow-up and adaptive management programs that will be conducted through all phases of the mine life. These provide an overview of the monitoring plans for the biophysical and human environment required of operating mines. It is expected that these plans will be modified and refined through discussions with regulatory authorities during the mine permitting phase.

Monitoring programs are designed to provide early warning of changes in environmental media that might be of future concern. With these early warnings, additional mitigation measures can be implemented and the appropriate EMP modified. This process is a continuous one and will occur throughout all phases of the Project.

29.1.6 Applicable Management Plans

The EMS applies to the following EMPs for the Project, including the:

- Adaptive Management Plan (ADMP; Section 29.2);
- Access Management Plan (AMP; Section 29.3);
- Air Quality and Dust Management Plan (AQDMP; Section 29.4);
- Aquatic Effects Management and Response Plan (AEMRP; Section 29.5);
- Community Involvement Plan (Section 29.6);
- Cultural and Heritage Resources Protection Plan (Section 29.7);
- Emergency Response Plan (ERP; Section 29.8);
- Erosion and Sediment Control Plan (ESCP; Section 29.9);
- Explosives Management Plan (Section 29.10);
- Fuel Management Plan (FMP; Section 29.11);
- Hazardous Materials Management Plan (HMMP; Section 29.12);
- Health and Social Services Plan (HSSP; Section 29.13);
- Local Procurement Plan (LPP; Section 29.14);
- Material Handling and Metal Leaching/Acid Rock Drainage (ML/ARD) Plan (MHMP; Section 29.15);

- Noise Abatement Plan (NAP; Section 29.16);
- Occupational Health and Safety Plan (OHSP; Section 29.17);
- Site Water Management Plan (SWMP; Section 29.18);
- Skills, Training, and Employment Plan (STEP; Section 29.19);
- Social and Economic Management Plan (SEMP; Section 29.20);
- Spill Contingency Plan (SCP; Section 29.21);
- Tailings Management Plan (TMP; Section 29.22);
- Terrain and Soil Management Plan (TSMP; Section 29.23);
- Vegetation and Ecosystems Management Plan (VEMP; Section 29.24);
- Waste Management Plan (WMP; Section 29.25); and
- Wildlife Management Plan (Section 29.26).

Six EMPs were listed in the Application Information Requirements (AIR) issued for the Project by the BC Environmental Assessment Office (EAO) that are no longer standalone EMPs, having been incorporated into other EMPs as follows:

- The Ore Storage Management Plan and Waste Rock Management Plan are included in the MHMP, which also addresses borrow it and quarry management;
- The Surface and Groundwater Management Plan and the Groundwater Monitoring Plan are included in the Site Water Management Plan;
- The Human Resources Plan is addressed in the Local Procurement Plan;
- The Environmental Management Plan has been replaced with the Environmental Management System that provides the framework for all the Environmental Management Plans; and
- The Traffic Control Plan is addressed in the Access Management Plan.

29.1.7 Surveillance Network Program

IDMs has incorporated the components of a Surveillance Network Program (SNP) within the following management plans: Site Water Management Plan, Aquatic Effects Management and Response, Erosion and Sediment Control Plan, and Materials Management and ML/ARD Management Plan. The Site Water Management Plan includes the portion of the surveillance network located within the Mine Site (i.e., prior to release to the environment) and within the groundwater immediately adjacent to or within the Mine Site (Section 29.18.6). This includes monitoring around the TMF, quarries, within the underground mine,

discharge from the underground mine, waste rock storage areas, artesian drill holes, and groundwater monitoring wells. The Aquatic Effects Management and Response Plan (AEMRP) includes monitoring within the receiving environment for surface water quality, hydrology, sediment quality, and biology, including fish species (Section 29.5.5). The Erosion and Sediment Control Plan includes surveillance monitoring up- and downstream of waterbodies that could potentially receive suspended sediment from earthworks. The Materials Handling and ML/ARD Management Plan includes geochemical monitoring (Section 29.15.5) that supports the surveillance monitoring presented within the Site Water Management Plan and Aquatic Effects Management Plan.

29.1.8 Continuous Improvement Framework

The company has developed an EMS that provides IDM with a tool for managing the effects of its activities on the environment, as well as providing a structured approach to planning and implementing environmental protection measures.

The EMS is based on a continuous improvement framework, defined as a Plan-Do-Check-Act (PDCA) model in alignment with the internationally-recognized International Standards Organization (ISO) 14000 series of standards for environmental management:

- Plan: Objectives and targets are set, plans for implementation are developed to address risks, and performance requirements are established;
- Do: Utilize controls to operate in a systematic manner to manage risk;
- Check: Provides for auditing and review to ensure the ongoing applicability of the EMS is performing to expectations; and
- Act: Ensure that opportunities identified during the assessment are incorporated in the EMS and relevant supporting documents.

Throughout all phases of the cycle, available traditional knowledge and engagement with local communities, including Nisga'a Nation, will be an integral part of decision making.

29.1.9 Precautionary Approach

The precautionary approach is the idea that that lack of certainty regarding a threat of environmental harm should not be used as a rationalization for not acting to avoid that threat. This approach also acknowledges that delaying action until there is compelling evidence of harm will often lead to actions that are too costly or impossible to avoid the threat. The use of the precautionary approach promotes action to avoid risks of serious or irreversible harm to the environment.

IDM integrates the precautionary approach throughout the design of the Project. This approach forms the basis for Project design criteria, the effects assessment volumes of the Application/EIS, the alternatives assessment, and the management practices.

IDM is fully committed to acting as a socially-responsible steward of the environment throughout the lifetime of the Project. To this end, the precautionary approach will be integrated into decision making on all aspects of implementation.

In gathering data to achieve scientific assessment, IDM has conducted extensive research to establish baseline data and, where data are not yet available, incorporated examples from other similar, established operations. IDM incorporated and will continue to incorporate information gathered from community members, stakeholders, and the public to achieve the precautionary approach goals.

29.1.10 Environmental Management System Framework

29.1.10.1 Core Elements

The EMS is structured around 10 core elements (Table 29.1-1) with associated sub-elements. The EMS elements are interrelated, and each one is essential for effective operation. IDM recognizes that environment, health, and safety are interrelated components of an effective EMS; each core element describes an essential part of the overall management of matters relating to all three components.

Ownership of the EMS resides with IDM's management team, who will make provisions for the resources necessary to assure the successful implementation and sustainability of the process.

Table 29.1-1: Core Elements of IDM's Environmental Management System

Core Element Number	Core Element Title
1	Environmental Policy and Leadership
2	Planning
3	Organization and Resources
4	Documents and Records
5	Risk Management
6	Regulatory Requirements
7	Implementation, Monitoring, and Measurement
8	Emergency and Crisis Management
9	Monitoring and Audit
10	Management Review

29.1.10.1.1 Core Element 1: Environmental Policy and Leadership

IDM is committed to environmentally-responsible and socially-acceptable exploration and mining practices. IDM is dedicated to creating and maintaining a safe environment for both the land it occupies and the people that drive its success. IDM also subscribes to the principles of sustainable development in mining. While mining cannot occur without an effect on the surrounding natural environment and communities, it is IDM's responsibility is to limit negative environmental and social effects and to enhance positive impacts.

IDM is committed to managing environment, health, and safety issues to meet regulatory and industry standards and has set out its commitment in the form of an environmental policy. The policy clearly states IDM's commitments to continuous environmental performance improvement.

IDM considers leadership, accountability, and transparency to be key components in the successful implementation of the EMS. The commitment of IDM's executive and management team will demonstrate to employees, contractors, government, and the community that the company regards excellence in environmental performance a priority.

Environmental Policy

IDM Mining Ltd. takes its responsibility to act as a steward of the environment seriously. To fulfill this responsibility, IDM strives to:

- Ensure that we design our activities and operate in compliance with all environmental regulations to minimize our effect on the environment;
- Promote responsibility and accountability of managers, employees, and contractors to protect the environment and make environmental performance an essential part of the management/contractor review process;
- Provide resources, personnel, and training to enable management, employees, and contractors to implement programs and policies to protect the environment;
- Communicate openly with employees, contractors, local stakeholders, and government on our environmental protection and sustainability programs and performance. We will also address any concerns pertaining to potential hazards and effects;
- Promote the development and implementation of systems and technologies to reduce environmental risks;
- Establish and maintain appropriate emergency response plans for all activities and facilities;
- Maintain a self-monitoring program at each facility to ensure compliance and to proactively address plans to correct potential deficiencies;

- Work cooperatively with government agencies, local communities, and contractors to develop and enhance systems and technologies to improve environmental and sustainability practices; and

- Encourage all employees, contractors, or stakeholders to report to management any known or suspected departures from this policy or its related procedures.

29.1.10.1.2 Core Element 2: Planning

Planning is an essential part of the EMS as it assists IDM in fulfilling its Environmental Policy. IDM will establish, implement, and maintain documented objectives and targets consistent with the requirements of each EMP. The objectives and targets will be set alongside business targets during the business planning process to give a clear indication of the importance placed by IDM on EMS performance. Programs will be developed to ensure that these objectives and targets are achieved.

The following subsections detail the key elements to planning and will be adapted as needed prior to construction.

Project Design Considerations

Considerations in Project design, operational safeguards, and contingency plans have been incorporated early on to mitigate potential effects and will continue to be incorporated where practicable. Highlights of the mitigation measures incorporated into Project design to date include:

- Minimize Project footprint, thus minimizing the loss of habitat and reduction of habitat effectiveness;

- Contain the Project mining activities within the Bitter Creek watershed;

- To the extent possible, avoid known archaeological sites and prioritize avoidance of important (unique and/or old) sites;

- Maintain a buffer setback for watercourses and other important environmentally sensitive areas;

- Select water sources such that water withdrawals will minimize the potential for drawdown and effects to fish habitat and the aquatic environment;

- Minimize cut-and-fill in areas with ML/ARD potential;

- Route portions of the Access Road to avoid wetlands;

- Optimize the design of the Access Road and Haul Road to minimize the distance travelled, which will reduce noise, dust, and emissions associated with construction and operations;

- Develop an underground mine, thereby minimizing surface clearing and dust emissions; and

- Upgrade the existing road alignment where practicable, thus reducing new surface disturbances.

Construction activities will utilize the existing Project infrastructure and footprint to the greatest extent practical to minimize land disturbance and improve the overall efficiency of construction activities. Where possible, permanent support infrastructure will be built at the onset of construction to be used during both the Construction and Operation Phases. In many instances, temporary infrastructure will be constructed or positioned at Project sites for the duration of the Construction Phase only. This temporary infrastructure will be removed at the completion of the construction.

Climate Change

IDM recognizes the importance of climate change and a discussion of climate change and its potential effects on the Project is presented in Volume 3, Chapter 7 (Air Quality Effects Assessment). The design incorporates measures to cope with potential effects of climate changes where practicable.

Ecosystem Integrity

Comprehensive baseline studies have been undertaken to characterize the various biophysical components of the Project (see appendices contained in Volume 8). A range of mitigation measures have been identified that will enable IDM to minimize effects on the receiving environment. These mitigation measures are presented in relevant effects assessment chapters in Volume 3 of the Application/EIS and are identified in each associated EMP.

In addition to these measures, IDM's EMS and associated EMPs define the sequence of policy, planning, implementation and operation, checking and corrective actions, and management review processes that must be established to ensure that the Project is executed in an environmentally-acceptable manner and in the framework of continuous improvement.

Updates to Environmental Management Plans

IDM will update the EMPs on an annual basis to target specific issues and ensure that responsibilities for individual actions are clearly assigned. Development of these plans is anchored in the continuous-improvement cycle (or the PDCA model) and will define objectives that are measurable and reasonably achievable. The development of EMPs will be formalized and will be scheduled to coincide with the budget planning cycle.

Daily Task Control

IDM will ensure that the planning required for daily task management benefits from risk identification (e.g., through job hazard analysis and environmental effects assessments),

feedback from employees, tailgate safety meetings, work reviews, and other permitting reviews.

29.1.10.1.3 Core Element 3: Organization and Resources

IDM will identify and provide the resources required to implement, maintain, and improve the EMS and environmental management plans. Similarly, key contractors will be required to demonstrate to IDM's satisfaction that they have appropriate resources and that they have an appropriate organizational structure to meet Project environmental commitments and conditions. Responsibilities and accountabilities for the provision of environmental management are assigned to all personnel throughout the organization by means of management plans, SOPs, and position descriptions.

Roles and Responsibilities

Roles and responsibilities will be documented and clearly described for all IDM worker positions. The descriptions for key roles are described in each management plan in this volume. These roles will be expanded in future iterations as Project development continues.

Training, Awareness, and Competence

All IDM workers will undertake environmental awareness training to provide an understanding of IDM's Environmental Policy, the environmental aspects and sensitivities of the proposed activities, and the EMS. All employees will be appropriately trained and qualified to carry out their duties under the scope of the EMS. The four key aspects of training are health and safety, general environmental, social and cultural awareness, and job-specific training. This will be undertaken through on-site/off-site worker inductions and targeted training programs for specific activities or positions. Environmental training programs will be developed and implemented prior to the commencement of the Project's Construction and Operation Phases. Contracts awarded for the Construction, Operation, or Closure and Reclamation Phases of the Project will detail specific requirements for contractors with respect to environmental training needs.

Communication

Effective internal and external communication processes, including responding to public concerns, are an integral part of effective environmental management. The environmental requirements of the EMS will be communicated through site communication meetings, Health, Safety, and Environment Committee meetings (both at the executive and employee levels), tailgate safety meetings, training, inductions, as well as through the distribution of plans, SOPs, and work instructions. More refined operating procedures will be implemented in future revisions of this document to address communication between internal-internal and internal-external sources on environmental matters.

Contractor Management

IDM pre-evaluates candidate contractors and service providers to assess their technical capabilities, their experience, and their commitment to health, safety, environmental protection and quality assurance and quality control (QA/QC). The preparation of specific

EMPs and appropriate environment and safety awareness training will be required for long-term or higher risk third-party contracts. No work will be permitted to commence on site until all appropriate documentation has been approved by IDM.

A process will be established to ensure that effective communication channels are established between IDM and its major contractors and service providers. This communication may include regular tailgate or other meetings and will be used to discuss any relevant issues, including critical interfaces, permits to work, risk assessments, process changes, and performance monitoring and evaluation.

29.1.10.1.4 Core Element 4: Documents and Records

IDM will maintain documented programs and procedures to address hazards and risks, regulatory requirements, and updates to standard operating procedures as they are operationalized. Detailed environmental documentation (e.g., plans, procedures, and processes) will be developed for the Project to assist in the successful implementation of the EMS.

Document Control

IDM has implemented a document control system that will be utilized for all Project documents, including raw data and environmental records, such as water quality monitoring results. The information will be maintained in a suitable medium, considering both printed and electronic forms, to provide direction to related documentation and to describe the core elements of the EMS and how these elements interact.

Control of Environmental Records

IDM will ensure that all environmental records will be legible, identifiable, and traceable to the activity, product, or service involved. Environmental records will be stored and maintained in such a way that they are readily retrievable.

29.1.10.1.5 Core Element 5: Risk Management

IDM has developed a risk management process to describe the methods and responsibilities to be used to ensure that risk management is planned and executed effectively. The risk management process ensures the ongoing and systematic assessment and management of risk. The risk assessment methodology applied in this Application/EIS is described in Volume 3, Chapter 23 (Accidents and Malfunctions).

Change in the work environment can pose risks, and the mining industry clearly recognizes the risks that can arise from temporary and permanent changes to organization, personnel, systems, processes, procedures, equipment, products, materials or substances, or laws and regulations. All proposed changes will, therefore, be managed by implementing the following steps:

- Identify the change;
- Assess the risk associated with the change;
- Establish responsibility to manage the change; and
- Develop a plan of action.

If IDM management approves an alteration, then the relevant EMPs will be revised or an addendum added to reflect the agreed-upon change.

29.1.10.1.6 Core Element 6: Regulatory Requirements

IDM will implement a compliance framework and database to manage and monitor its regulatory obligations and ensure that performance expectations are met. In its Environmental Policy, IDM has committed to meet all relevant laws, regulations, and standards for the protection of the environment.

IDM will ensure that it achieves full regulatory compliance by the following means:

- Implement awareness training for its workers;
- Actively use and maintain a regulatory compliance matrix; and
- Conduct regular audits of its systems and activities to monitor compliance.

A summary of the Project's applicable government approvals and legislative requirements will be provided in a future revision of this document.

29.1.10.1.7 Core Element 7: Implementation, Monitoring, and Measurement

The following details the key elements of the implementation, monitoring, and measurement component of the EMS.

Work Procedures

Procedures will be developed to minimize the exposure to actual or potential hazards associated with the work to be performed. The need for procedures will be identified by reviewing processes, activities, tasks and assessing their potential impact on personnel, assets, and the environment.

Regulatory Compliance Matrix

As future permits are received, IDM will review the terms and conditions. A Regulatory Compliance Matrix will then be populated and maintained to capture the permit conditions and compliance requirements from the permits received. The database will be reviewed as required to update status, incorporate new conditions, and edit or remove conditions that have changed or no longer apply.

The matrix can be used to display conditions that are specific to timing, type of condition, or responsible party. These can be applied by Project phase to further develop environmental performance checklists used in daily monitoring activities. The matrix headers are provided below and will be populated prior to the Construction Phase:

- Administering agency;
- Legislation;
- Permit Type and Number;
- Commitment;
- Status; and
- Responsibility.

Performance Monitoring

Proactive and reactive monitoring programs will be developed by IDM to monitor performance against EMS objectives and to promote continuous improvement. Monitoring programs will be developed for the Project to ensure that there is alignment and consistency in achieving performance goals. Performance statistics based on the checklists will be compiled and distributed internally for further analysis, as appropriate. Environmental indicators and monitoring programs associated with the aspects or activities of the Project will be refined as Project development continues.

Incident Notification, Reporting, and Investigation

IDM will develop and implement an incident management and investigation procedure. The intention of this procedure is to ensure that all incidents, including "near misses," no matter how minor, are recorded, investigated, and reported, where applicable. This will achieve the following objectives:

- At-risk behavior will be identified;
- Deficiencies in workplace conditions will be identified;
- Improvements to methods and equipment will be identified;
- Failures in management systems and controls will be identified;
- Regulatory authority and industry reporting obligations will be fulfilled; and
- Management systems will be continuously improved.

This procedure follows clear and documented guidelines to ensure that all incidents are uniformly, methodically, and effectively investigated to a degree consistent with their potential severity. The objective is to establish the facts, determine the root cause(s), and take the appropriate action to prevent a recurrence of the event. All incidents, investigations, and corrective and preventive actions will be input to an incident reporting database and tracked until closure.

Asset Integrity

IDM will emphasize the importance of ongoing asset integrity in contributing to a safe and environmentally-sound operation. Asset integrity is a key component in the prevention of major accident events. Systems will be established to ensure the ongoing integrity of Project components and equipment. These systems will include maintenance, inspection, testing, calibration, and certification of equipment at frequencies appropriate for the level of risk associated with the equipment and/or as determined by manufacturers' requirements.

29.1.10.1.8 Core Element 8: Emergency and Crisis Management

A rapid and effective response to emergency situations can significantly reduce any effect on worker safety, the environment, and nearby communities. A response is achieved by implementing prevention, preparation, response, and recovery strategies.

Potential for accidents and emergencies will be identified utilizing the hazard identification and risk assessment tools discussed in the OHSP (Section 29.17) and the ERP (Section 29.8). Operating procedures will be further developed to maintain control of such situations and

to reduce the risk of adverse environmental effects. Procedures that are directly related to response to environmental spills and incidents are presented in relevant EMPs (e.g., the SCP in Section 29.21) and the HMMP in Section 29.12).

Emergency management plans (the ERP and OHSP) will be updated prior to the Construction Phase with the identification of resources (e.g., personnel and equipment), key roles and responsibilities, and the procedures to be followed. Relevant personnel will receive sufficient training to ensure that they have the skills and competence to respond to an emergency.

Third-party emergency management plans will also be advanced by IDM's contractors.

29.1.10.1.9 Core Element 9: Monitoring and Audit

Review audits, both internal and external, will be conducted to ensure:

- Compliance with regulatory requirements, Project approval conditions, and license conditions; and
- Identified objectives of the Project are being achieved.

A formalized audit schedule will be developed in future iterations of the EMS that will define the scope and frequency of audits.

29.1.10.1.10 Core Element 10: Management Review

To maintain continuous improvement, formal reviews of the suitability and effectiveness of the management process and its associated implementation documents will be scheduled periodically.

Management reviews will be based on the following considerations:

- Audit and incident investigation outcomes;
- Changes in organization and/or operational practices;
- Changes in regulatory environmental requirements;
- Assessments of targets and performance standards have been met; and
- Analyses of the continuing adequacy of the EMS.

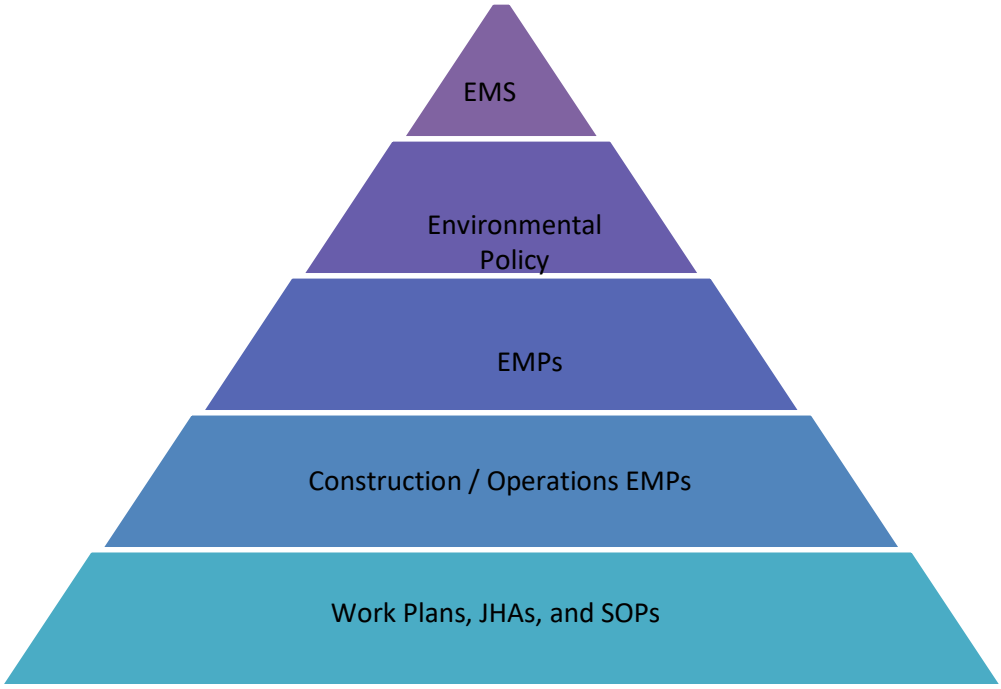
Implementation documents (e.g., management plans, SOPs, and monitoring programs) will be reviewed annually to assess their effectiveness and to ensure that they remain applicable to current operations. Management review outcomes, including observations, conclusions and recommendations, will be documented and tracked through to completion.

29.1.11 EMP Hierarchy, Objectives, and Implementation

29.1.11.1 Hierarchy of Environmental Management Documentation

The development and implementation of the EMPs are key tools for the environmental protection and management measures necessary to avoid, reduce, or mitigate the potential effects of the Project on the environment. Figure 29.1-1shows where the EMPs are placed in relation to other EMS documentation.

Figure 29.1-1: Hierarchy of Environmental Management Documentation



Certain EMPs are currently further advanced (e.g., Wildlife Management Plan) than others, with certain plans at a conceptual stage of development (e.g., AEMRP). Refinements to EMPs will be developed as permitting progresses prior to the Project's Construction and Operation Phases to manage the Project's potential environmental and socio-economic effects as identified in the Application/EIS.

In addition to the EMPs, work instructions and SOPs will be developed to support the EMPs and ensure that they are effectively implemented. A greater level of detail on the technical input and practical application of the management and control measures will become available as the Project moves towards the Construction Phase. These further details will be used in an ongoing program of improvement and refinement of EMP documentation to ensure that objectives are achieved.

These EMPs will serve as a guide and framework for the development of more detailed construction EMPs and, in due course, operational EMPs.

29.1.11.2 Objectives and Targets for Management Plans

For each of the EMPs, IDM has set out environmental objectives and targets with consideration of the following:

- IDM's Environmental Policy;
- Environmental aspects and impacts identified in this Application/EIS;
- Relevant BC and federal regulatory standards and industry standards;
- Legal and other requirements;
- Measurable objectives; and
- Opportunities for continuous improvement.

Environmental objectives, targets, and indicators are defined below.

- An 'environmental objective' is a specific environmental goal. Each EMP will include high-level objectives, which will be consistent with IDM's environmental policy and the commitments set out in the Application/EIS;

- To gauge the extent to which environmental objectives have been achieved, threshold targets or narrative statements will be outlined in the EMPs prior to the Construction Phase for specific indicators, which, if reached, will trigger specified management responses; and

- The setting of target thresholds in the EMPs will be based on performance indicators, which are significant physical, chemical, biological, social, or economic variables that can be measured in a defined way for management purposes.

An example of an environmental indicator could be the number (richness) and diversity of aquatic organisms resident in a waterbody. These can indicate whether an aquatic ecological system is functioning normally or not. To be effective, an indicator must be relevant, representative, and able to show concerned parties something about the system that they need to know. It must be easy to understand, even at a non-technical level. It must be reliable, so that the information the indicator provides is trustworthy. And it must be timely, so that the information is made available while there is still time to act.

29.1.11.3 Biophysical and Socio-Economic Plan Implementation

The Project EMPs identify which Project components and phases they apply to conceptually. Each Project activity or component will require a different combination of management plans. IDM will review and approve construction-level EMPs prior to the commencement of activities. IDM will subsequently review operational documents to ensure that they meet all commitments made in the Application/EIS and in the relevant environmental and regulatory approvals.

29.2 Adaptive Management Plan

29.2.1 Introduction

The Adaptive Management Plan (ADMP) describes the framework under which all other management plans will operate with respect to adaptive management. Adaptive management is a planned systematic approach for continuously improving environmental management practices by learning from management outcomes; it is an important tool in effective management and achieving continual improvement in environmental performance (Canadian Environmental Assessment Agency (the Agency) 2009, Environment Canada 2009). Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a Project.

29.2.2 Scope and Objectives

The scope of the ADMP is applicable to all management plans listed in this chapter and the Follow-up and Monitoring Plans listed in Volume 5, Chapter 30.

The objective of the ADMP is to define adaptive management and to provide the framework and approach that IDM has committed to continuously develop in order to achieve mitigation commitments and performance goals, resulting in reasonable mitigation measures aimed at avoiding or minimizing adverse effects on the environment, including biophysical components, socio-economic components, and human health.

This will be applied to all Project phases: Construction, Operation, Closure and Reclamation, and Post-Closure.

29.2.3 Applicable Legislation and Guidelines

Adaptive management is a principle incorporated into applicable valued component- (VC-) and management plan-specific legislation and guidance documents. At the broader scope, the ADMP development and implementation will be guided by policy, BMPs, and guidance documents including but not limited to:

- BC Mitigation Policy and Procedures for Mitigating Impacts on Environmental Values (BC MOE 2014a and 2014b);
- Operational Policy Statement, Adaptive Management Measures under the *Canadian Environmental Assessment Act* (Agency 2009), which was developed prior to the 2012 update to this act but applicable as a BMP;
- Environmental Code of Practice for Metal Mines (Environment Canada 2009); and
- Adaptive Management of Forests in British Columbia (MOF 1997).

As a component of the ADMP, any changes to regulations, guidance documents, or BMPs will be implemented and any necessary changes to management plans and procedures will

be updated accordingly. In addition, adaptive management will consider a wide range of factors, including:

- The results of:
  - Environmental audits or other evaluation activities;
  - Environmental monitoring; and
  - Monitoring of the performance or condition of environmental infrastructure;
- Technological developments; and
- Changing environmental conditions.

29.2.4 Performance Indicators

Proactive and reactive key performance indicators (KPIs) will be developed by IDM prior to the Construction Phase and implemented throughout the Project life through the Follow-up and Monitoring Programs and the implementation of the management plans. These KPIs will monitor performance against the EMS objectives and promote continuous improvement. They will be well-defined and measurable parameters to which any potential effects can be identified for each relevant VC. These will be adjusted if and as necessary as part of the adaptive management approach, e.g., if legislation or guidelines change, measurable parameter or thresholds will be adjusted.

The KPIs will be tracked and monitored by using environmental checklists. These will be developed for the Project as a whole to ensure that there is alignment and consistency in achieving performance goals. Performance statistics based on the checklists will be compiled and distributed for further analysis to internal and external stakeholders, as appropriate. Environmental indicators and monitoring programs associated with the aspects or activities of the Project will be refined as Project development continues.

Certain components of the ADMP may need to be modified based on site experience or changes in legislation or best practices. All aspects of each management plan will be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading.

29.2.5 Project Activities

All activities will be subject to the ADMP; however, the primary implementation will be through the follow-up and monitoring activities. Any effects that are not successfully mitigated through the mitigation measures and management plans will trigger action to implement adaptive management through consultation with the Mine Manager, Qualified Environmental Professional (QEP), regulatory agencies, Aboriginal consultation, and/or other relevant professional consultations as appropriate.

29.2.6 Adaptive Management Approach and Implementation

The strategies and measures outlined in the overall EMS, the inclusive management plans, and the follow-up and monitoring plans are developed and anchored on an effective adaptive management framework. As part of a continual improvement process, the

Project's management plans will be revised periodically to accommodate new and amended legislation, evolving industry standards, emerging community concerns, or changes to the Project's design or schedule. By taking an adaptive management approach, rigorous plans can be developed early, based on the best available information, and prior to detailed Project engineering and construction. After the detailed engineering design phase, these plans can be adjusted, if needed, and monitoring implemented to measure whether the actions in the management plans are working as intended.

Monitoring programs are designed to provide early warning of changes in environmental media that might be of future concern. With these early warnings, additional mitigation measures can be implemented and the appropriate EMP modified. This process is a continuous one and will occur through all Project phases with changes to environmental management made, as and when required. Adaptive management should accompany an effectiveness monitoring program and adjusting management actions based on the lessons learned from effectiveness monitoring increases the likelihood of achieving mitigation commitments (BC MOE 2014b).

The mitigations incorporated in the Project are based on BMPs and are expected to prevent or minimize adverse effects on human health and the receiving environment. Ongoing monitoring will inform IDM regarding the effectiveness of these mitigation measures. If any unforeseen adverse effects are identified, measures will be taken as soon as practicable to correct them and prevent them from occurring in the future. Adaptive management (Figure 29.2-1) is an iterative approach based on a learning process gained from monitoring, which improves long-term management outcomes.

As part of the adaptive management framework, the monitoring provisions may include the following:

- Measuring the condition of the system using selected environmental indicators (e.g., numbers, size and health of fish populations, water quality in external receiving bodies);

- Identification of goals and setting performance criteria and standards, such as target numbers of fish in offset habitat, water quality at or below predetermined thresholds/triggers; and

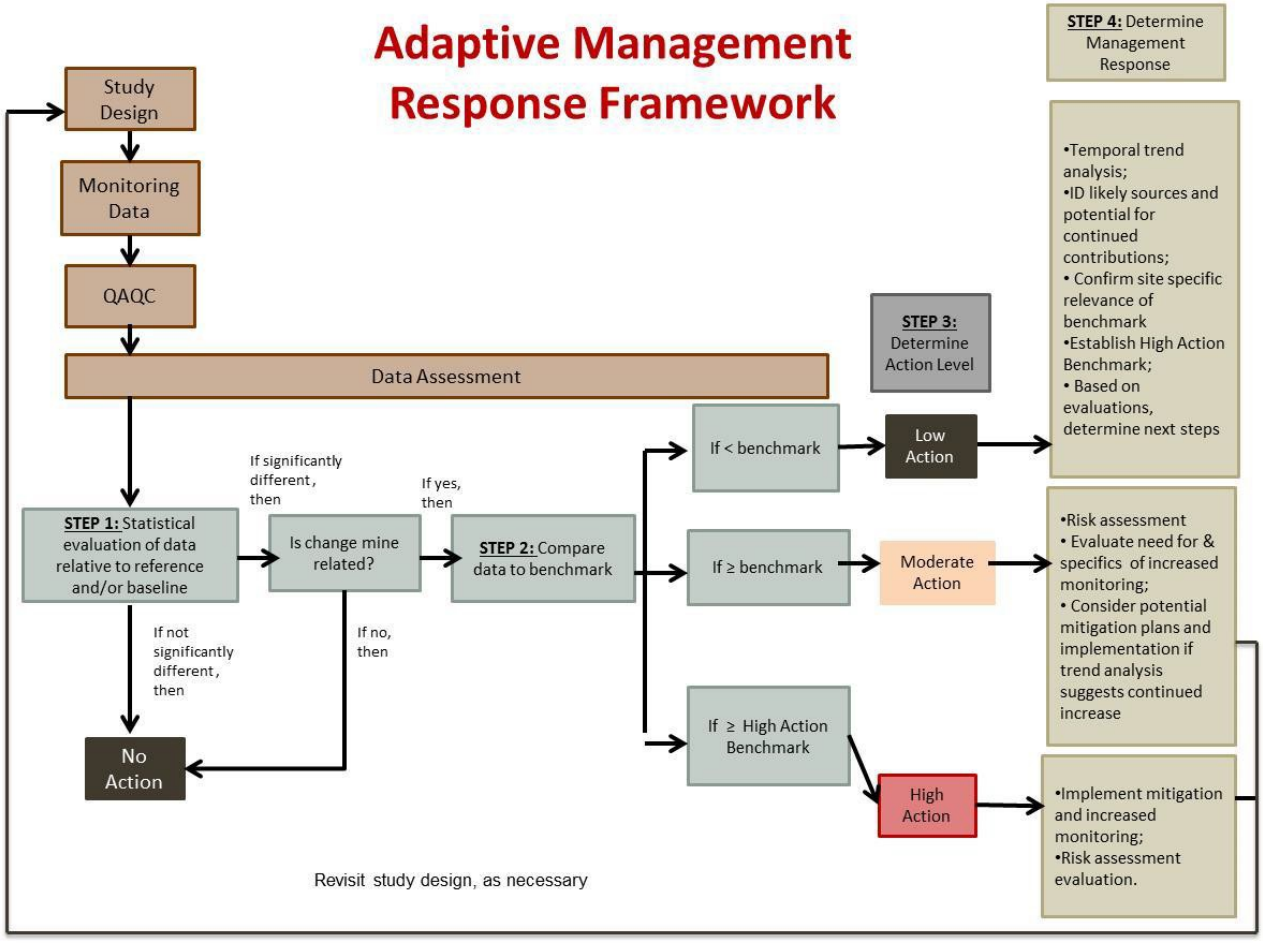
- Measures for evaluating root causes and the extent of deficiencies to make a decision on what actions to take (e.g., do nothing/status quo, implement corrective actions, or change the goal).

For the VC being monitored, should the indicator or monitored parameter approach a predefined threshold, this would trigger an adaptive management response, which may include:

- Increased monitoring frequency;
- Studies to identify root causes; and
- Specific action(s) or mitigation measure(s) to address the concern/s.

Figure 29.2-1 provides an example of an adaptive management framework that could be applied to a number of situations or activities, along with triggers for various actions, and resulting management responses.

Figure 29.2-1: Adaptive Management Response Framework



The concept of alert and/or action levels could be applied to a wide range of environmental concerns, including the example for freshwater fish and fish habitat:

- Predicted water quality in external receiving waterbodies and tributaries;
- Survival, growth, and health of fish at monitoring stations; and
- Trophic status and capability of target waterbodies to support and sustain populations.

There are also "feedback loops" built into the adaptive management approach, so that changes to the study design can be made if there is a need to modify monitoring based on what the results indicate. This approach is systematic and includes prescribed actions, which will assist in minimizing effects to the environment.

As part of an adaptive management process, the EMS fully supports changes and updates by providing regular review of the adequacy of the environmental policy, environmental management programs, and operational controls in light of concerns or other outcomes. EMS elements can then be updated as needed, based on results. Associated training programs can then be enhanced to improve the level of environmental protection. In this way, continual improvement of the Project EMS and mitigation programs will be assured.

29.2.7 Reporting Requirements

Reporting of follow-up and monitoring programs will be implemented as per the EMS. IDM commits, as an ADMP requirement, that all management plans will be annually reviewed and updated as necessary, based on monitoring results. For the EMS reporting, all required and implemented adaptive management mitigations will be documented in the Project database management system and included in reports to regulators. Reporting will also be implemented through the individual management plan to which the adaptive management measures applies (e.g., if a mitigation measure changes for water quality and is implemented, that adaptive mitigation will be reported in the adaptive management reporting, as well as the AEMRP reporting).

Details of the management and monitoring plans will be refined through discussions with regulatory authorities, Aboriginal Groups, communities, and other stakeholders as review of the Project proceeds.

An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.2.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the ADMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan. The Environmental Superintendent will seek review and recommendation of the ADMP and associated adapted mitigations from the relevant QEPs.

29.3 Access Management Plan

29.3.1 Introduction

The AMP covers the management of mine traffic, Mine Site, mine road maintenance, road safety, and environment along the transportation route and on the Access Road.

29.3.2 Scope and Objectives

The AMP will provide administrative and policy plans and commitments along the transportation route and describe policy and procedures that road users will follow. These policies, plans, and procedures will apply to all phases of the Project. Specific to the Access Road, the AMP will describe policies, procedures, and guidelines on how to manage construction and maintenance activities. The objectives of the AMP are to ensure that the Access Road is designed, maintained, and used in a manner that is safe for road users; that the potential for adverse effects on the environment are reasonably mitigated; and to ensure that existing provincial roads, which form part of the transportation route, are used in a safe manner.

Other Project management plans within the EMS that link with the AMP include:

- ERP;
- FMP;
- ESCP;
- HMMP;
- MHMP;
- TMP;
- SWMP;
- SCP; and
- Explosives Management Plan.

An integrated approach will be adopted in the application of the various components of environmental management and reporting for the Project.

29.3.3 Applicable Legislation and Guidelines

Further development and implementation of the AMP will be guided by provincial and federal acts, regulations, and BMPs. There are several legislative statute requirements, industry standards, and codes of practice applicable to access road construction, operation, and deactivation, including:

- *Mines Act* (1996a);
- *Mineral Tenure Act* (1996b);
- *Forest Act* (1996c);
- *Transportation Act* (2004);
- *Motor Vehicle Act* (1996d);
- *Forest and Range Practices Act* (FRPA; 2002a);
- *Fisheries Act* (1985a) and Fish-stream Crossing Guidebook (BC MFLNRO, BC MOE, and DFO 2012);

- *Wildlife Act* (1996e); and
- *Species at Risk Act* (2002b).

29.3.4 Performance Objectives

Prior to the start of construction, the AMP will describe the following performance objectives and how they will be achieved:

- Follow laws and regulations related to traffic and highway/road use;
- Implement reasonable mitigations to avoid and minimize risk to the environment; and
- Implement reasonable mitigations to avoid and minimize risk to the safety of Project personnel and the public.

29.3.5 Mine Access

Equipment, materials, supplies, and personnel will be transported to the Project using Highway 37 and 37A. The majority of personnel will be housed in Stewart and transported to the Project using buses.

The Access Road is the sole land-based entry and exit corridor to the Project. It consists of an existing road that will be extended by a new road to the Mine Site and used during all phases of the Project:

- 13 kilometers of existing access road interconnecting with Highway 37A and following the Bitter Creek valley; and
- 7 km of new and/or upgraded seasonal access roads between Hartley Gulch and Otter Creek, connecting the existing access in the Bitter Creek Valley to the Mine Site and portals.

Project-related traffic will be at its peak during construction and operation of the Project and significantly less during the Closure and Reclamation Phase and Post-Closure Phases. Vehicle types include legal freight load, oversize freight load, fuel trucks, passenger buses and passenger cars. Only authorized vehicles will be able to proceed through the gated entrance to the Access Road at the intersection with Highway 37A. An estimated total annual count of one-way trips during the Construction Phase is 2,218 and the Operation Phase is 2,918. Vehicle traffic will greatly reduce during the Closure and Reclamation Phase and Post-Closure Phase.

29.3.6 Traffic Management Plan

Prior to the start of construction, a Traffic Management Plan will be developed as part of the AMP that describes the administration, policies, and commitments along the transportation route. The Traffic Management Plan is intended to be used primarily by management and

access road maintenance contractors and outlines procedures on how to perform traffic management during construction and operation phases of the Project. This Plan will include:

- Information on existing bridge load ratings and limiting dimensions;
- Speed limit monitoring and enforcement;
- Road safety information, monitoring, and compliance; and
- Spill response planning/implementation.

29.3.7 Vehicle Operation and Safety Procedures

Prior to the start of construction, Vehicle Operation and Safety Procedures will be developed to ensure the safe movement of all mine-related traffic along the transportation route and is primarily for road users. The Procedures plan will include:

- A description of activities within the corridor;
- Identification of key personnel and contact information, such as traffic control personnel and security;
- Road use information and road use contract (if applicable);
- Detailed procedures outlining proper etiquette and procedures on how to drive each road segment in a safe manner;
- Spill reporting and procedures; and
- Road map, radio frequency information, and signage map.

29.3.8 Access Road Design and Maintenance

The design and construction of the Access and Haul Roads will follow the Forest Act and the Health, Safety, and Reclamation Code for Mines in BC (the Code; Mines Act; 1996a). Designs will include appropriately spaced pullouts and adequate width. Road design will incorporate water management features, such as ditches, cross-ditches/waterbars, and French drains/panel drains where applicable. The Access Road cross slope will range between 2 and 5% to allow drainage of surface runoff. Particular attention will be given to appropriate design of the crossing of Bitter Creek to accommodate peak flows.

Construction will involve grubbing and stripping to ensure stability of the road prism and roadside vegetation clearing to prevent blocking sightlines. Site distance and the ability to spot hazards along a road will influence the recommended speed limit. Construction methods for the Access Road will mitigate stream channel changes along the alignment.

29.3.8.1 User Safety

The AMP will describe how the Access Road will be designed, constructed, operated, and maintained in a manner that reasonably mitigates the potential safety concerns. Roadside vegetation not only blocks visibility but it also allows wildlife to approach the road verges,

thereby giving operators little or no time to react when animals step onto the road. To minimize the risk of collisions, roadside vegetation will be cleared initially during construction and then periodically as part of the maintenance program. Speed limit signage will be posted that is appropriate for the geometry (i.e. curves, grade) of the various sections of the Access Road.

29.3.8.2 Environmental Protection Measures

The AMP will describe how the Access Road will be designed, constructed, operated, and maintained in a manner that reasonably mitigates the potential for adverse environmental effects. Several other Project management plans will include environmental protection measures that are relevant to the Access Road including the SCP, ERP, ESCP, Wildlife Management Plan, HMMP, and FMP. The relevant information from these plans will be incorporated into the AMP. Topics that will be discussed include surface and groundwater quality, aquatic habitat, wildlife, and air quality. Some general guidelines are provided herein.

29.3.8.2.1 Blasting Near Fish-Bearing Waters

Some blasting is expected to occur near fish-bearing waters. Noise, vibrations, and possible blasting residue could enter the watercourse and have adverse effects on fish and the aquatic environment if special care is not taken. To reduce any potential effect to fish and/or fish habitat, all blasting operations near fish-bearing water will follow the requirements established in the DFO Guidelines for Use of Explosives In or Near Canadian Fisheries Waters (Wright & Hopky 1998):

- No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change greater than 100 kilopascals in the swim bladder of a fish;
- No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 millimetres (mm) per second in a spawning bed during the period of egg incubation; and
- Blast mats must be used to prevent fly-rock from entering the watercourse.

29.3.8.2.2 Placement of Riprap

The following BMPs are recommended to minimize the effects to fish habitat in any crossing locations or areas of fill that require riprap placement:

- Clearly mark vegetation clearing limits prior to the commencement of clearing activities while limiting clearing to the footprint of the crossing or toe of slope;
- Pull back cleared vegetation away from the water rather than pushing towards the water;

- Time works to ideally occur during periods of low water to minimize in-water works whenever possible. Procedures may be modified if work is completed outside of the low water period;
- Re-contour banks prior to placing riprap making sure to pull all material away from the water;
- Ensure that riprap placed below the high-water mark is clean and free of fines that could generate sediment loading; and
- Ensure riprap is a mixture of size classes, rather than a uniform size class; this creates interstitial spaces that can provide habitat to small-bodied and juvenile fish.

29.3.8.2.3 Fording Equipment

When fording equipment is required to safely construct crossings or perform other required work, the following BMPs will be followed to reduce the risk to the aquatic environment (BC MFLNRO 2012a).

- Material is to be pulled back from the water to construct ramps to facilitate equipment crossings;
- Stream banks are to be protected with matting in the event that rutting or damage could occur to the stream bank (e.g., swamp mats, rubber tire mats, logs, etc.);
- Remove matting immediately after crossing;
- Do not allow matting or other protective materials to excessively constrict flow, or block fish passage;
- Ensure equipment is clean and free of hydrocarbon residue prior to crossing;
- Conduct crossings at slow speed, with a steady pace to prevent bogging;
- Do not stop while crossing the channel; and
- Do not allow equipment to work from within the wetted channel.

29.3.8.3 Operations, Monitoring, and Maintenance Program

The Access Road is a key component of the Project infrastructure and will be subject to a comprehensive and ongoing maintenance program to ensure the integrity of the road and protection of the environment.

The program will include regular inspection of the road surface, culverts, bridges, and danger trees/snags. As needed, maintenance will include grading, snow ploughing, application of granular material for traction control in the winter, dust control in the summer, ditch and culvert cleaning, and roadside vegetation management. The road will have appropriate signage to establish speed limits and warn of road-use hazards. Wildlife

observed on the road will be given the right of way by drivers and breaks in snow banks will provide escape routes.

Emergency and hazardous spill response plans will be developed for the Access Road and will be appropriate for the Construction, Operation, and Closure and Reclamation Phases.

High levels of snowfall are common in winter. A snow management strategy will be essential for maintaining open access and allowing planned earthwork to progress on either side of the shut-down period.

Access and use by members of the public will be reviewed and authorized by IDM in consultation with Aboriginal Groups and stakeholders. Use of the Access Road will require attendance of an orientation meeting that includes acceptable uses of the Access Road, laws, and regulations, IDM commitments, and requirements of the BC Environmental Assessment Certificate and other permit stipulations. A gate will be installed at the intersection with Highway 37A and personnel will control vehicle access to the Project to those that are authorized. Authorized frequent users may be provided with a key; infrequent authorized users may be provided with a temporary key.

Adjustments to the program may be required in response to changes in mine construction, operations, and closure activities. Best practice includes anticipation of the likely risks and being prepared for unusual circumstances.

29.3.9 Reporting Requirements

Reporting will be conducted as per future permits, approvals, and authorizations relevant to use and maintenance of the Access Road and will be delivered to the Mine Manager and/or delegates. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.3.10 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the AMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.3.11 Review of Plan Effectiveness

Certain components of the AMP may need to be modified based on site experience or changes in legislation or best practices. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Formal evaluations of this plan will be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.4 Air Quality and Dust Management Plan

29.4.1 Introduction

The Air Quality and Dust Management Plan (AQDMP) is one of many plans that form part of IDM's EMS developed for the Project and addresses mitigation and management measures for air quality- and fugitive dust-related adverse effects from the Project's mining activities. It defines mitigation measures to control air quality effects from the mine. A change in air quality has the potential to adversely affect people and recreational activities in the local area. Although no residual adverse effects were identified in the Air Quality Effects Assessment (Volume 3, Chapter 7), the AQDMP sets forth industry BMPs to control air and fugitive dust emissions and reduce the overall adverse Project effects. This is a conceptual plan and, prior to construction, IDM will revise the AQDMP as necessary to include additional details relating to air quality contingency measures, inspections, reporting, documenting, and details of continual improvement initiatives.

29.4.2 Scope and Objectives

This AQDMP focuses on limiting the adverse effects of the Project emissions sources. The main objectives of the AQDMP are to provide the:

- Legislation and standards relevant to Project air emissions;
- Planned Project mitigation measures to reasonably minimize effects from Project air emissions; and
- Outline of monitoring and reporting planned throughout the Project life.

29.4.3 Applicable Legislation and Guidelines

The management of air quality in Canada is accomplished primarily through federal and provincial government collaboration. At the federal level, the Canadian Council of Ministers of the Environment (CCME) acts as a forum for provincial governments to jointly undertake initiatives to address major environmental issues. Regarding air quality, the CCME approved a new Air Quality Management System (AQMS) in 2012. The AQMS is a comprehensive approach for improving air quality in Canada and is the product of collaboration by the federal, provincial, and territorial governments and stakeholders. As part of the AQMS, the CCME has issued / is developing new Canadian Ambient Air Quality Standards (CAAQS) for ambient air quality management across the country. They have also established a new framework for air zone management within provinces that enables action tailored to specific sources of air emissions of concern in a given area.

As a result of these new Canadian initiatives, BC has adopted or updated several air quality objectives for a number of contaminants under the *Environmental Management Act* (2003a). The BC MOE uses air quality objectives as limits on the acceptable level of contaminants in the atmosphere to protect human health and the environment. Provincially, air quality objectives are used to:

- Gauge current and historical air quality;
- Guide decisions on environmental effect assessments and authorizations;
- Guide air shed planning efforts;
- Inform regulatory development; and
- Develop and apply episode management strategies such as air quality advisories.

Substances for which there are regulatory objectives developed are referred to as criteria air contaminants (CACs). Table 29.4-1 provides a summary of the relevant provincial and federal ambient air quality objectives (AAQO), including the National Ambient Air Quality Objectives (NAAQO) and the CCME CAAQS (BC MOE 2016a). Any one of these criteria is referred to as the applicable objective within the appropriate context.

Table 29.4-1: Relevant Provincial and Federal Ambient Air Quality Objectives

Contaminant	Averaging Period	Ambient Air Quality Objective ($\mu g/m^3$)	Source[1]
Nitrogen Dioxide (NO_2)	1-hour	188	Interim Provincial AQO
	Annual	60	
Sulphur Dioxide (SO_2)	1-hour	196	Interim Provincial AQO
	1-hour	183	CAAQS
	Annual	13	CAAQS
Particulate Matter < 2.5 microns ($PM_{2.5}$)	24-hour	25	BC AQO
	24-hour	28	CAAQS
	Annual	8	BC AQO
	Annual	10	CAAQS
Particulate Matter < 10 microns ($PM_{2.5}$)	24-hour	50	BC AQO
Total Suspended Particulate (TSP)	24-hour	120	NAAQO
	Annual	60	NAAQO

[1] Source Abbreviations (BC MOE 2016a): AQO: Air Quality Objective; NAAQO: National Ambient Air Quality Objectives; BC AQO: BC Air Quality Objective; CAAQS: Canadian Ambient Air Quality Standards

Air quality objectives are meant to be protective of human health, including sensitive individuals, such as the elderly, infants, or those with health conditions. Therefore, when evaluating air dispersion monitoring, it is typical to apply those standards for an area of the Project accessible to the general public, which is the area exterior to the Project "fenceline." Air quality effects within the fenceline are assumed to be regulated by occupational health and safety codes applicable to the Project. The air quality objectives applied for the area exterior to the fenceline are used as a tool to indicate the potential for air quality effects.

Provincial air quality objectives for dustfall are not included in the most recent release from the BC MOE (2016a). The previous provincial objectives that have been used as an indicator in other regional environmental assessments were adopted from the Pollution Control Objectives for the Mining, Smelting and Related Industries of British Columbia (BC MOE 1979) that defined dustfall rate limits for mining, smelting, and related industries. A lower range objective for discharges as applied to sensitive environmental situations was set at 1.7 milligrams per square decimeter per day ($mg/dm^2/day$) and an upper range that limited unacceptable deleterious changes at 2.9 $mg/dm^2/day$ (BC MOE 1979). Since new provincial objectives have not been set for dustfall, these historical limits will be used as indicators for air quality management.

In the context of the AQDMP, monitored exceedances of air quality objectives outside the active mining areas, Project road alignments, and the Process Plant area will trigger further mitigation and adaptive management measures.

29.4.4 Relevant Project Activities

The following are the potential relevant Project activities linked to implementing the AQDMP:

- Use of mobile equipment;
- Mining and use of process equipment, including use of stationary equipment, rock loading, and smelting, and use of fuel and chemical storage tanks; and
- Road use and other activities that may generate fugitive dust.

29.4.5 Protection Measures

29.4.5.1 Approach

Air quality mitigation is targeted at reducing the direct release of emissions from point or equipment sources and the control of fugitive dust from mining and related activities. The majority of mitigation measures are relevant for all phases of the Project and for all pollutants.

Approaches to manage and mitigate air quality will rely primarily on:

- Design Mitigation;

- Best Available Technology (BAT); and
- BMPs.

Recommendations for mitigation are provided broadly based on the type of emission source, which is considered as potential source of air emissions or fugitive dust from the Project.

29.4.5.2 Mobile Equipment

The following BMPs concerning the use of mobile equipment onsite will be implemented where practicable for construction and operations:

- Select and use equipment with low emissions that meet the latest applicable Canadian emissions standards and guidelines;
- Properly maintain equipment and engines for efficiency with the documented maintenance program and schedule; and
- Turn off equipment when not in use to avoid unnecessary idling (i.e., an anti-idling policy will be implemented).

29.4.5.3 Mining and Process Equipment

The following mitigation measures that consider project design, BMPs, and BATs will be implemented where practicable for Project activities concerning the use of stationary equipment used in the mine development and process for construction and operations:

- Rock loading into the primary crusher will be undertaken inside a building;
- Dust collectors or bin vents will be installed along the crushing circuit to reduce fugitive dust emissions, as properly operated baghouses maintain particulate control efficiencies in excess of 99%;
- Kiln off-gas pre-treatment will include wet coarse particulate filtration, gas cooling, gas demisting, high efficiency particulate air (HEPA) filtration, and carbon adsorption;
- The drying oven stack will be outfitted with a scrubber as well as pretreatment of exhaust air that will include cartridge filtration, HEPA filtration, and carbon adsorption;
- The smelting furnace stack will be outfitted with a baghouse;
- Water sprays and/or dust suppression measures will be used to a practical extent considering temperature in order to suppress dust generation from equipment in the crushing facility;
- Drop heights will be minimized from the crushers to conveyors; and
- Where necessary, vapor recovery units will be used at fuel and chemical storage tanks.

29.4.5.4 Fugitive Dust Sources

The following mitigation measures, in following BMPs, will be used where practicable to control the release of fugitive dust during construction and operations:

- Drop heights will be minimized at material transfer points;
- Water sprays and/or dust suppression measures will be used to mitigate the dust generation potential along the unpaved Project roads, work areas, and storage piles as needed and when ambient air temperatures permit;
- Roads will be regularly maintained and kept in good repair;
- The TMF will be regularly monitored for tailings beach saturation and dust emissions. Tailings spigots will be rotated as required to maintain beach saturation; additional spigots or dust suppression may be required.
- The site layout will be optimized to minimize the distance travelled, thereby reducing vehicle emissions and dust generation;
- The operation of equipment will be optimized to minimize dust generation, e.g. by reducing vehicle speeds; and
- Windbreaks or fences will be installed as necessary around stockpiles or other areas of concern to limit the dispersion of dust emissions from equipment, stockpiles, and/or activities likely to generate dust.

29.4.6 Complaints and Response

Given the lack of permanent human receptor points within the Bitter Creek valley, the effect to people would be limited to those temporarily visiting the area for recreational or other purposes. Mine signage will identify contact numbers that the public can use to report air quality concerns.

Should a complaint be received, an individual or department will be assigned the responsibility of launching an initial investigation to determine the likely causes with focus on identifying the possible source of emissions or dust. This may be accomplished by studying: the description of the event provided by the complainant; the nature and types of activities taking place onsite during the complaint time; and prevailing meteorological conditions. Air monitoring may form part of the investigation or response to complaints if there is active monitoring of air quality being conducted concurrent with the complaint time. The complainant would be contacted with the results of the investigation, which would also be recorded for future reference.

29.4.7 Monitoring Program

An onsite meteorological station has been in operation at the Project site since July 30, 2014, and will continue through the life of the Project. The location and siting of the station can be reviewed, as needed, with the BC MOE prior to Project commencement. Data collected includes temperature, precipitation, wind speed and direction, relative humidity, and solar radiation.

As per the Air Quality Effects Assessment (Volume 3, Chapter 7), the relevant baseline air quality conditions used in the assessment are to be confirmed through monitoring prior to Project commencement. Based on the known potential for mining activities to result in fugitive dust emissions, the TSP, PM_{10}, $PM_{2.5}$ and dustfall baseline conditions will be confirmed. This will consist of active monitoring of 24-hour averaged TSP, PM_{10}, and $PM_{2.5}$ using a monitor that is suitable to the remote site conditions. Possible monitors to be employed for this application include E-samplers or Partisols. The monitoring technology will be confirmed with the BC MOE prior to monitoring. Monitoring locations will be selected to meet the recommendations from the Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE 2012) and the draft Air Monitoring Site Selection and Exposure Criteria.

Fugitive dust deposition will be monitored through the implementation of dustfall monitoring stations. Dustfall monitoring stations collect particulates small enough to pass through a 1 mm screen and large enough to settle by virtue of their weight. Each dustfall monitoring station will consist of two canisters, each surround by a wind screen and mounted on a 2-metre pole. One of the containers will be analyzed in the laboratory for particulates (total, soluble, and insoluble), anions (sulphate, nitrate, chloride, and ammonia), and the other, for total metals. The windscreen around the sample containers will improve the dustfall collection efficiency and bird spikes will be used to minimize contaminants from bird feces.

Dustfall monitoring containers are collected on a monthly basis to determine the 30-day average ground-level mass of deposited dust. These values will be compared with historical dustfall objectives (as described in Section 29.4.3 above) and used to determine if any trends are evident that might indicate increasing or unacceptable levels of dust deposition from the Project. Results will be reviewed on a monthly basis to determine compliance with objectives, and trends analysis should be made available in annual reports. Based on this analysis, further air quality management or monitoring requirements may be implemented.

29.4.8 Reporting Requirements

Reporting will be conducted as per future permits, approvals, and authorizations relevant to air quality management and will be delivered to the Mine Manager and/or delegates. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.4.9 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the AQDMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.4.10 Review of Plan Effectiveness

Certain components of the AQDMP may need to be modified based on site experience and conditions and/or changes in legislation or BMPs. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Most importantly, review of this plan shall include any aspects affecting protection of the environment, property, and persons.

Formal evaluations of the AQDMP shall be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.5 Aquatics Effects Management and Response Plan

29.5.1 Introduction

The Aquatic Effects Management and Response Plan (AEMRP) describes ways that IDM intends to minimize the risk of effects to the aquatic environment through Project design, monitoring, and adaptive management. The AEMRP includes an Aquatics Effects Monitoring Program (AEMP; see Volume 5, Chapter 30) that will provide feedback via the receiving environment on the performance of IDM's management and mitigation during construction, operations, reclamation and closure, and post-closure phases of the Project. The AEMRP also includes management response measures (additional assessment, monitoring and mitigation measures) that would be implement in response to a change in the receiving environment.

The AEMRP is closely linked to the SWMP and ESCP as these plans include management and monitoring of water within the Mine Site prior to release to the receiving aquatic environment. Groundwater monitoring is also included as part of the SWMP and ESCP.

The AEMRP will be further developed as the Project undergoes the Application/EIS review and moves to the permitting phase.

29.5.2 Objectives and Scope

Aquatic effects management and monitoring encompasses an array of activities designed to provide information on the physical, chemical, and biological characteristics of a receiving water system (MacDonald et al., 2009). Baseline information provides the foundation to the aquatic effects monitoring, and the objectives of the AEMRP are as follows:

- Confirm the predictions of the Application/EIS effects assessment;
- Determine if short- or long-term effects on the aquatic ecosystem occur in conjunction with the Project;
- Assess the efficacy of the implemented mitigation measures;
- Identify any unanticipated effects in the aquatic environment as a result of the Project;
- Ensure regulatory compliance with relevant legislation, including effluent discharge requirements; and
- Provide a mechanism that allows for management responses for unanticipated effects (i.e., adaptive management).

A comprehensive AEMRP for the Project at all Phases (Construction, Operation, Closure and Reclamation, and Closure and Post-Closure) will be in place, and monitoring activities will occur across all relevant ecosystem components. The AEMRP is focused on the potential effects to the aquatic receiving environment, specifically the Bitter Creek watershed, including Goldslide Creek and Bitter Creek, and far-field effects in the Bear River (Figure 29.5-1) as mine water will be discharged to Goldslide Creek and Bitter Creek.

The AEMRP targets the following VCs:

- Water Quality;
- Hydrology;
- Sediment Quality;
- Benthic Invertebrates (Aquatic Resources); and
- Fish and Fish Habitat.

This document describes the regulatory need, rationale, and outline of the AEMRP for the Project. A detailed plan will be prepared following development of data quality objectives, and feedback from, and consultation with EAO, Environment Canada (EC), Fisheries and Oceans Canada (DFO), and Nisga’a Lisims Government (NLG) during the review of the Application/EIS and as the Project moves into the permitting phase.

29.5.3 Applicable Legislation and Guidelines

The AEMRP is designed to comply with existing regulations and follow guidelines and technical guidance documents provided by the federal government and the government of BC. Applicable regulations, guidelines, and guidance documents are outlined below.

There are several legislative statute requirements, industry standards, and codes of practice applicable to access road construction, operation, and deactivation, including:

- *Canadian Environmental Assessment Act* (CEAA, 2012);
- BC *Environmental Management Act* (2003);
- BC *Environmental Assessment Act* (2002c);
- *Fisheries Act* (1985a); and
- Metal Mining Effluent Regulations (MMER; SOR/2002-222).

A list of appropriate guidelines and standards for the AEMRP include, but are not limited to, the following:

- British Columbia Field Sampling Manual (Clark 2013);
- British Columbia Water and Air Baseline Monitoring Guidance Document for Mine Proponents (BC MOE 2016b);
- Metal Mining Technical Guidance for Environmental Effects Monitoring (Environment Canada 2014a);
- Technical Guidance 1: Environmental Management Act Applications. Terms of Reference. Environmental Impact Assessment and Technical Assessment Report. Version 1.0 BC Ministry of Environment (2014).
- British Columbia Fish Collection Methods and Standards (Resource Information Standards Committee [RISC] 1997);
- British Columbia Guidelines for Sampling Benthic Invertebrates in British Columbia Streams (BC MOE 2006);
- Canadian Aquatic Biomonitoring Network (CABIN) Field Manual: Wadeable Streams (Environment Canada 2012a);
- CABIN Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples (Environment Canada 2014b); and
- Environmental Code of Practice for Metal Mines (Environment Canada 2012b).

29.5.3.1 Applicable Federal Legislation

29.5.3.1.1 Fisheries Act

Environment and Climate Change Canada (ECCC) administers section 36 of the *Fisheries Act* (1985a), which prohibits the deposit of deleterious substances into waters frequented by fish, unless authorized by regulations under the *Fisheries Act*. A deleterious substance can be any substance that, if added to water, would degrade or alter its quality such that it could be harmful to fish, fish habitat or the use of fish by people. The MMER are administered under section 36(3) of the *Fisheries Act*.

29.5.3.1.2 Metal Mining Effluent Regulations

The MMER apply to mines that:

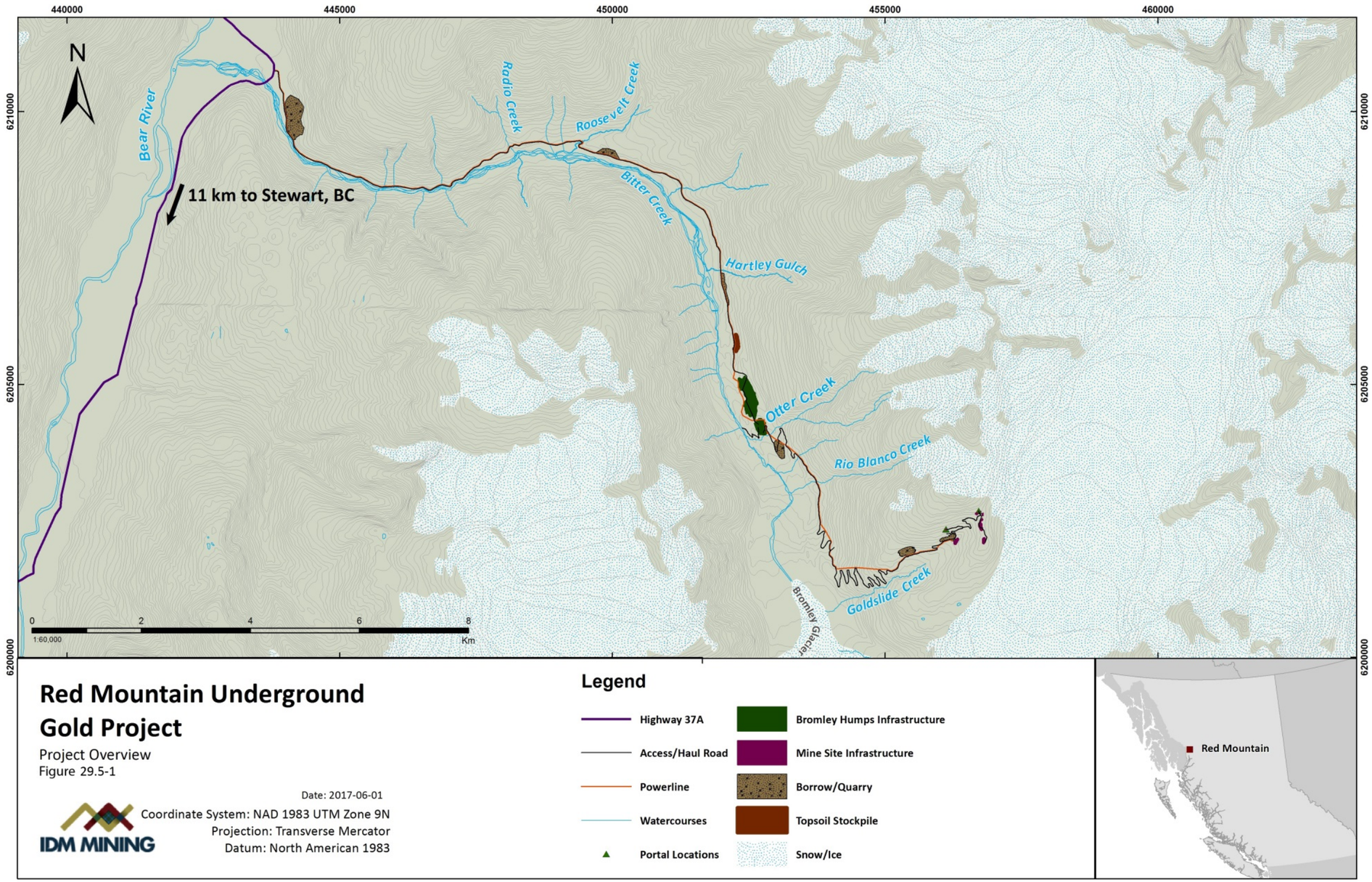
- At any time exceed an effluent flow rate of 50 m^3 per day, based on effluent deposited from all the final discharge points of the mine; and
- Deposit a deleterious substance in any water or place referred to in subsection 36(3) of the Act.

Schedule 5 of the MMER outlines the requirements and periods that the mine shall conduct environmental effects monitoring (EEM) studies of the potential effects of effluent on the fish population, on fish tissue, and on the benthic invertebrate community.

29.5.3.1.3 Canadian Environmental Assessment Act, 2012

CEAA, 2012 requires monitoring to verify whether required mitigation measures were implemented, and to determine the accuracy of the conclusions of the environmental assessment, the effectiveness of the mitigation measures, and support the implementation of adaptive management measures to address unanticipated adverse environmental effects.

Figure 29.5-1: Project Location and Mine Components



29.5.3.2 Applicable Provincial Legislation

29.5.3.2.1 British Columbia Environmental Management Act

The BC *Environmental Management Act* (2003) provides a framework for the protection of human health and the quality of water, land, and air in BC. Mines require authorization under the BC *Environmental Management Act* (2003) to discharge mining effluent to receiving waters, and are required to register (or include on the permit) sewage discharges greater than 100 persons. The BC *Environmental Management Act* (2003) specifies environmental monitoring requirements for *Environmental Management Act* (2003) permit holders, which should enable ongoing evaluation of waste management performance, receiving environment condition, and evaluation of impact predictions made during the permit application.

29.5.3.2.2 British Columbia Environmental Assessment Act

The *BC Environmental Assessment Act* (2002c) requires compliance to the conditions attached to the Application/EIS, including mitigation and protection measures.

29.5.4 Environmental Protection Measures

A number of considerations have been incorporated in the Project design, including operational safeguards and contingency plans, so that 'mitigation by design' has been incorporated from an early stage. Some of the key 'mitigation by design' measures incorporated are:

- Minimize Project footprint, thus minimizing the loss of habitat and reduction of habitat effectiveness;
- Project mining activities contained within the Bitter Creek watershed;
- Maintain a buffer riparian setback for watercourses; and
- Select water sources such that water withdrawals will minimize the potential for drawdown and effects to fish habitat and the aquatic environment.

The primary mitigation approach for the mine development will be to minimize the number and magnitude of pathways through which Project activities can adversely affect the aquatic environment. Several management and monitoring plans are in place to mitigate potential effects to the aquatic environment due to mine activities (Table 29.5-1). The Project has been designed to control potential effects; application of relevant BMPs during all Project stages will further mitigate effects. The relevant mitigation and protection measures applicable to the aquatic environment are summarized below.

Table 29.5-1: Red Mountain Management and Monitoring Plans related to the AEMRP

Title	Relevance to Aquatic Environment
Adaptive Management Plan	Includes requirements for annual reviews and updates to all management plans as necessary, based on monitoring results.
Air Quality and Dust Management Plan	Potential release of dust and air-borne emissions
Erosion and Sediment Control Plan	Potential release of sediment
Explosives Management Plan	Potential release of explosive residue
Fuel Management Plan	Potential release of hydrocarbons
Material Handling & Metal Leaching/Acid Rock Drainage (ML/ARD) Management Plan	Potential discharge or metals and acidic water
Site Water Management Plan	Management and control of mine water quality and quantity
Tailings Management Plan	Potential water quality changes within the mine site
Waste Management Plan	Handling, storage and disposal procedures for hazardous and non-hazardous waste

Mitigation measures that assist in protecting aquatic habitat and fish include:

- Oily water treatment separators at equipment maintenance facilities will be used to minimize water and surface hydrocarbon contaminants;
- All hydraulic equipment will be inspected once per shift by the operator for potential leaks;
- Any machinery identified as having the potential to result in a fluid release or leak will be repaired prior to use;
- Refueling and maintenance activities will not occur within 15 m of a watercourse or waterbody except where required due to equipment breakdown or approved activities near water;
- Erosion potential will be reduced by conducting sensitive work during periods of low runoff as much as possible;
- Disposal of excavated material will be in a location above the high water mark to ensure that this material does not enter the watercourse;
- Regular inspections will be conducted to ensure erosion and sediment control measures are functioning properly (“performance monitoring”), and all necessary repairs and adjustments will be conducted in a timely manner;

- Exposed landscape surfaces will be protected, where possible, by the installation of covering material like riprap, aggregate, or rolled erosion control products;

- Sediment loading in runoff will be minimized by the application of measures to intercept total suspended sediments (TSS) before it reaches the freshwater environment. Sediment control measures may include:

  - Preservation of riparian zones to trap sediment and to reduce flow velocities;

  - Installation of synthetic permeable barriers, fiber rolls, and/or silt fences as required;

  - Installation of check dams, gabions, and sediment basins to reduce flow velocities and encourage sediment deposition; and

  - Locating stockpiles well away from watercourses;

- Where practical, instream work will be conducted during periods of lowest risk to fish and wildlife species and habitat, as per provincial guidance, with a QEP present to monitor instream works;

- Work within sensitive environmental time periods will be completed with additional mitigation as necessary to minimize risk to the environment;

- Efforts shall be made to minimize the duration of any instream works and minimize disturbance of riparian vegetation at stream crossings;

- All temporary works, silt curtains, construction material or debris, etc. are to be completely removed from the waterway when work is completed;

- Hydraulic plugs will be installed and flooding will occur of the underground to prevent continued geochemical reactivity of fractured zone; and

- Manage ML/ARD by submerging tailings in TMF.

29.5.5 Aquatic Effects Monitoring Program

The overall purpose of the AEMP will be to monitor the receiving aquatic environment during Project activities, such as construction of infrastructure and operation of the mine, including discharge of effluent. The results from the monitoring will be used to determine the efficacy of protection and monitoring measures, and provide opportunity for adaptive management at the Project, should it be required.

The AEMP has been designed to meet the commitments of the Application/EIS, as well as EEM studies as required under the MMER and as part of the EMA permit conditions.

At a high level the monitoring program will include:

- Monitoring streams at locations potentially affected by the Project and at reference areas well away from Project activities;
- Monitoring surface quality/quantity, sediment quality, and aquatic biology;
- Monitoring fish populations and fish tissues;
- If effluent (as defined in the MMER) is discharged to the environment, then additional sampling for MMER requirements will be conducted (effluent characterization; acute toxicity testing; site characterization studies (including surface hydrology); and sublethal toxicity testing);
- Water quality and quantity within the mine site (see SWMP); and
- Groundwater monitoring within and or near the mine site (See SWMP).

29.5.5.1 AEMP Regulatory Requirements

29.5.5.1.1 MMER

An EEM program is required under MMER. The EEM provides the framework of the AEMP. The MMER include discharge limits that provide national minimum standards that are intended to protect fish, fish habitat, and the use of fisheries resources. The purpose of an EEM program is to evaluate the effects of mining effluents on fish, fish habitat, and the use of fisheries resources. The EEM program has two components:

- Effluent characterization and water quality monitoring studies that are designed to aid the interpretation of biological data; and
- Biological monitoring studies that include surveys for fish populations and health, fish prey resources (benthic invertebrate surveys), and fish usability (mercury/metal tissue content).

29.5.5.1.2 Environmental Management Act Discharge Permit Requirements

At a minimum, EMA permits will require comprehensive monitoring programs for the mine discharge and the receiving environment. The monitoring program should include the following:

- Proposed study design;
- Objectives;
- Site locations (coordinates and mapped);
- Sampling frequency;
- Parameters for assessment;
- Sampling and analytical lab methodology;
- Rationale for proposed sampling program;

- Proposed assessment techniques; and
- Proposed data QA/QC programs.

29.5.5.2 Relevant Project Activities and Project Design

The first step in the AEMP development process involves the identification of issues and concerns associated with the proposed development activity relative to potential effects on the aquatic ecosystem. For the Project, the major activities that have the potential to affect fish, fish habitat, benthic invertebrates, surface and ground water quantity and quality, and sediment quality are:

- Development of the Mine Portal area in Goldslide Creek;
  - Receiving environment: Cambria ice field, Goldslide Creek and tributaries, Bromley Glacier, Upper Bitter Creek; and
- The TMF in Bromley Humps;
  - Receiving environment: Bitter Creek and Otter Creek.

The AEMP will be based on a Before/After/Control/Impact (BACI) study design, although the design may be modified in consultation with ECCC as part of the study design stage of the EEM program under the MMER. The AEMP will focus on a comparison of baseline and Project conditions during the Construction, Operations, Reclamation and Closure, and Post-Closure Phases, as well as compare exposure and reference sites to strengthen the AEMP. An exposed area is considered to be an area that is likely to be affected by Project-related activities. A reference (or control, or unexposed) area is considered to be an area spatially removed from the Project that has physical, chemical, and biological conditions that are/were similar to those in the exposed area prior to the Project-related stressors.

29.5.5.3 Study Areas and Sampling Locations

The study design will outline the approach to determine significant differences, including a power analysis to determine the number of sites, samples, and replicates to detect a statistically significant difference.

For all the AEMP components, monitoring locations will consist of reference and exposure areas, including ‘near-field’ (high effluent exposure) and ‘far-field’ (lower effluent exposure areas). An effluent characterization study will be undertaken at the appropriate stage, and sampling locations may be modified as necessary. Effluent characterization studies are presented in the Site Water Management Plan. Table 29.5-2 and Figure 29.5-2 describes and shows the location of the proposed sampling sites.

29.5.5.4 AEMP Study Components

Proposed AEMP components (Table 29.5-2, Table 29.5-3 and Figure 29.5-2) include:

- Surface Water Quality;
- Hydrology;

- Sediment Quality;
- Benthic Invertebrates; and
- Fish.

29.5.5.4.1 Water Quality

Water quality sampling in the AEMP will focus on the receiving environment and reference areas. Any differences between water quality in exposed and reference areas will be analyzed for Project effects. Water quality monitoring is also required as part of the effluent and water quality monitoring studies for EEM. Water quality samples will be collected monthly from relevant monitoring locations as part of effluent characterization.

29.5.5.4.2 Water Quantity

Hydrometric monitoring stations at or near water quality sampling locations will be part of the overall AEMP data collection program. The stations will collect continuous daily flow measurements during the open water season. During periods of snow and ice buildup in the streams, spot measurements will be taken when conditions are safe to do so.

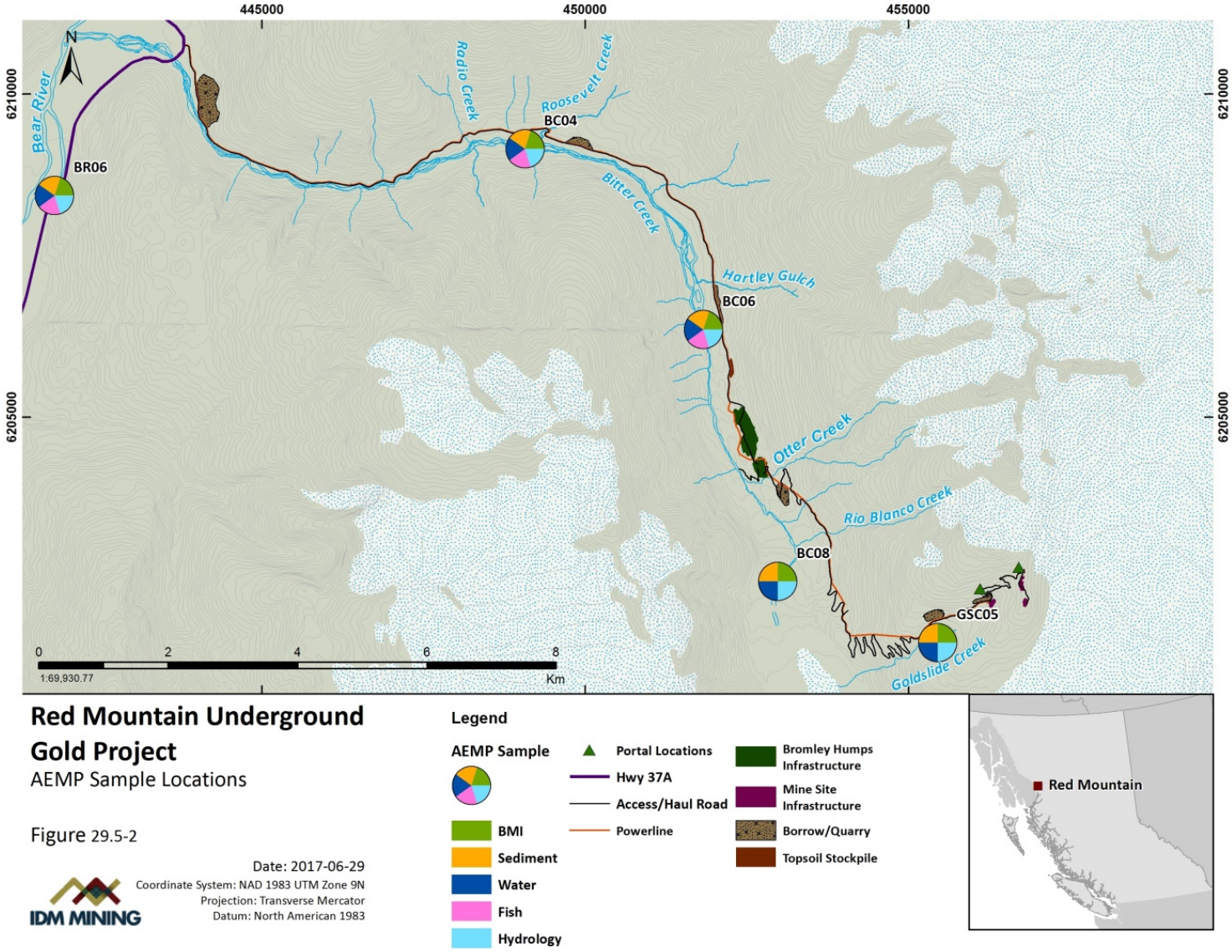
29.5.5.4.3 Sediment Quality

Sediment quality samples will be collected every three years in conjunction with the benthic invertebrate surveys to measure Project effects, including in relation to benthic invertebrates and fish and fish habitat.

Table 29.5-2: AEMP Sampling Locations and Descriptions

Watercourse	Site Name	Site Description	Site Type	Rationale
Goldslide Creek	GSC05	Downstream of mine	Exposed Near Field	Receiving environment during construction and operation of the mine site
Bitter Creek	BC08	Downstream of mine	Exposed Far-Field	Receiving environment for discharges from the mine site during life of project
Bitter Creek	BC06	Downstream of TMF	Exposed Mid-Field	Receiving environment for effluent from TMF during post-closure
Bitter Creek	BC04	Downstream of TMF and adjacent to road alignment	Exposed Far-Field	Receiving environment for effluent from TMF during post-closure and potential exposure site from mine access road construction, operations, decommissioning and post-closure
Bear River	BR06	Downstream of TMF and all Project infrastructure, just below confluence of Bitter Creek	Exposed Far-Field	Ultimate receiving environment for potential downstream effects from Project during life of project

Figure 29.5-2: AEMP Sampling Locations



29.5.5.4.4 Biological Monitoring

Benthic Invertebrates

Benthic invertebrate surveys using CABIN sampling protocol will determine the effects of Project activities on lower trophic levels of the aquatic environment. Benthic invertebrates will be sampled and measured for abundance and diversity. CABIN reference condition approaches along with summary statistics will be calculated on the following and compared between reference and exposure areas, as well as before (baseline) and after (mine development):

- Total organism abundance; and
- Taxonomic diversity.

Fish

Fish population surveys will occur every three years in summer to confirm fish community and determine catch-per-unit effort (CPUE). Fish population health will focus on one large-bodied fish, Dolly Varden (*Salvelinus fontalis*), and one small-bodied fish, Coast-range sculpin (*Cottus aleuticus*). Non-lethal sampling will be conducted, however lethal sampling will be necessary on the small-bodied fish tissue metal analysis. Survival, growth, reproductive, and condition parameters will be collected from the fish and compared between sites and over time up until post-closure of the mine.

Table 29.5-3 includes the AEMP Monitoring Components and Table 29.5-4 provides a summary of the AEMP Monitoring Components.

Table 29.5-3: AEMP Monitoring Components

Component	Sites(s)	Parameters/Metric	Frequency	Timing	Methodology
Effluent Characterization	End of pipe from underground mine and final release point from TMF	Physical parameters (e.g. Conductivity, pH), Anions and nutrients, Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC), Metals (total and dissolved)	As required under MMER	Beginning of Discharge	According to MMER Schedule 5 and in agreement with ECCC during EEM Study Design Phase
Water Quality	GSC05 BC08 OC07 BC06 BC04 BR06 Ref Locations: Rio Blanco RBC02 Otter Cr. (u/s of Mine)	Physical parameters (e.g. Conductivity, pH), Anions and nutrients, TOC, DOC, Metals (total and dissolved)	Monthly	Baseline (pre-construction/operations) to Closure, depending on permit conditions	According to MMER Schedule 5 and in agreement with ECCC during EEM Study Design Phase
Sediment Quality	GSC05 BC08 BC06 BC04 BR06 Ref Locations: Rio Blanco Otter Cr. (u/s of Mine)	% moisture, particle size, nutrients, TOC, metals, sulphur, polycyclic aromatic hydrocarbons (PAHs)	Once every 3 years	Baseline (pre-construction/operations) to Closure, depending on permit conditions, in August	According to MMER Schedule 5 and in agreement with ECCC during EEM Study Design Phase

Component	Sites(s)	Parameters/Metric	Frequency	Timing	Methodology
Benthic Invertebrates	GSC05 BC08 BC06 BC04 BR06 Ref Locations	Total organism abundance Taxonomic diversity	Once every 3 years	Baseline (pre-construction/operations) to Closure, depending on permit conditions, in August	According to MMER Schedule 5 and in agreement with ECCC during EEM Study Design Phase
Fish	BC06 BC04 BR06	Growth Condition Survival Population structure Fish Tissue – metals	Once annually or every 5 years – to be determined as part of EEM cyclic monitoring	Baseline (pre-construction/operations) to Closure, depending on permit conditions, in August	According to MMER Schedule 5 and in agreement with ECCC during EEM Study Design Phase

Table 29.5-4: Summary of AEMP Monitoring Components

AEMP Component	Design Type	Measurable Parameter and Threshold	Key Project Interactions	Objectives
Water Quality	Before-After, Control-Impact	Exceedances of BC WQG[1] / CCME[2] guidelines or SBEBs[3], MMER criteria.	Discharge of mine effluent from underground mine and TMF. Non-point source release of suspended sediment	Evaluate changes in water quality due to Project activities. Confirm the Application/EIS predictions and provide monitoring data for adaptive management.

[1] BC MOE "Approved Water Quality Guidelines for Aquatic Life"
[2] CCME "Canadian Environmental Quality Guidelines for the Protection of Aquatic Life"
[3] BC MOE "Science-Based Environmental Benchmarks for Aquatic Life"

AEMP Component	Design Type	Measurable Parameter and Threshold	Key Project Interactions	Objectives
Sediment Quality	Before-After, Control-Impact	Exceedances of BC WQG / CCME Interim Sediment Quality Guidelines (ISQG)	Discharge of mine effluent from underground mine and TMF. Non-point source release of suspended sediment	Evaluate changes in sediment quality due to Project activities. Confirm the Application/EIS predictions and provide monitoring data for adaptive management.
Benthic invertebrates	Before-After, Control-Impact	Significant change in abundance of organisms and taxonomic diversity	Discharge of mine effluent from underground mine and TMF. Non-point source release of suspended sediment	Evaluate changes in benthic invertebrates due to Project activities. Combine results with water and sediment quality to inform potential effects on fish and fish habitat. Confirm the Application/EIS predictions and provide monitoring data for adaptive management.
Fish	Before-After, Control-Impact	Significant change in fish population or biological variable. Growth (Age; weight against age) Condition (length against weight; relative liver size; physical deformities etc) Fecundity (gonad size; # eggs against body weight) Diet – stomach contents Fish Tissue – metals.	Changes or loss of habitat from runoff from mine footprint, dust or sediment deposition, effluent from TMF	Evaluate changes in fish due to Project activities. Combine results with benthic invertebrates, water and sediment quality to inform potential effects on fish and fish habitat. Confirm the Application/EIS predictions and provide monitoring data for adaptive management.

29.5.5.5 Power Analysis

Adequate sample sizes will be determined using power analysis and estimates of parameter variability from the baseline sampling programs.

29.5.5.6 Quality Assurance/Quality Control

QA/QC principles will follow those outlined in guidance documents throughout the field sample collection and laboratory analysis. All samples will be collected by qualified personnel and, where samples are transferred to laboratories for analysis, Chain-of-Custody forms will be used to track all samples. Travel and field blanks will be collected to detect potential sources of contamination for water and sediment quality samples.

29.5.6 Management Response

The AEMRP, SWMP, and the ESCP include monitoring programs that will allow IDM to quantify change within the aquatic environment. The AEMRP specifically will establish "triggers" for key aquatic components. A trigger is a quantifiable change from baseline conditions. Triggers will be set below a "threshold" level. A threshold is a quantifiable change that has the potential to result in an effect. If a trigger is reached within the aquatic environment, management will implement a response that will at a minimum include an assessment of the data from the above referenced plans as well as additional assessment of the aquatic environment.

Prior to reaching a trigger, data collected from and around the Mine Site through the above plans will serve as a precursor to the potential for change. For example, regular monitoring of mine water discharge from the underground mine and TMF will provide advance warning of the potential for change in the receiving environment. If a change is detected from mine site monitoring, management has the ability to assess the performance of the water treatment plant, holding and settling ponds, etc. to determine if a change to design or operating procedures may be necessary.

When an AEMP trigger is exceeded, the management response will consider data and information from the AEMP and other monitoring programs. Management response options include further monitoring / assessment and additional mitigation. Additional monitoring and assessment is meant to confirm the trigger; i.e. additional monitoring as per EEM.

Example of additional assessment and mitigation tools:

- Water trigger (assessment tool) – bioavailability study, receiving environment toxicity tests using pore or surface water;
- Water trigger (assessment and mitigation tools) – water treatment studies to determine if the water treatment plant can be operated differently to address the trigger;
- Water Management (mitigation tool) – determine if additional holding time or redirecting water address the trigger; and

- Biological trigger – additional studies to quantify the magnitude of effects and spatial extent.

The management response strategy and action plans will be further developed during the review of the Application/EIS and during the permitting process.

29.5.7 Reporting

Reporting will be conducted as per future permits, approvals, and authorizations relevant to water quality management and will be delivered to the Mine Manager and/or delegates. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks, quality assurance, and quality control. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.5.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the AEMRP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan. The Project Environmental Superintendent will be on site during the Construction and Operations Phases and will be responsible for the implementation of the AEMRP, including all internal and external reporting, regulatory compliance, and adaptive management.

Further details on the roles and responsibilities, including a work flow chart and function of any AEMRP Working Groups, will be developed for the detailed AEMRP as part of the Project permitting phase.

29.6 Community Involvement Plan

29.6.1 Introduction

This plan outlines the process IDM will follow in order to meet its commitments to community members, stakeholders, and the public during the construction, operation, decommissioning, and post-closure phases of the proposed the Project.

The Project is located in the Bitter Creek valley, approximately 15 km northeast of Stewart, in northwest BC. IDM is a company with deep roots in Stewart and northwest BC; Rob McLeod, IDM's president and Chief Executive Officer, was born and raised in Stewart. IDM's goal is to proactively engage with Stewart and the communities of northwest BC. This engagement will be made in the spirit of respect and integrity with the objectives of building and maintaining constructive relationships and of maximizing local benefits.

IDM will work with local community members, stakeholders, and the public to maximize the positive economic benefits of the Project that will flow to their communities. IDM is committed to establishing collaborative dialogue with local community members,

stakeholders, and the public to gain better understanding of community priorities and to integrate feedback and concerns into all levels of project planning, decision-making, and implementation.

29.6.2 Scope and Objectives

The purpose of the Community Involvement Plan is to outline IDM's commitment to community involvement and the methods of communication that IDM will continue to undertake throughout the life of the Project to achieve the goal of maintaining mutually respectful and beneficial relationships with local community members, stakeholders, and the public.

29.6.3 Corporate Vision and Principles for Community Involvement

IDM is committed to maintaining strong, respectful, and mutually beneficial long-term relationships with local community members, stakeholders, and the public through ongoing and meaningful engagement and communication. Throughout the life of the Project, IDM is committed to:

- Continue to engage in open dialogue with local communities, taking into consideration their aspirations, priorities, and concerns throughout the life of the Project;
- Collaborate with local communities to ensure that IDM develops a mutual understanding of cultural, environmental, and recreational values;
- Create broad awareness within local communities of opportunities to pursue employment, training, and contracting associated with the Project;
- Be transparent, accountable, and honest in responding to questions and concerns raised by local community members, stakeholders, and the public; and
- Continue ongoing meaningful engagement and communication with local community members, stakeholders, and the public, including participation in local events hosted by communities or IDM.

29.6.4 Community Involvement Measures

29.6.4.1 Local Communities and Stakeholders

IDM is committed to being an engaged and responsible neighbour. Throughout construction, operation, and closure, IDM will aim to continue to maintain relationships with the local community members and stakeholders who live and work in the Project area. These communities include the District of Stewart and the four Nisga'a Villages in the Nass Valley (Gingolx, Gitwinksihlkw, Laxgalts'ap, and Gitlaxt'aamiks).

IDM recognizes a responsibility to support the local communities where its employees live. IDM has committed to develop a Donations and Sponsorship Policy that guides how IDM's donations could support local initiatives, organizations and activities that promote

sustainable benefits to community wellbeing, including education, health, recreation, or other priorities identified to IDM by community members.

IDM will continue to maintain close working relationships with the District of Stewart, the Regional District of Kitimat-Stikine, the provincial Member of the Legislative Assembly for the Skeena riding, and the federal Member of Parliament for the Skeena-Bulkley Valley riding.

IDM will continue to maintain open communication and share information with stakeholders with interests in the Project area, including trapline and guide outfitter license holders, businesses and infrastructure, and mineral tenure holders.

29.6.4.2 Methods of Communication

IDM will continue to share information with the public, stakeholders, and local community members to keep them informed of milestones in construction, operations, and closure, and employment and contracting opportunities, which may include the following communication methods:

- Regular newsletters;
- Red Mountain Community website (RedMountainProject.com);
- Social media sites;
- Community open houses; and
- Newspaper advertisements regarding events, employment opportunities, or milestones that may affect regional communities.

IDM will be accessible to community members to receive questions, concerns, and feedback through the following communication methods:

- IDM's community email address, available on the community website and in the community newsletters;
- Social media accounts;
- Community open houses;
- Attending local community events; and
- Meetings with local community members, stakeholders, and the public, as requested.

IDM is committed to responding to questions, concerns, and feedback in a timely, transparent, accountable, and honest manner.

29.6.4.3 Local Employment, Training, and Procurement

IDM believes the Project will have a positive economic influence on Stewart and northwest BC and is committed to working with community members, stakeholders, and the public to maximize local benefits through creating opportunities for employment, training, and local procurement. The Local Procurement Plan (see Section 29.14) outlines IDM's proposed approach to maximize local procurement opportunities during all phases of the Project.

29.6.5 Roles and Responsibilities

Everyone from corporate management to camp service staff play a role in developing a corporate culture that promotes a strong and respectful relationship with local community members and the public. IDM will establish clear roles, responsibilities, and processes for continued engagement and involvement with local communities to achieve the goal of maintaining mutually respectful and beneficial relationships.

29.6.6 Review of Plan Effectiveness

The Community Involvement Plan is a living document that will be updated as required based on need and feedback from local community members and stakeholders who live and work in the Project area. IDM is committed to applying adaptive management principles across all management plans. The approach is further outlined in Section 29.1.4.

29.7 Cultural and Heritage Resources Protection Plan

29.7.1 Introduction

There are no archaeological, paleontological, cultural, or heritage resources in the Project area as identified by an Archaeological Overview Assessment (2015) and a Preliminary Field Reconnaissance (2015) and consultation by IDM with Aboriginal Groups and stakeholders.

IDM has prepared this Cultural and Heritage Resources Protection Plan in order to mitigate against the disturbance of potential unidentified archaeological, paleontological, heritage, or cultural resources encountered during the Construction, Operation, and Closure and Reclamation Phases of the Project.

29.7.2 Scope and Objectives

The purpose of the Cultural and Heritage Resources Protection Plan is to protect heritage resources associated with the Project and establish control measures to mitigate potential effects on potential unidentified archaeological sites within or adjacent to the Project footprint. The plan outlines a procedure to discover any previously unidentified archaeological, paleontological, heritage, or cultural resource and ensure sites area preserved, recorded, and protected while minimizing disruption to Project activities in the area.

29.7.3 Applicable Legislation and Guidelines

The provincial *Heritage Conservation Act* (1996f) prohibits the destruction, excavation, or alteration of archaeological, historical, and/or paleontological sites predating 1846 in BC without a permit. The Archaeology Branch of the Ministry of Forests, Lands and Natural Resource Operations (Archaeology Branch) is the provincial ministry responsible for the administration of the *Heritage Conservation Act* (1996f), issuing permits for heritage inspection and site alterations, and maintaining a database of known archaeological sites. All newly discovered archaeological or historical resources must be reported to the Archaeology Branch. Burials and gravesites are also protected in BC by the *Cremation, Interment, and Funeral Services Act* (2004).

The South Nass Sustainable Resource Management Plan (BC MFLRNRO 2012b) requires that any cultural or heritage sites identified in the Project area be reported to the NLG and the Archaeology Branch of BC MFLNRO for inclusion in the BC Government's *Remote Access to Archaeological Data* database.

Relevant guidelines include:

- British Columbia Archaeological Impact Assessment Guidelines (BC MFLNRO n.d): provides guidance on conducting Archaeological Impact Assessments in BC;
- Fossil Management Framework (Province of BC, n.d): provides guidance related to fossil management in BC; and
- British Columbia Archaeological Inventory Guidelines (BC Ministry of Small Business, Tourism and Culture 2000).

29.7.4 Cultural and Heritage Resources Protection Measures

29.7.4.1 Types of Resources

No archaeological, paleontological, heritage, or cultural resources have been identified in the Project area, however previously undiscovered sites may include:

- Artifact scatters;
- Burials;
- Cultural depressions such as cache pits, roasting pits, or earth ovens;
- Culturally modified trees;
- Historic sites;
- Petroforms;
- Petroglyphs and Petrographs; and
- Trails.

29.7.4.2 Chance Find Procedure

The Chance Find Procedure provides a clear protocol should an archaeological, paleontological, heritage, or cultural resource be discovered during the Construction, Operation, or Closure and Reclamation Phases of the Project. The Chance Find Procedure is applicable to:

- Construction, operations, and management personnel;
- Environmental team members; and
- All visitors and individuals in the Project area.

In the event a previously unidentified archaeological, paleontological, heritage, or cultural resource is encountered, crews will abide by the following procedure:

1. All activities in the immediate vicinity of the resource will immediately cease. The resource will not be disturbed. The area will be delineated with flagging tape and an appropriate buffer will be applied in order to secure the area to prevent damage or loss.

2. The Environmental Superintendent (or equivalent) will document the resource's location on an Archaeological or Cultural Heritage Site Card. The Archaeological or Cultural Heritage Site Card will include the following information:

    - Date of encounter;
    - Observer (name of person completing the Archaeological or Cultural Heritage Site Card);
    - Site location (with GPS or enough detail to relocate the site);
    - Type of site (archaeological, paleontological, heritage, or cultural resource);
    - Any disturbance to the site (by equipment, etc.); and
    - Photographs.

The completed Archaeological or Cultural Heritage Site Card will be submitted to the Mine Manager.

3. The Environmental Superintendent will immediately contact the IDM executive representative responsible for environment, health, and safety (for example, the Director of Health, Safety, and Environment).

4. The appropriate IDM executive representative will, in a timely manner, notify:

    - NLG;
    - The Archaeology Branch of BC MFLNRO; and
    - A qualified archaeologist.

If photographs are available, they will be provided.

5. If human remains are located, procedures will follow the Archaeology Branch Policy Statement "Found Human Remains" (September 1999). The appropriate IDM executive representative will also contact the Royal Canadian Mounted Police (RCMP). The Archaeology Branch of BC MFLNRO and RCMP will determine whether the remains are archaeological.

6. The qualified archaeologist will determine if a visit to the site is required. If a field visit is determined to be necessary, the archaeologist(s) will undertake the inspection process in accordance with all Project Health and Safety protocols under the direction of the Mine Manager.

7. If the significance of the resource is determined to be significant enough to warrant further action, the qualified archaeologist will work in consultation with the Archaeology Branch of BC MFLNRO and NLG to determine the appropriate course of action or mitigation plan for the site or artifact.

8. The appropriate IDM executive representative and Mine Manager will implement the appropriate course of action or mitigation plan. Should it be necessary to excavate, move, or alter the resource, permitting will be obtained in accordance with sections 12, 13, and 14 of the *Heritage Conservation Act*.

9. When the site is assessed and mitigated to the satisfaction of the Archaeology Branch of BC MFLNRO and NLG and the site has been cleared, Project activities may recommence.

29.7.5 Monitoring and Reporting

IDM, in collaboration with a Project Archaeologist, will coordinate monitoring and site inspection and the document of chance finds as required by the mitigation plan or *Heritage Conservation Act* permit. IDM will maintain documentation regarding monitoring and any heritage sites that may be discovered during the Project activities throughout the Construction, Operation, and Closure and Reclamation Phases. A report will be submitted as appropriate to the Archaeology Branch of BC MFLNRO, which may include the following items:

- A summary of activities at or near any archaeological site;
- Any non-compliance activities and subsequent work stoppages, mitigative actions, and/or rectifying measures;
- Unexpected archaeological concerns and potential mitigation strategies; and
- Incident reports describing significant archaeological issues.

29.7.6 Roles and Responsibilities

Chance find procedure roles and responsibilities are detailed above. IDM will engage at least one individual to be responsible for identifying previously undiscovered archaeological,

paleontological, heritage, or cultural resources that may be encountered. IDM will ensure that the individual(s) responsible is provided with adequate training to identify resources.

The appropriate IDM executive representative will contact the following parties in the event of the discovery of previously unidentified archaeological, paleontological, heritage, or cultural resource is encountered.

Table 29.7-1: Chance Find Contact Information

Party	Contact Information
Lands and Resources Department, NLG	Phone: 250-633-3000
Archaeology Branch of FNLRO	Phone: 1-250-953-3334 Fax: 1-250-953-3340 Email: arcwebfeedback@gov.bc.ca Website: http://www.for.gov.bc.ca/archaeology/index.htm
RCMP, Stewart Detachment As outlined above, the RCMP will **only** be contacted **if human remains** are encountered. **Do not dial 9-1-1** if the RCMP are contacted in relation to this procedure.	Phone: 250-636-2233 Fax: 250-636-2787 Physical Address: 707 Conway Street, Stewart Hours of Operation: Monday-Thursday: 9:00 a.m. - 3:30 p.m. Friday: 9:00 a.m. - 4:00 p.m.

29.7.7 Review of Plan Effectiveness

The Cultural and Heritage Resources Protection Plan is a living document and will be reviewed and updated as required based on need and findings of ongoing monitoring and evaluations. IDM is committed to applying adaptive management principles across all management plans.

29.8 Emergency Response Plan

29.8.1 Introduction

The Emergency Response Plan (ERP) describes potential emergency scenarios that would require action to reasonably mitigate (avoid and minimize) human health and environmental hazards. The ERP provides direction on the prompt, effective, and organized emergency response to reduce the consequences and severity of potential accidents, malfunctions, and unplanned events.

29.8.2 Scope and Objectives

The objective of the ERP is to have a system in place in the event of an emergency situation for the protection of life, property/equipment, or environment for the Mine Site (underground mine with dual portal access), Bromley Humps area (Process Plant and Tailings Management Facility (TMF)), and the interconnecting access roads during all phases of the Project.

The ERP will outline the procedures that are essential for effective and timely management of an emergency, contain all the elements required in the 'Mine Emergency Response Plan Guidelines for the Mining Industry' (Ministry of Energy, Mines and Natural Gas 2013), include the emergency preparedness and response plans for tailings storage facilities, and include affected communities and Aboriginal Groups in the identification of potential hazards, emergency communications, and responses.

Other Project management plans that link with and will be coordinated with the ERP include:

- OHSP;
- FMP;
- HMMP;
- SCP; and
- Explosives Management Plan

29.8.3 Applicable Legislation and Guidelines

Development and implementation of the ERP will be guided by several provincial and federal acts, regulations, and BMPs to cover all aspects of human health, safety, and environmental emergency preparedness.

The *Mines Act* (1996a) and the Code (BC MEM 2017) protect workers and the public through provisions for minimizing the health, safety and environmental risks related to mining activities (Ministry of Energy and Mines 2017). The *Mines Act* and Code require that an ERP be prepared. Other legislations and their relationship to the Project and potential emergencies will be described in the ERP, include, but are not limited to, the following:

- *Fisheries Act* (1985a);
- *Species at Risk Act* (2002b);
- *Transportation of Dangerous Goods Act* (1992);
- *Wildlife Act* (1996e);
- FRPA (2002a);
- *Environmental Management Act* (2003a);
- *Fish and Seafood Act* (2015a);
- *Water Sustainability Act* (2014);
- *Health Act* (1996g);
- *Fire Services Act* (1996h);
- *BC Fire Code Regulations (BC Reg. 166/2013);*

- *Motor Vehicle Act* (1996d);
- *Transportation of Dangerous Goods Act* (1996i); and
- Workplace Hazardous Materials Information System (WHMIS; WorkSafeBC 2015).

29.8.4 Relevant Project Activities

Potential accidents, malfunctions, and unplanned events that may occur in any phase of the Project that will be assessed include, but are not limited to:

- Spills of hazardous substances stored on site (reagents, fuels, contained liquid waste);
- Leakage or spill of materials with potential risks to the environment (including petroleum products, chemicals, and other materials) as a result of road and/or reclaim waterline;
- Uncontrolled discharge of contaminants from ore/waste rock stockpiles;
- Breach or failure of tailings dam or other containment structure;
- Accidental discharge of off-specification effluent from treatment plants;
- Sediment releases into watercourses;
- Accidents related to construction and operation of underground facilities;
- Fires or explosions;
- Failure of permanent and temporary waste rock dumps or stockpiles;
- Safety to personnel resulting from inrushes of water to the underground mine;
- Safety to personnel resulting from fly rock from blasting; and
- Failure of the lower adit plug, installed on closure of the mine.

29.8.5 Emergency Response Measures

Developing an ERP involves examining each area of the mine for potential eventualities as well as possible means of prevention and protection. This pre-planning exercise is repeated periodically to ensure changing conditions are incorporated into the ERP.

All areas and processes of the mine are inspected to determine what risks are associated with the work environment. Once risks are identified, control measures are considered to prevent emergency situations.

29.8.5.1 Action Plans

Response to an emergency situation will follow action plans. Action plans will be developed for potential emergency scenarios and clearly stipulate the procedures to follow.

29.8.5.2 Notification

A component of the action plans will be the pre-planned notifications that will occur internally and externally to the Project, depending on the nature and extent of the emergency. A procedure to engage with and notify authorities, stakeholders, Aboriginal Groups, and communities in the event of an emergency will be detailed and developed prior to Construction, such that those groups may initiate response for their own interests or their assistance elicited.

Internal notifications will ensure that rapid response to an emergency is initiated and hazards are minimized and contained. On-site personnel will follow concise emergency response procedures that include identifying and reporting the emergency, monitoring the situation, and will be followed by appropriate action.

External notifications will occur when management decides that outside help is needed due to escalation of the emergency or a reporting requirement is triggered. The notification procedures will clearly and succinctly identify key personnel with assigned tasks to avoid confusion and delays.

29.8.6 Reporting Requirements

The type of emergency will dictate the necessary reporting requirements. The ERP will list the various types of emergencies and the reporting protocol for each type. A record of the annual test of the ERP is included in the annual report submitted to the Chief Inspector of Mines. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.8.7 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the ERP. The Environmental Superintendent will inform and report to the Mine Manager and will be responsible for developing and filing the ERP with the Chief Inspector of Mines. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan. The ERP is to be maintained up to date and followed in the event of an emergency. The updated ERP will further specify the roles and responsibilities of workers, including the on-site and off-site emergency responders.

29.8.8 Review of Plan Effectiveness

The ERP will include a plan for conducting and reviewing practice drills of emergency response procedures. The Mine Manager is responsible for ensuring that the ERP is tested annually, and revised as necessary, for effectiveness. Aboriginal Groups are included in the annual testing of the plan.

29.9 Erosion and Sediment Control Plan

29.9.1 Introduction

The Erosion and Sediment Control Plan (ESCP) describes ways that IDM intends to minimize the risk of erosion and control sediment transport for the life of the Project. The ESCP provides direction on the planning, prevention, and effective response and management strategies that will be implemented for soil erosion and sediment transport.

29.9.2 Scope and Objectives

The objective of the ESCP is to conserve soil and minimize adverse effects to waterbodies from sedimentation during all phases of the Project. The plan outlines the legislation, policies, and procedures that IDM would follow for minimizing the risk of erosion and sediment transport.

The ESCP documents IDM's approach to erosion prevention and sediment control and outlines strategies that will be used to prevent erosion and sediment transport to ensure environmental protection. Sediment has the potential to affect fish, fish habitat, riparian habitat, surface water quality, and land use (such as reclamation to wildlife habitat). The overall objectives are to:

- Minimize the disturbance of existing vegetation and soil;
- Prevent erosion (water and wind); and
- Prevent sediment from entering waterbodies.

Other Project management plans within the EMS that link with the ESCP include:

- ERP;
- FMP;
- HMMP;
- TMP;
- Material Handling & ML/ARD Management Plan;
- Site Water Management Plan;
- SCP; and
- Explosives Management Plan.

An integrated approach will be adopted in the application of the various components of environmental management and reporting for the Project.

29.9.3 Applicable Legislation and Guidelines

Development and implementation of the ESCP will be guided by provincial and federal acts, regulations, and BMPs to cover proper erosion and sediment control. There are legislative statute requirements, industry standards and codes of practice applicable to erosion and sediment control, including:

- *Mines Act* (1996a);
- The Code (BC MEM 2017);
- *Fisheries Act* (1985a);
- Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1992);
- Standards and Best Practices for Instream Works (BC MOE 2004); and
- Handbook for Mineral and Coal Exploration in British Columbia a Working Field Guide (MABC et. al. 2009).

Minimizing erosion and sediment transport is important for the following reasons:

- Sediment in water bodies interferes with growth and function of aquatic life and support services; and
- Conservation of soils is needed to facilitate revegetation success.

29.9.4 Relevant Project Activities

The risk of erosion and sediment transport exists at any time when soil is disturbed. Disturbance activities will be most pronounced during initial excavation in support of the construction of Project facilities, and it is at this time that risk is greatest. However, the risk is also present during all phases of the Project's life (Construction, Operation, Closure and Reclamation, and Post-Closure Phases) and different controls might be necessary at different phases in the mine life as the nature of the site changes. The infrastructure and activities related to the Project that will require erosion and sediment control measures are the:

- Haul Road and stream crossings;
- Process Plant;
- Ancillary buildings and facilities;
- Underground staging areas;
- Waste rock storage and growth medium stockpiles;
- TMF; and
- Powerline and Access Road.

29.9.5 Potential Causes of Erosion

The key to prevent erosion from occurring is to plan soil disturbance activities in advance and be prepared to control sediment that may become suspended and transported by water. The ESCP identifies areas of high erosion and sedimentation potential. Erosion can be water borne (precipitation or snow melt) or wind borne.

29.9.6 Erosion and Sediment Control Measures

Multiple erosion and sediment control measures can be used to minimize risk to the environment. The on-site application of these mitigation measures will depend on site specific conditions, and the most appropriate measures will be implemented. Erosion and sediment controls are installed prior to starting work and during the conduct of the work to guard against sedimentation of waterbodies. The following sections describe some of the control measures that will be included in the ESCP.

29.9.6.1 Construction Scheduling and Phasing

Well planned construction phasing and scheduling can significantly reduce the risk of erosion and sedimentation by reducing the extent and duration of soil exposed to water and wind erosion. Whenever possible, scheduling should consider the effect the time of year/season has on erosion potential and incorporate staged revegetation of exposed soil to reduce the length of time soil is at risk to erosive forces.

29.9.6.2 Cut and Fill Slopes

The following general guidelines are intended to reduce the risk of erosion in areas of cut and fill along the alignment:

- Silt or sediment fencing close to the base of the cut or fill slope will be installed if sediment has a potential of entering the watercourse;
- Benching and straw wattles should be used to reduce slope lengths where possible;
- Hydroseed or seed fill steep cut slopes with potential for sediment runoff into a watercourse;
- Track walking slopes prior to hydroseeding should be done to promote water infiltration and slow runoff; and
- Steep slopes may require erosion blankets if hydroseeding is not undertaken until late summer or fall.

29.9.6.3 Ditching

Precipitation and snow melt can cause significant water movement on the surface. Ditching allows for water movement to be controlled in a manner that directs water away from construction areas (excavation, spoil placement and staging areas) to safe locations to

dissipate energy. Ditching will occur along roads, across long stretches of road surfaces, and the perimeter of areas under construction.

29.9.6.4 Check Dams

Check dams may be used to prevent erosion in channels with limited drainage areas. Check dams reduce erosion by decreasing the velocity of run-off in a channel and, when properly installed and maintained, also provide temporary detention of run off that allows the settling of coarse sediment.

29.9.6.5 Retention and Settling Ponds

Retention and settling ponds are structures located at the base of a slope to collect runoff from areas of high erosion possibility and sediment transport. The ponds slow the flow of water sufficiently to allow the suspended particles to settle out. The clean water decants over the edge of the pond to the surrounding environment. It may be necessary to have a series of ponds to adequately remove suspended sediment or provide additional treatment prior to discharge. The size of the pond is dependent on the predicted flow rate and volume of sediment laden water to be collected.

29.9.6.6 Re-contouring and Surface Features

Where possible, re-contouring the surface of slopes can aid in the minimization of sheet and rill erosion by surface runoff. Reducing the length and decreasing the angle of slopes can reduce erosion. Creating undulations or troughs parallel to steep slopes will also reduce surface water movement velocity. Re-contouring is suitable for areas that are no longer needed for other purposes.

29.9.6.7 Stabilized Construction Exits

Site access/exit points should be stabilized so as to reduce the potential for vehicles to track sediment off site. Commonly used stabilizers include gravel or chipped woody material.

29.9.6.8 Mulching, Hydromulching, and Hydroseeding

Application of mulch, on its own or through a hydraulic slurry with a tackifier, can immediately and effectively protect the soil surface from erosion. Including seed in the application can enhance germination and revegetation to further aid in the prevention of soil erosion.

29.9.6.9 Revegetation

The most effective and low maintenance method of preventing erosion is to revegetate exposed soils. Establishing permanent areas of vegetation or the temporary seeding of hardy, fast growing plant species can offer short- or long-term erosion control. Factors to consider when revegetating for erosion control include plant species suitability, slope, aspect, growth medium, and long- and short-term goals.

29.9.6.10 Silt Fencing

Silt fencing is a suitable method of minimizing diffuse soil erosion on gentle slopes. Silt fencing is used to protect downslope areas and prevent further movement of the sediment being transported. In certain locations, straw bales (certified weed-free) can be used to intercept slow-moving sediment on gentle slopes.

29.9.6.11 Sheeting

Impermeable polyethylene sheets can offer immediate and temporary erosion prevention. Their use is suited for emergency responses or for short term protection in an area where the sheets will not be disturbed. Polyethylene sheets are susceptible to tearing or movement by wind and heavy rainfall events. They also require continual inspection and maintenance until more permanent erosion control measures can be implemented.

29.9.6.12 Dust Control

Soil erosion by wind can cause the transportation of fine-textured material from roadways and stockpiles into water bodies. Liquid calcium chloride or water may be applied to road surfaces or other areas at risk to wind erosion.

29.9.7 Monitoring and Maintenance Program

All aspects of the erosion control and sediment retention program will require periodic monitoring for efficacy and maintenance to ensure sediment retention is being achieved. This will ensure that replacement and repairs of materials and works are conducted as soon as required to prevent degradation of the surrounding environment. Monitoring methods will include visual inspections and water quality monitoring for TSS. The monitoring locations and frequency will be dictated by permits issued by provincial and federal authorities.

Adjustments to the program may be required in response to changes in mine construction, operation, and closure activities. Best practice includes anticipation of the likely risks and being prepared for unusual circumstances.

29.9.8 Reporting Requirements

Reporting will be conducted as per future permits, approvals, and authorizations relevant to erosion and sediment control and will be delivered to the Mine Manager and/or delegates. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.9.9 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the ESCP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.9.10 Review of Plan Effectiveness

Certain components of the ESCP may need to be modified based on site experience or changes in legislation or best practices. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Formal evaluations of this plan will be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.10 Explosives Management Plan

29.10.1 Introduction

The Explosives Management Plan forms part of the Project's EMS. The Explosives Management Plan addresses transportation, storage, and use of explosives during relevant phases of the Project. Prior to construction, IDM will revise the Explosives Management Plan to include additional details relating to explosive transportation, manufacturing, storage locations, contractor certifications, explosives handling, employee training programs, work instructions, inspections, reporting, documentation, and details of continual improvement initiatives.

29.10.2 Scope and Objectives

The intent of the Explosives Management Plan is to ensure explosives are transported, stored, manufactured, and used in a safe and secure manner to not cause unintended negative effects. The objective of the Plan is to have no accidental release to the environment and cause no accidental harm to property or persons.

Certain procedures in the Explosives Management Plan overlap with other Project management plans, including:

- ERP;
- HMMP;
- Waste Management Plan; and
- SCP.

29.10.3 Applicable Legislation and Guidelines

The *Explosives Act* (1985b) regulates manufacturing, storage, importation, sale, and transportation of explosives. The *Explosives Act* is administered by Natural Resources Canada (NRC). Section 7(1)(a) of the *Explosives Act* requires NRC to issue a licence to manufacture and store explosives. Licence application requirements include type and volume, transportation means, storage facilities, use, safety, and operational plan that details efforts to minimize unintended outcomes. In addition to the *Explosives Act*, the following regulations and guidelines pertain to explosives:

- Explosives Regulations (SOR/2013-211);
- BC *Mines Act* (1996a);
- The Code (BC MEM 2017);
- *Railway Safety Act* (1985c);
- Ammonium Nitrate Storage Facilities Regulations (CRC. C. 1145);
- *Transportation of Dangerous Goods Act* (1992);
- Transportation of Dangerous Goods Regulations (SOR/2001-286); and
- Guideline for Bulk Explosives Facilities (NRC 2014).

29.10.4 Relevant Project Activities

Explosives will be required for construction and operations but are not anticipated for closure and reclamation and post-closure phases. Explosives will be used during construction of major infrastructure, such as the process plant pad foundation, Access Road and Haul Road. Ammonium nitrate (AN) and fuel oil (FO) would be used as the explosive for quarries. Emulsions and gel-stick types of explosives will be used where appropriate (i.e., exposure to water). Ammonium nitrate will be stored on site in a 30 tonne silo. Ammonium nitrate will be mixed with diesel oil at the blast hole using a bulk ammonium nitrate and fuel oil (ANFO) truck.

During the Construction Phase, ANFO quantities of approximately 1,000 kg to 10,000 kg will be used daily; larger quantities may be required for individual blasts depending on the design and location. Blasting may be conducted on a daily basis, at approximately 3,000 to 5,000 m^3/day. Temporary explosives magazines may be required during construction, and will be located at safe distances from active work sites and infrastructure as is mandated by the Explosives Act (Canada). During the Operation Phase, bulk emulsion will be stored on surface in a 20,000 kg magazine and underground in a 36,000 kg magazine. This will provide explosives storage for up to 28 days to reduce the risks associated with transporting explosives during poor weather conditions.

Explosives and explosive detonators will be stored in separate, approved magazines located a safe distance from one another and with appropriately sized berm or barrier (if required) between them as is mandated by the Explosives Act (Canada). The surface storage location will have appropriate signage and barriers to prevent unauthorized entry. The underground storage location will be secured in a bay off the decline, accessed by a controlled lockable gate. Open flames and smoking will be prohibited within 10 meters of the magazine storage area. The magazines will be equipped with fire extinguishers, wooden shelves, and concrete floor.

The handling of explosives will be conducted by a licenced operator (the Explosives Operator). This operator will be responsible for obtaining licences and permits associated with the use, manufacture, and storage of explosives. IDM and the Explosives Operator will adopt BMPs for blasting and the handling of explosives to avoid spillage and minimize explosives residue remaining after blasting, thereby lowering the potential for contamination.

29.10.5 Protection Measures

IDM employees and contractors will follow the requirements of the *Explosives Act* (1985b), Ammonium Nitrate Storage Facilities Regulations, Transportation of Dangerous Goods Regulations, Guidelines for Bulk Explosives Facilities, and the Code (BC MEM 2017).

The Mine Manager will assign authorized persons to undertake inspections of the explosive storage facilities and magazines. The authorized persons will ensure that the explosives, magazines, and associated devices and equipment are locked and secured when not in use, that record keeping is up to date at all times, and that the areas will be keep clean, dry, and will not be used to store expired, used, or damaged material.

Explosive storage and use areas will be smoke free and clearly demarcated to restrict access. Only personnel with proper certification will be allowed within the explosive storage and use areas. IDM will engage a third party to construct and operate explosives manufacturing facility(s). The facility will be secured with berms on three sides.

IDM and the Explosives Operator will be guided by BMPs for blasting and the handling of explosives with the goal to avoid spillage and minimize ammonium residue remaining after blasting, thereby lowering the potential for ammonium contamination. It is understood that ANFO is not water-resistant and its use should be avoided if contact with water if very likely. IDM will use commercially available explosives that are able to withstand exposure to water when conditions warrant. Water-resistant explosives are available in gels and emulsions. Bulk forms of emulsions are also available and can be manufactured on site.

Some blasting is expected to occur near fish-bearing waters during construction. Noise, vibrations, and possible blasting residue could enter the watercourse and have adverse effects on fish and the aquatic environment if special care is not taken. To reduce any potential effects to fish and/or fish habitat, all blasting operations near fish-bearing water will follow the requirements established in the DFO Guidelines for Use of Explosives In or Near Canadian Fisheries Waters (Wright & Hopky 1998):

- No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change greater than 100 kilopascals in the swim bladder of a fish;

- No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm per second in a spawning bed during the period of egg incubation; and

- Blast mats must be used to prevent fly-rock from entering the watercourse.

The Explosives Operator with take care to ensure that excess product in augers, hoses, and other dispensing equipment is recovered for subsequent use or proper disposal. Controlling explosive spillage when filling blast holes is key to reducing the amount of material released into the environment. If water comes into contact with explosives, that water will be contained and managed to prevent the release of explosives into the environment. This includes exposing explosives to precipitation. Attention to blasting efficiency and full denotation will be given and the blasting plan, e.g. number of boosters will be varied to ensure highly efficient blasts are carried out. Communication between borehole drillers and those responsible for loading the boreholes will be standard procedure as feedback from drillers can assist and the proper loading of boreholes. For example, boreholes with fractures or openings may require additional stemming to ensure an efficient blast.

29.10.6 Adaptive Management

The above will be implemented as protective measures. Prior to construction, the Explosives Management Plan will be revised with additional detail. The Explosives Management Plan will be reviewed on a regulator basis. The procedures will be compared to revised regulations and or guidelines to ensure they are up to date. Inspections and audits will help identify opportunities for improvement and overall effectiveness of the Explosives Management Plan.

29.10.7 Monitoring Program

The Mine Manager will oversee the tracking and monitoring of magazine inventories, explosives, and ammonium nitrate received at the mine. The Explosives Operator will directly monitor quantities received and consumed and reconcile results with manifests. Inspections will also be initiated by IDM to audit inventory records and overall management of explosives and associated materials on site.

29.10.8 Reporting Requirements

Inventory tracking documents, manifests, audits, etc. will be part of internal reporting and as required by the EMS. Regulatory authorities will be notified if inventories do not match logbooks and tracking records. The Chief Inspector of Mines will be notified if an explosives-related safety incident occurs. As per the *Mines Act* (1996a), the Mine Manager is required to notify the Chief Inspector of Mines.

29.10.9 Roles and Responsibilities

The Environmental Superintendent will be responsible for the oversight of the Explosives Management Plan. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.10.10 Review of Plan Effectiveness

Certain components of the Explosives Management Plan may need to be modified based on site experience and conditions. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Most importantly, review of this plan shall include any aspects affecting protection of the environment, property, and persons.

Formal evaluations of the Explosives Management Plan shall be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.11 Fuel Management Plan

29.11.1 Introduction

The Fuel Management Plan (FMP) is one of many plans that form part of the Project's EMS. The EMS forms the basis of how IDM intends to minimize to an acceptable level the risk of negative environmental effects during all phases of the Project. The FMP refers to the transportation, handling, and storage of diesel, gasoline, propane, and jet fuel.

Prior to construction, IDM will advance the FMP to include details including figures with fuel storage and handling locations, employee training programs and certifications, work instructions, inspections, reporting, documentation, and details of continual improvement initiatives.

29.11.2 Scope and Objectives

Protecting the environment from the potential effects of fuel requires the implementation of procedures for transportation, storage, and handling of fuel products; procedures for inspection, documenting, and reporting; and procedures for review and continual improvement of the FMP throughout the mine life.

The intent of the FMP is to ensure that activities involving fuels are undertaken in such a way that minimizes the risk of an accidental release into the ground or water. The objective is to have no "reportable" fuel releases. A reportable release is defined in Spill Reporting Regulation (BC Reg. 263/90) within the BC *Environmental Management Act* (2003a). If there is a reportable release to ground or water, then the objective of the FMP has not been met, and thus a re-assessment of the plan will be directed by the Mine Manager.

Response to fuel spills and emergencies are addressed under the SCP and ERP, respectively. Health and safety aspects of transporting, handling, and storing fuels are addressed in the Occupational Health and Safety Plan. The Explosives Management Plan includes management of ANFO.

29.11.3 Applicable Legislation and Guidelines

Fuel facilities shall be operated and maintained according to the following statutes, industry standards and codes of practice:

- BC *Environmental Management Act* (2003a):
  - Spill Reporting Regulation (BC Reg 263/90);
  - Spill Cost Recovery Regulation (BC Reg 250/98);
  - Petroleum Storage and Distribution Facilities Storm Water Regulation (BC Reg 168/94);
- BC Mines Act (1996a):
  - Health, Safety and Reclamation Code for Mines in BC (BC MEM 2017);
  - Workplace Hazardous Materials Information System Regulation (BC Reg 257/88);
- BC Building Act (2015b):
  - BC Fire Code Regulations (BC Reg. 166/2013);
- BC Workers Compensation Act (1996j):
  - Occupational Health and Safety Regulation (BC Reg 296/97), Part 5 WHMIS;
  - Fisheries Act (1985a);
- Transportation of Dangerous Goods Act (1992):
  - Transportation of Dangerous Goods Regulations (SOR/2001-286);
  - Underwriters Laboratories of Canada and Canadian Standards Association; and
  - A Field Guide to Fuel Handling, Transportation & Storage (BC MWLAP 2002).

29.11.4 Relevant Project Activities

Gasoline and diesel will be used throughout the Project area and stored in various locations. Propane will be used for temporary and permanent facilities for space heating. Propane will be stored in both portable and permanent containers.

Fuel storage is designed with capacity for 140,000 L of diesel. This will be delivered as needed from the town of Stewart and stored in an Enviro-Tank. Surface mobile equipment will fuel-up at the storage tank, and fixed equipment will be supplied by the fuel truck. The fueling station will be equipped within a lined and bermed area to contain minor spills or leaks during refuelling. The liner (e.g., 40 mm High-density polyethylene (HDPE) liner or equivalent) will be protected by aggregate bedding. Vehicles and mobile equipment will drive onto this bedding for refuelling. Fuel transfer is done by pumps.

The refuelling area will be provided with standard instrumentation and controls to monitor and safely manage the inventory in the tanks. Fuel storage areas and vehicles will be equipped with spill kits for emergency response. Each spill kit contains the appropriate type, size, and quantity of equipment for the volume/type of product present in the storage.

Diesel will be used by motor vehicles and mining equipment on the site. Limited quantities of propane and gasoline will be used in maintenance facilities for smaller motorized equipment and machinery.

29.11.5 Environmental Protection Measures

The environmental protection measures relating to fuel management include reasonable procedures aimed at minimizing the risk of a negative environmental effect (i.e., release to ground or water) and equipment and storage facilities designed with best available technology to minimize the risk of the release of fuel to the environment.

29.11.5.1 Fuel Transport

Fuel will be delivered to site by third party supplier with proper certification and training in fuel transport. Fuel suppliers will be required to provide documentation supporting their authority to transport fuel and present their procedures and measures to minimize the risk of accidental release of fuel. Fuel will be delivered by tanker trucks from Stewart.

Fuel shipments will include material safety data sheet (MSDS) and manifests. Fuels will be properly secured and labelled during transport. The third-party supplier will be responsible for the fuels during transport to Bromley Humps and the Mine Site will be required to complete necessary documentation relating to Transportation of Dangerous Goods Regulations. Drivers will be required to complete a site orientation prior to or upon arrival to site. Planning of delivery timing will consider weather and road conditions and availability of appropriate transportation equipment and personnel.

29.11.5.2 Fuel Storage

Fuel will be stored away from ignition sources and environmentally sensitive areas, with consideration of site drainage and surface flows and pathways to the nearest waterbody. The designated storage sites are one 20,000 L fuel tank (Lower Portal) at the Mine Site and one 100,000 L fuel tank at Bromley Humps. These storage sites will be well ventilated, and the areas will be designated as non-smoking. Sites will be equipped with spill kits and anti-spill devises like drip pans, interceptor drains, high level sensors, and one-way valves. Access to the fuel storage areas will be controlled and/or restricted. Transfer from tanker trucks to tanks at the fuel storage facilities will be done using enclosed lines, hoses, and pumps. Diesel and gas will be delivered to larger storage tanks on site by commercial purpose designed tanker trucks equipped with the necessary instrumentation to ensure no spills.

29.11.5.3 Fueling Handling

Fuel dispensing personnel will receive training and must demonstrate an understanding of the procedures and work instructions. Key components to be included in the fuel handling procedures include:

- Fuel dispensing areas to be covered, where practical, to prevent accumulation of snow or rainwater;
- Fuel dispensing system will meet applicable regulations and codes;
- Precipitation will not be allowed to accumulate within containment area;
- Monitoring and reporting of any release (reportable or not) should they occur;
- Oil/water separators installed where necessary;
- Measures to ensure no overfilling of tanks;
- Fuelling to be conducted outdoors;
- Dispensing fuel with approved hose-reel and automatic closing nozzles;
- Valves at the storage tank must be constructed of steel according to the Fire Code;
- An automatic shut-off nozzle must be used when using an integral hold-open device; and
- Tanks must not be filled beyond their safe filling level.

29.11.5.4 Adaptive Management

The above procedures will be reviewed on a regular basis. The procedures will be compared to revised regulations and or guidelines to ensure they are up to date. Inspections and audits will help identify opportunities for improvement and overall effectiveness of the FMP. A reportable release of fuel to ground or water will trigger a full review of the FMP.

29.11.6 Monitoring Program

Monitoring fuel inventories, inspecting equipment, and documenting said tasks are key component of the FMP and IDM's commitment to continual improvement.

29.11.6.1 Fuel Inventory

Fuel products transported to and moved within the mine site and storage facilities shall be inventoried regularly. This shall include reconciliation of total amounts received against amount ordered and measuring fuel volumes and use during distribution to bulk tanks.

29.11.6.2 Facility Monitoring and Preventative Maintenance

Fuel tanks and fueling equipment shall be kept in good operating condition. Facility monitoring, preventative maintenance activities, and procedures shall be undertaken to prevent inadvertent releases of product to the environment, including, but not limited to:

- Equipment and light vehicle operators shall conduct regular visuals to ensure equipment integrity, cleanliness, and the adequacy of spill prevention material;
- Fuel tanks shall be visually-monitored for signs of leakage, which includes looking for signs of corrosion, staining on the ground, and cracks or breaks in hoses and other ancillary equipment during the visual inspection;
- Signs of fuel tanks shall be present, visible, and legible;
- Piping shall be protected from traffic;
- Containment areas shall be kept clear of debris, snow, ice, or standing water; and
- Emergency pumps and/or skimmers shall be tested on a regular basis.

29.11.6.3 Inspections & Leak Detection

Every storage tank, piping system, and sump at fuel dispensing stations in service shall be monitored for leaks in accordance with minimum frequency requirements and tested when a leak is suspected.

29.11.7 Reporting Requirements

Records of inspections shall be kept on site, including summaries of the reconciled bulk inventory, fuel use summaries, reconciliation for each storage tank, overfill alarm tests, pressure tests (if relevant), inspections and maintenance checks, any alteration to the system, reports of leaks and loses, and records of training.

Records will be kept of all tests, inspections, maintenance, and operational procedures. Records of all leak tests will be retained and available for inspection as follows:

- Initial verification and commissioning tests shall be retained for the life of the system;
- In-service monitoring tests and leak investigation tests shall be retained for a minimum of two (2) years, but at least the latest and immediately prior tests shall be retained on file.

An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.11.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the FMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.11.9 Review of Plan Effectiveness

Certain components of the FMP may need to be modified based on site experience. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Most importantly, review of this plan shall include any aspects affecting protection of the environment.

Formal evaluations of the FMP shall be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.12 Hazardous Materials Management Plan

29.12.1 Introduction

IDM intends to use, generate, and dispose of hazardous materials as part of the Project's Construction, Operation, Closure and Reclamation, and Post-Closure Phases. The purpose of this Hazardous Materials Management Plan (HMMP) is to provide a framework for the management of hazardous materials, including performance objectives to be achieved and safe practices and procedures to be employed. The information contained in this plan is at a level of detail appropriate for the Application/EIS and will be further developed during permitting.

29.12.2 Scope and Objectives

In Canada, hazardous materials and hazardous recyclable materials are defined as those with properties such as flammability, corrosiveness, or inherent toxicity (Canadian *Environmental Protection Act* 1999), while dangerous goods are a schedule designation under the *Transportation of Dangerous Goods Act* (1992) under Classes 2 to 6, and 8 to 9, that are no longer used for its original purpose and are intended for storage, treatment, recycling, or disposal. These materials are the scope of this management plan, except for Class 1 materials (Explosives), which are discussed in the Explosives Management Plan, and fuels which are discussed in the FMP. Both definitions overlap in the types of substances. The applicable classifications under the *Transportation of Dangerous Goods Act* (1992) which are included in this plan are:

- Class 2 – Gases;
- Class 3 – Flammable liquids;

- Class 4 – Flammable solids;
- Class 5 – Oxidizing substances and organic products;
- Class 6 – Poisonous (toxic) and infectious substances;
- Class 8 – Corrosives; and
- Class 9 – Miscellaneous products or substances.

A hazardous waste does not include materials that are household in origin, Class 7 materials, radioactive materials, an empty container, or material intended for disposal in a sewage system or landfilling. The WMP provides the framework for waste in more detail.

A more detailed HMMP will be developed to identify and monitor potentially hazardous materials with regard to safety and the environment. Transportation, storage, use, and disposal will be considered for each stage of Project life. Safety to the workers and the surrounding communities will determine each stage of materials handling.

A variety of supplies and materials classified as potentially hazardous will be required during each phase of the Project. Example materials included in this plan include:

- Unused chemical reagents;
- Used oil;
- Used glycol; and
- Hazardous vehicles and equipment parts (e.g., fuel tanks, gear boxes, or hydraulic oil).

The goal of the HMMP is to protect human health, safety, and the environment, including aquatic and terrestrial species and their habitats, from adverse effects from harmful hazardous materials. Performance objectives have been established to achieve this goal:

- A goal of zero reportable hazardous material incidents will be established and communicated to all workers, achieved through the implementation of an effective management strategy and environmental protection measures for the handling, transportation, and storage of hazardous materials;

- A WHMIS will be implemented prior to construction that will continue to the Post-Closure Phase; and

- Safe and efficient inspection procedures will be implemented in all Project phases that confirm compliance and effectiveness.

Information regarding hazardous waste management is provided in the WMP.

The HMMP is supported by several other environmental management plans, which are referenced throughout the HMMP as appropriate, including but not limited to the WMP, FMP, Explosives Management Plan, SCP, OHSP, and the ERP.

29.12.3 Applicable Legislation and Guidelines

Development and implementation of the HMMP will be guided by several provincial and federal acts, regulations, and BMPs applicable to aspects of hazardous materials management:

- *Environmental Management Act* (2003a);
- Hazardous Waste Regulation (BC Reg. 63/88);
- Spill Reporting Regulation (BC Reg 263/90);
- *Public Health Act* (2008);
- *Fisheries Act* (1985a);
- *Water Sustainability Act* (2014);
- *Mines Act* (1996a);
- Workplace Hazardous Materials Information System Regulation (Mines), BC Reg 232/2005;
- The Code (BC MEM 2017);
- Petroleum Storage and Distribution Facilities Storm Water Regulation (BC Reg. 168/94);
- *Canada Transportation Act* (1996l);
- *Canadian Environmental Protection Act* (1999);
- *Nuclear Safety and Control Act* (1997a);
- *Hazardous Products Act* (1985d);
- Controlled Products Regulations (SOR/88-66);
- *Hazardous Materials Information Review Act (*1985e);
- *Transportation of Dangerous Goods Act* (1992);
- Transportation of Dangerous Goods Regulations (SOR/2001-286);
- Ministry of Water, Land and Air Protection's publication A Field Guide to Fuel Handling, Transportation and Storage (BC MWLAP 2002); and
- WHMIS (WorkSafeBC 2015).

The Project will put into place operational policies and procedures (i.e., SOPs) which meet or exceed the requirements of the applicable legislation and authorizations. These SOPs will be developed during permitting and prior to the Construction phase of the Project.

29.12.4 Relevant Project Activities

Hazardous materials will be required on the Project site throughout the life of the mine, except the Post-Closure phase which only has materials associated with monitoring. During Post-closure, there will be no storage of materials on site. MSDS's will be required for each of these products prior to their delivery to the Project site. Most of the products will be consumed on site, but some (e.g., hydraulic fluid and batteries) will require disposal after use.

The typical types of hazardous materials anticipated by Project phase, along with their use, are provided in Table 29.12-1.

Table 29.12-1: Potential Hazardous Materials Used or Generated by Project Phase

Product	Used or Generated	Project Phase
Used petroleum products or new fuel/lubricants/oils/ greases	Regular use and maintenance of Project vehicles and machinery will require the periodic replacement of products such as fuel, lubricants, oils, and greases. Wastes from these products will also require management.	• Construction • Operation • Closure and Reclamation
Oil and fuel filters; hydraulic fluid	Regular preventive maintenance of Project vehicles and machinery will require the periodic replacement of hydraulic fluid, oil, and fuel filters in the on-site maintenance facilities.	• Construction • Operation • Closure and Reclamation
Used sorbents and rags	Used sorbents and rags may be generated from regular maintenance and occasional spill response activities.	• Construction • Operation • Closure and Reclamation
Empty petroleum hydrocarbon containers and drums	Empty petroleum hydrocarbon containers and drums will be stored and returned for recycling and disposal. Empty containers will also be used for the containment of spent or used products, such as oil, glycol, and hydraulic fluid.	• Construction • Operation • Closure and Reclamation
Ethylene Glycol	As a result of the regular use of glycol, spent or contaminated glycol will be generated. The types of waste generated within this category will include: • Glycol solutions from heat recovery and building HVAC. • Waste antifreeze from vehicles and equipment. • Used glycol products.	• Construction • Operation • Closure and Reclamation

Product	Used or Generated	Project Phase
Sodium cyanide and other process reagents	Process reagents to be stored onsite include hydrated lime, sodium cyanide, activated carbon, sodium hydroxide, hydrochloric acid, sulphur, copper sulphate, sodium metabisulphite (SMBS), flocculant, lead nitrate, and anti-scalant.	• Operation
Tailings supernatant	Tailings supernatant, containing cyanide and elevated metals, will be located at the Tailings Management Facility (TMF).	• Operation • Closure and Reclamation
Laboratory chemicals and reagents	Laboratory chemicals and reagents will be stored onsite for use mainly during the Operation Phase, with minor amounts used for environmental sample preservatives during the Construction, Closure and Reclamation, and Post-Closure Phases.	• All Project phases
Paints and Solvents	Paints and solvents such as cleaning agents (degreasers), oil-based paints, and paint thinner and industrial glues will be used and stored at the on-site maintenance facility.	• Construction • Operation
Fluorescent light bulbs	Used florescent light tubes are expected to be generated by the Project.	• Construction • Operation • Closure and Reclamation
Electronics and electrical waste	Electrical devices will be used at the Project site, some of which may be hazardous which will require proper handling, recycling, and disposal.	• Construction • Operation • Closure and Reclamation
Batteries	Various types of batteries will be used on-site and stored at the on-site maintenance facility.	• Construction • Operation • Closure and Reclamation
Surfactants	Product used at the mineral processing facility.	• Operation
Biomedical	Biomedical waste will be generated from human health care and personal health requirements on site, such as First Aid rooms.	• Construction • Operation • Closure and Reclamation

29.12.5 Environmental Protection Measures

29.12.5.1 Hazardous Materials Planning

This management plan addresses the regulatory arrangements for transportation of hazardous materials to and from the Project site and their proper and safe storage and use.

An inventory of hazardous materials is a key element of this management plan. The inventory will list all chemicals on site and will include MSDS and WHMIS information on the products to ensure that Project personnel have all the necessary information for their safe transportation, storage, use, and disposal. Before any chemical is brought to the site, the supplier or contractor will supply a MSDS for the product. Commercial, consumer products, such as those purchased at a hardware store, will be exempt.

Minimizing the risk of safety infractions and environmental adverse effects from accidental releases of hazardous materials will include the following practices:

- Knowing which hazardous materials are on site via an inventory system;
- Understanding the adverse human health and environmental effects associated with the storage and handling of hazardous materials;
- Assigning roles and responsibility for managing hazardous materials;
- Implementation of reasonable controls and procedures to minimize escape of hazardous materials under all circumstances of all Project phases;
- Minimizing the use and generation of hazardous materials;
- Constructing safe storage facilities to appropriately contain the materials;
- Implementing the ERP to minimize environmental effects from potential uncontrolled discharge of contaminants; and
- Monitoring and reporting any and all discharges and ensuring accurate record keeping.

Materials will be stored in appropriate containers within suitably contained areas (see Section 29.12.5.4).

All the process reagents will be prepared in a separate reagent preparation and storage facility in a containment area. The reagent storage tanks will be equipped with level indicators and instrumentation to prevent spills from occurring during Operations. Appropriate ventilation and fire and safety protection will be provided.

The following will be implemented as reasonable avoidance, control, and mitigation actions in the management of hazardous materials:

- Manufacturers of hazardous products used for the Project will provide safe packaging and appropriate labelling;
- Chemical storage areas would be designated as non-smoking areas and located away from food storage areas;
- Storage areas would be appropriately climate-controlled, i.e., dry and well-ventilated;

- Containers holding hazardous materials will remain sealed until required use to prevent accidental leakage or spillage;

- Incompatible chemicals will be stored separately to prevent chemical reactions and cross-contamination;

- All workers handling dangerous goods will be trained and provided with personal protective equipment and required to wear it as appropriate; and

- All bulk chemical storage sites will be constructed with concrete or lined floors and walls capable of containing appropriate volume and as stipulated by appropriate legislation or permits.

The SCP provides additional information on response in the event of a hazardous material spill. A communication system will be implemented to facilitate rapid notification of any observed spills, and workers will have basic spill response training appropriate to their positions, with trained emergency response team members specifically trained to contain and recover spills. Storage areas and transfer stations will have spill kits appropriate for the materials being handled. Spill kits will be stationed at appropriate locations at the Project site and equipped with appropriate equipment.

29.12.5.2 Management Options of Petroleum Products and Reagents

29.12.5.2.1 Petroleum Products

Petroleum products likely have the highest risk potential for a spill or accidental release due to their frequency of use. Hydrocarbon transportation, storage, and use will be outlined in the SCP. This policy will highlight the need for the following:

- Proper containers for each application;
- Secondary containment for all liquid hydrocarbons;
- Clear procedures for safe transfer between containers and equipment;
- Constraints on refueling in sensitive areas, such as wetland or riparian areas;
- The use of drip pans for stationary equipment; and
- Requirement for spill containment and response plans and equipment.

Regular inspections of facilities and activities by designated and trained workers will reinforce policy compliance and will be recorded and reported to the Mine Manager (see Section 29.2.8). Workers will require training on the policy and procedures before being permitted to transport, store, or use hydrocarbons.

Diesel fuel pipelines will be equipped with leak detection systems and automatic shut-off valves, as appropriate, and related safety provisions will use technologies that will be consistent with regulations governing petroleum product pipelines.

Guidelines relating to the safe handling, transportation, and storage of hazardous materials will be followed, including the Code (BC MEM 2017) and A Field Guide to Fuel Handling, Transportation and Storage (MWLAP 2002). Secondary containment and appropriate lining

with oil/water separators will be implemented as appropriate. High-level alarms for tanks and sumps will be used as appropriate. Transfers from tanker trucks to tanks at the fuel storage facilities will be conducted using enclosed lines, hoses, and pumps and spill kits will be located at storage and transfer locations as appropriate.

Petroleum-based products, such as oils, lubricants, degreasers, and solvents, will be transported by truck to the Project site in drums. These will be stored in a secure area. Fuel transfer procedures will include reasonable practices to avoid and minimize spillage, and, if spills occur, procedures for reporting spills or accidents immediately (see the SCP). Hydrocarbon spills will be collected, and any contaminated soils or overburden materials will be bioremediated on site where practicable. Off-site bioremediation will be considered, depending on the severity of the contamination.

29.12.5.2.2 Reagents

All the reagents will be prepared in a separate reagent preparation and storage facility with containment, and storage tanks will be equipped with level indicators to aim at minimizing spills. Proper ventilation and fire and safety protection, including personal protection equipment, will be provided at the facility. Reagents will be clearly labelled with MSDSs available. The following reagents are expected for use at the Process Plant and will be properly stored at the Project site:

- Sodium cyanide;
- Activated carbon;
- Hydrated lime;
- Flocculant;
- Sodium hydroxide;
- Sulphur;
- Hydrochloric acid;
- Copper sulphate;
- Sodium metabisulphite (SMBS);
- Lead nitrate; and
- Anti-scalant.

29.12.5.2.3 Cyanide

The disposal and discharge of cyanide into the environment at mine sites is regulated provincially through the use of permits and licenses. In addition, the cyanide concentration of effluent leaving a metal mining operation must be below the maximum allowable as prescribed by the MMER under the federal *Fisheries Act* (1985a).

Cyanide is toxic in large doses and is strictly regulated in most jurisdictions worldwide to protect people, animals, and the aquatic environment. Many jurisdictions, including Canada, recommend that mines that use cyanide do so in a manner consistent with the International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide (International Cyanide Management Institute 2015a). Cyanide transportation, storage, and use for the Project will be consistent with the International Cyanide Management Code principles and standards of practice, e.g., purchasing cyanide from safe and responsible

manufacturers, handling and storage design conducted to prevent releases, and implement the ERP and SCP to effectively contain potential spills and protect human health and the environment. IDM will follow these principles and standards of practices. This involves minimizing the amount of cyanide used; designing measures to protect surface and groundwater; designing and operating systems that reduce cyanide levels in effluent; and preventing spills. Cyanide will only be used to recover gold, and the Process Plant will incorporate cyanide detoxification prior to release to the TMF. Cyanide-containing effluent will be analyzed and treated as required prior to discharge to the receiving environment to ensure cyanide concentrations are below the maximum authorized limits as outlined in the MMER (SOR/2002-222) under the *Fisheries Act* (1985a).

Appropriate emergency response plans will be implemented for cyanide transporters, and detailed cyanide management plans will be developed, including measures to protect human health and the environment from direct and indirect discharges of cyanide process solutions to surface water. Handlers of cyanide will have thorough training.

29.12.5.3 Transportation

From the start of the Construction Phase to the Closure and Reclamation Phase, transport of hazardous material from site and disposal will be contracted to licensed contractor(s) who will have adequate certification for the transportation, handling, and disposal of hazardous materials. The transport of hazardous materials will require the following approach:

- Designated materials will have MSDSs available;
- Fire extinguishers and fire prevention materials transported will be used as appropriate;
- Containers will be:
  - Appropriately sized for the material being shipped;
  - Properly secured; and
  - Properly marked, labelled, and placarded; and
- Workers responsible for working with hydrocarbons will receive training in proper operating procedures and emergency response.

29.12.5.4 Storage

Hazardous materials will be stored at the Hazardous Materials Storage Area at Bromley Humps. Hazardous materials will be safely secured and clearly labelled. An accurate and detailed inventory of hazardous materials on the Project site will be implemented, maintained, and audited. Copies of MSDSs will be kept in an easily accessible location at every site where related dangerous goods or hazardous materials are stored, in addition to the first aid office for reference in an emergency.

29.12.5.5 Disposal

Disposal of surplus or hazardous waste materials will be guided by the WMP. Surplus materials will be collected, packaged, labelled, and shipped to appropriate off-site disposal

facilities. MSDS information and input from suppliers will be referenced to guide the disposal process. Disposal activities will be inspected by a designated person, and inspection reports will be directed to the Environmental Superintendent who will report to the Mine Manager.

29.12.5.6 Training

IDM is committed to train those employees and contractors (workers) associated with transportation, storage, and use of dangerous goods and hazardous materials. All new workers will be provided basic training of the general issues and concerns surrounding the management of hazardous materials as part of their routine health and safety orientation and training. Additional specific training will be provided for workers in hazardous materials management; for example, workers responsible for transporting or storing hydrocarbons or fueling vehicles will receive training in proper operating procedures and emergency response. Basic and specific training will provide information on how to safely assess an incident, to implement the prescribed response, and to safely complete a follow-up, including any corrective action. Proper communication and reporting will be part of the training as well. Mandatory refresher training will also be implemented at reasonably schedule intervals. Written procedures will be revised as improvements are identified and tested.

29.12.6 Monitoring Program

The storage and use of hazardous materials will be inspected regularly for leaks, non-compliance of policies, plans, and procedures. Inspections will cover on-site facilities, such as pipelines, tanks, connections, valves, gauges and meters, sumps, and separators. Proper documentation of inspections will be conducted, including inventories, manifests, and logbooks, and tracked and audited. The frequency of scheduled inspections will depend on the relevant policies, plans, and procedures.

The HMMP will be reviewed annually for optimal effectiveness. Emergency or spill incidents will be reported per the requirements of the ERP and SCP.

29.12.7 Reporting Requirements

Reporting will be conducted as per future permits, approvals, and authorizations relevant to hazardous materials management and will be delivered to the Mine Manager and/or delegates. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.12.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the HMMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

Specific additional training in hazardous materials management will be provided to identify workers prior to working with any hazardous materials management, or within a reasonable time if their current training level safely allows the specific training to be delayed.

29.12.9 Review of Plan Effectiveness

Certain components of the HMMP may need to be modified based on site experience or changes in legislation or best practices. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Formal evaluations of this plan will be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.13 Health and Social Services Plan

29.13.1 Introduction

This Health and Social Services Plan (HSSP) aims to address two potential effects of the Project. First, that the proximity of the Project's workforce to the community of Stewart has the potential to place demands on the limited health and social resources available to this remote community with implications for local residents. Second, there is a potential for the development or worsening of social and related health issues in Stewart that are linked directly or indirectly to the Project and the Project's workforce.

Requirements and configurations of supplemental health and social services will vary across the different phases of the Project. During the Construction Phase, the Project will operate a camp in Stewart with capacity to house approximately 250 employees. The majority of the Project's construction workforce will be non-residents of Stewart and will fly-in and fly-out or bus-in and bus-out (FIFO/BIBO) from their respective communities. This workforce will require access to occupational-based health services as well as non-occupational and non-urgent health care services.

During the Operation Phase, IDM will encourage employees and any dependent(s) to relocate to Stewart. The level of funding and resources provided by NHA for health care and related community and social services to any community in northern BC is based on the local resident population. It is expected that, eventually, health and social services in Stewart will be augmented by additional funding to reflect the anticipated increase in the resident population anticipated during operations.

The following outlines the components of the HSSP to be developed further in partnership with Northern Health Authority (NHA), service providers, working group members, and other stakeholders.

29.13.2 Scope and Objectives

This HSSP outlines IDM's commitment to working with NHA, service providers, and other stakeholders to support the delivery of sufficient and appropriate social and health services to employees, families, and local community members and to avoid and minimize the adverse effects of the Project on health and social services.

The main goals of the HSSP are to:

- Outline how IDM will work with NHA to ensure that employees, their families, and local community members have access to appropriate health and social services to prevent and treat social and health issues that may arise as a result of the Project and Project workforce;
- Support the continued delivery of social and health services in Stewart; and
- Maximize the positive effects of the Project on community health and wellbeing while minimizing adverse effects.

To accomplish these goals the HSSP has the following objectives:

- Outline the corporate philosophy and supporting policies in support of a work culture that recognizes the importance of employee, family, and community health and wellness;
- Design and construct a camp and on-site infrastructure that meet regulations and incorporate up-to-date elements known to support healthy workplaces and worker wellbeing; and
- Define the health and social services and programs to be provided to the Project workforce during three key Project phases: the Construction Phase; the transition from construction to operation; and the Operation Phase.

For clarity, "employees" refers to direct IDM employees as well as any contractors or sub-contractors who are engaged by IDM on the Project and who are active in Stewart or on site.

29.13.3 Applicable Legislation and Guidelines

The HSSP includes IDM's commitment to meet or exceed provincial standards and requirements outlined in the applicable legislation and guidelines:

- BC *Mines Act* (1996a);
- The Code (BC MEM 2017);
- *Public Health Act* (2008);
- Industrial Camps Regulation (BC Reg. 70/2012);
- Sewerage System Regulations (BC Reg. 326/2004);
- Food Premises Regulation (BC Reg. 210/99);

- *Drinking Water Protection Act* (2001);
- Drinking Water Protection Regulation (BC Reg. 200/2003);
- *Environment Management Act* (2003);
- Municipal Wastewater Regulation (BC Reg. 87/2012);
- *Workers Compensation Act* (1996b); and
- Occupational Health and Safety Regulation (BC Reg. 296/97).

The HSSP is also be guided by:

- Health and Medical Services Plan, Best Management Guide for Industrial Camps (Northern Health 2015);
- National Standard of Canada Psychological Health and Safety in the Workplace (CSA Group and BNQ 2013);
- Psychological Health and Safety: Action Guide for Employers (Gilbert and Bilsker 2012);
- Healthy Workplaces Online Guide (Canadian Cancer Society);
- Best Practices Guiding Industry-Community Relationships, Planning, and Mobile Workforces (Community Development Institute 2015); and
- Working on Wellness Resources (BC Healthy Living Alliance, n.d.).

29.13.4 Corporate Philosophy and Policies

IDM will continue to develop a strong corporate philosophy to support the institutionalization of a work culture that recognizes the importance of employee, family, and community health and wellness and that encourages and enables access and use of available resources and services. This corporate philosophy will include a vision statement, values, principles to be upheld, and health and wellness objectives.

IDM will also develop several sub-policies that contribute to realization of the vision statement and health and wellness objectives. These may include the following:

- Pre-employment screening and processes to ensure employees are fit-for-duty, including fit-for-work policies;
- Drug and alcohol screening and testing policy;
- Substance abuse treatment and re-hiring policies;
- Expected behavior and conduct within the community policy;
- Anti-bullying and harassment policy;
- Chronic illness and disability management policies;
- Worksite healthy eating policy;

- Fatigue management policy;
- Sick and mental health days policy;
- Mental wellness policies; and
- Anti-discrimination and workplace diversity policy.

As with traditional occupational health and safety plans, everyone from corporate management to camp service staff play a role in developing a corporate culture that promotes health and wellbeing. IDM will establish clear roles, responsibilities, and processes for internal communication across the company to meet health and wellness objectives.

29.13.5 Health and Social Services Measures

29.13.5.1 Design Considerations for Camp and Other Facilities

IDM will design, develop, and operate a camp in Stewart for the 18-month Construction Phase, which will potentially remain during the transition period between Construction and Operation to support the relocation of Project employees and their families to Stewart. IDM recognizes that the camp has implications for employees' health outcomes and the potential spread of diseases. IDM is committed to designing the camp and Project facilities according to regulations and industry best practices as appropriate and in a way that promotes worker health and wellbeing.

IDM will develop a Camp Services and Health Plan (CSHP), as required, for the construction and operation of the camp. The CSHP will provide information on the design, construction, and operation of accommodation, sanitary facilities, drinking water systems, disposal and treatment of sewage, disposal of refuse, laundry facilities, recreation and leisure facilities, and food services. The Project will implement appropriate designs with the objectives of avoiding and minimizing adverse effects to employee health and wellbeing. Specific measures may include, but are not limited to, the following:

- Private bedrooms and common rooms constructed and designed to ensure adequate heat, ventilation, light (artificial and natural), space, and means of egress;
- Dorm room areas separated for night and day shift camp residents to reduce noise and sleep disruption;
- Separate drying room established away from bedrooms and food preparation and serving areas to promote health;
- Camp residents provided with personal storage facilities that are moisture-proof, lockable, and resistant to pests;
- Camp residents provided with reasonable access to laundry facilities. This includes provision of an adequate number of machines to support the camp;

- Flush toilets provided within an appropriate distance from each bedroom, equipped with efficient and sufficient ventilation, and constructed with durable and easily sanitized material;

- Hand washing, hand drying, and showering facilities designed to accommodate the number of camp residents housed and be designed with adequate space to allow camp residents to dry and dress in a private space;

- Food services provided at camp with food services locations located at appropriate distances from wastewater facilities; and

- Recreation and leisure facilities, including fitness areas, social rooms, quiet rooms, games rooms, and outside recreation areas.

29.13.5.2 Project Health and Social Programs and Services

Select health and social services will be made available to Project employees both in camp and on site to reduce potential burdens on health and social services currently available in nearby communities. These services will cover the Construction Phase, the transition from construction to operations, and to a lesser extent the Operation Phase (depending on the capacity for service providers in Stewart to respond to the changing population). Services to be provided should focus on health and medical care services, trauma care and emergency response, and health and wellness promotion programs.

29.13.5.2.1 Medical and Emergency Response

IDM will work closely with emergency services based in Stewart, including the volunteer fire department, the RCMP, BC Ambulance, and NHA, to develop a detailed Emergency Response Plan. The emergency procedures are also outlined in the Emergency Response Plan.

Management processes for medical escalations and traumas that cannot be treated on site or at camp will be fully developed with input from partners and service providers. IDM will work with NHA to assess the potential need for additional emergency service personnel, ambulances, and, if necessary, medivac. Terrace emergency room personnel and doctors will also be consulted on their resources and recommendations for procedures.

29.13.5.2.2 Wellness Programs and Services

A proactive approach will be taken to avoid and minimize the development or exacerbation of potential social issues and their related effects on health and wellbeing. Services and programs that will be provided include wellness, lifestyle, and life skills training, regular wellness messaging and communication, provision of recreational opportunities, and establishment of health procedures for disease and infection prevention.

Wellness, Lifestyle and Life Skills Training

IDM will develop, organize, and provide training sessions on a wide-variety of health, wellness, lifestyle, and life skills training topics. Training may use a variety of methods,

including in-person presentations, webinars, or self-paced courses. Some training sessions will be mandatory for all employees to complete. Sessions may include:

- Introduction to health and wellness resources and services available to employees and, during the Operation Phase, to family members;
- Workplace sensitivity training;
- Financial planning;
- Stress and fatigue management;
- Smoking and health;
- Work-life balance;
- Maintaining healthy relationships;
- Nutrition, exercise, and health;
- Sexual health;
- Personal hygiene and health;
- Developing a personal fitness program; and
- Substance abuse management.

Wellness Communication

IDM will regularly post information notices on health and wellness. This may include notification of new health and wellness resources, upcoming training programs, or useful tips and reminders for employees on healthy communities, physical activity, healthy eating, tobacco reduction, injury prevention, stress management, sexual health, or substance abuse.

IDM will train supervisors and managers in recognizing the signs of stress, fatigue, and depression and enable them to provide necessary support and direction to employees to get help. Supervisors and managers will be tasked with leading by example and developing a workplace culture that eliminates stigmas attached with mental health, encourages employees to support each other, and promotes healthy lifestyles. This may include additional questions during daily check-in meetings or simple approaches, such as group stretching at the end or beginning of shift rotations. Peer-to-peer communication and support groups have also proved to be effective means of disseminating messages.

Recreational Opportunities

In addition to the provision of recreational areas and equipment, different activities, classes, and recreational opportunities may be established. Recreational activities may include

intramural sports, fitness classes, card tournaments, art classes, and organized community volunteering.

Health Procedures

Policies and procedures for laundry, cleaning, food preparation, and various sanitation and hygiene protocols reduce the likelihood of disease transmission. Measures and procedures to reduce disease transmission include:

- Clean bedding and towels provided at the beginning of each shift and as requested during the shift;
- Promotion of hand washing by employees as they transition from one task to another, particularly before food preparation and before eating;
- Daily cleaning of bathrooms and showers;
- Sufficient and effective laundry service;
- Provision and use of drying rooms; and
- Policies and procedures to manage disease and infection outbreaks.

29.13.5.2.3 Community Services and Public Health Program

During the Construction Phase, provision of Project health and social services is anticipated to mitigate any pressure that may have been felt on existing health and social services. However, the population influx anticipated during the Operation Phase may lead to some pressure on select services providers, including the fire department, RCMP, Ministry of Children and Family Development (MCFD) Family Consultant, Telehealth, Stewart Health Centre, housing, municipal services, Bordertown recycling, low-income services, and education. To reduce this pressure, IDM will:

- Communicate early and often with service providers to provide up-to-date estimates of population influx and timelines; and
- Aim to work with service providers in Stewart and Terrace, community groups, and the District of Stewart to discuss service needs and outline the most effective means for IDM to support the community.

29.13.6 Monitoring and Reporting

Through monitoring, reporting, and evaluation, IDM will aim to continually improve the services and programs available to employees, their families, and community members. Evaluations will occur at appropriate intervals, such as internal monthly reports and semi-annual evaluations. External evaluators will be engaged as needed to assess the effectiveness, efficiency, effects, and sustainability of the Project's programs, services, and initiatives.

29.13.7 Roles and Responsibilities

The Manager of Human Resources will be responsible for the overall and ongoing development and implementation of the HSSP. The Human Resources Department will lead engagement with NHA, community of Stewart, service providers, Aboriginal Groups, and other stakeholders in relation to this plan.

29.13.8 Review of Plan Effectiveness

The HSSP is a living document that will be updated as required based on need and findings of ongoing monitoring and evaluations. IDM is committed to applying adaptive management principles across all management plans. The approach is further outlined in Section 29.1.4.

29.14 Local Procurement Plan

29.14.1 Introduction

IDM is committed to maximizing local benefits realized from the Project, including the engagement and contracting of local and regional suppliers. This Local Procurement Plan (LPP) outlines IDM's proposed approach to maximize local procurement opportunities during all phases of the Project.

29.14.2 Scope and Objectives

The objective of this LPP is to establish a fair and transparent process that will facilitate and encourage the participation of local businesses and contractors, especially during the construction and operation of the Project.

Local procurement refers to Project spending on:

- The purchase of goods, such as consumables, supplies, and equipment;
- Services, such as consultants and contractors; and
- Expenses incurred during travel, such as car rentals, fuel, meals, and accommodation.

IDM will work with local governments, businesses, and others to identify appropriate criteria and requirements necessary to qualify as a "local" or "regional" supplier. A map delineating proposed areas will be included in future iterations of this document.

As a starting point for the LPP, local suppliers are defined as local businesses and contractors whose headquarters or primary area of operation is situated within the Project's local procurement area (LPA), including:

- District of Stewart; and
- The Nisga'a Villages;
- Terrace; and

- Other communities within a 100 km radius of the Project, excluding communities in Alaska.

The regional procurement area (RPA) is defined as the area in northwest BC that is south of the BC-Yukon border, west and north of Prince George (inclusive of Prince George in its southeastern extent), and east of the Canada-USA border.

Proposed criteria to qualify as a local (or regional) business may include:

- A business or franchise wholly owned by a full-time or seasonal resident of a community located within the LPA or RPA;
- A joint-venture between another company and a resident of an LPA/RPA community;
- A business that owns or leases office space or employee accommodation space in an LPA/RPA community; or
- A supplier at least 51% owned by NLG, Nisga'a Pacific Ventures LP (NPV), a Nisga'a citizen or any other Nisga'a Nation entity, whether or not they are headquartered in the Nass Valley, the LPA, or RPA.

IDM will aim to track its performance and that of its primary contractors with respect to its use of local or regional suppliers.

29.14.3 Local Procurement Measures

29.14.3.1 Organization and Governance

A local procurement advisory committee may be established, if needed, to help inform and shape the development of the LPP, with representatives of relevant areas of the Project management group, including procurement, construction, operations, human resources, and community relations. The procurement committee could determine priorities, provide oversight, monitor performance, and define ways for improvement. Specific tasks may include:

- Review of IDM's purchasing needs and identification of all relevant procurement decision makers;
- Development, implementation, and review of this LPP;
- Development of a Local Procurement Policy;
- Identification of opportunities for local procurement;
- Identification of internal strengths and weaknesses around the use of local suppliers;
- Monitoring and measurement of IDM's local procurement performance;

- Working with Project contractors and other third parties to implement and adhere to similar local procurement policies and objectives to maximize their use of local suppliers; and

- Oversee a feedback process to handle complaints or other issues from local suppliers and businesses.

29.14.3.2 Identifying Local Procurement Opportunities

A clear understanding of the range of local businesses available and their capacity to meet IDM's procurement needs, including adherence to safety and environmental requirements/standards, quality, price, and timeliness, is critical to the success of the LPP. IDM will engage with internal stakeholders, Aboriginal Groups, and external stakeholders to create a database of local businesses that appear to fall under one or more of IDM's procurement categories.

29.14.3.2.1 Internal Stakeholder Engagement

Understanding internal stakeholders' interests and issues may help align the LPP with broader corporate objectives, identify potential barriers to implementation, and increase support and buy-in.

Internal stakeholders potentially include:

- Construction and operations management;
- Procurement staff;
- Community relations;
- Human Resources; and
- Other end-users, including primary contractors.

29.14.3.2.2 Aboriginal and External Stakeholder Engagement

Discussion with Aboriginal Groups and external stakeholders is intended to provide information and context about the local business environment to help define priorities and focus for the LPP.

Engagement with Aboriginal Groups and external stakeholders can help to ground-truth IDM's underlying assumptions and focus IDM's approach to local procurement that will, in turn, help to align the LPP with the local business environment and IDM's procurement needs.

Aboriginal Groups and external stakeholders potentially include:

- Select local businesses;

- NLG, NPV, Nisga'a Education Skills and Training (NEST), Nisga'a business owners, and Nisga'a citizens;

- Other Aboriginal Groups or communities;

- Chambers of commerce and other local business organizations;
- Regional District Economic Development sections;
- Local legal and accounting organizations;
- Training institutions;
- Financial institutions; and
- Interested small-medium sized enterprises.

29.14.3.2.3 Suppliers Database

A supplier database with local and regional suppliers may be created, if needed, and categorized according to IDM's procurement requirements. To the extent possible, businesses and contractors may be prioritized or ranked according to their capacity to meet specific IDM needs. The database can include both companies that have undergone prequalification and companies identified through engagement with internal and external stakeholders.

The 2017 Northwest BC Industrial Resources Service Directory, which is published by the Terrace Business Resource Centre and covers Terrace, Kitimat, Stewart, and New Hazelton, includes almost 1,000 company listings in approximately 150 categories (Terrace Business Resource Centre 2017). Many of these businesses are directly or indirectly geared towards the natural resources sector and offer a substantial pool of potential suppliers to IDM.

IDM will also aim to identify and work with local business organizations and associations to improve its understanding of the local supplier landscape, identify gaps and barriers to local and regional business participation in the tendering process for the Project, and inform local procurement strategies.

29.14.3.3 Communicating Opportunities

Regular communication will flow through various channels to local communities, governments, businesses, and contractors. Key subjects and information to be communicated may include:

- How local and regional suppliers can keep up-to-date and informed about upcoming contracts and bidding opportunities;
- Details of the prequalification process;
- Minimum standards to ensure transparency and fair competition;
- Details about the Project's tendering process;
- Definition of what constitutes a "local" or "regional" business;

- Details of how being local or regional is factored in to the tender process; and
- Special circumstances, such as direct award contracts, renewals, or extensions.

29.14.3.4 Procurement Policy and Practices

IDM recognizes that its procurement practices (such as the lead time it gives to suppliers or the purchasing price negotiated) may result in both positive and adverse effects on local businesses and the supply chain. IDM will aim to develop a procurement policy that outlines the Project's commitments to local procurement and a process to enhance local business participation in the supply chain, including, for example:

- Advance notification to local and regional businesses and contractors;
- Flexibility in ordering and payment routines;
- Consideration of opportunities to tender more, smaller work packages potentially more conducive to local business capacity; and
- Measures to reduce the impact of changed or cancelled orders.

A prequalification process may also be established, if appropriate, for local businesses to become a prequalified supplier. Such a process may help manage direct inquiries from local businesses, control expectations, and ensure a fair and transparent tendering process is maintained.

29.14.4 Monitoring and Evaluation

IDM will monitor and track procurement opportunities provided and secured by local suppliers and contractors. The monitoring and tracking process will primarily rely on information that is readily available, such as purchase orders and supplier information generated through prequalification or contract documentation. Data collection and management should be coordinated between functional areas, including construction management, operations (especially purchasing), human resources, accounting, and community relations.

29.14.5 Roles and Responsibilities

The Manager of Human Resources (or delegate) will be responsible for the overall and ongoing development and implementation of the LLP, including establishment of the local procurement advisory committee as required.

29.14.6 Review of Plan Effectiveness

Certain components of the LPP may need to be modified based on site experience and feedback from community members and local suppliers. All aspects of the plan shall be reviewed for effectiveness and to identify components needing correction, adjustment or

upgrading. IDM is committed to applying adaptive management principles across all management plans.

29.15 Material Handling & ML/ARD Management Plan

29.15.1 Introduction, Scope and Objectives

The Material Handling and Metal Leaching/Acid Rock Drainage Management Plan (MHMP) is one of many plans that form part of the Project's EMS. The MHMP outlines IDM's plan to manage the following materials at the Project:

- Ore;
- Waste rock;
- Talus rock quarried for use as mine backfill;
- Construction aggregate extracted from borrow pits/quarries; and
- Construction materials associated with rock cuts along the access road.

The main environmental considerations related to these materials include:

- Potential for the materials to leach metals and/or generate acidic conditions, resulting in adverse quality runoff reporting to local receiving waters; and

- Potential for dust emissions associated with handling, transporting, and stockpiling the materials.

This plan outlines the applicable legislation and the environmental protection measures to be implemented, proposed monitoring to confirm the effectiveness of the mitigation strategies, and the responsibilities of IDM and its contractors.

This plan applies to the Construction and Operation Phases of the Project, during which:

- Ore will be produced and temporarily stored prior to processing;

- Waste rock will be produced, temporarily stockpiled, and used as backfill in the mine; and

- Aggregate will be extracted through drilling and blasting (when required) and/or excavation, crushed and/or screened (when required), and will be transported to various points of use.

Stockpiled ore and waste rock will be consumed by the end of planned operations. Quarries and borrow pits will be progressively reclaimed at, or prior to, closure in accordance with IDM's Closure and Reclamation strategy (Volume 2, Chapter 5).

The MHMP addresses the requirements for four separate plans identified in the Project's AIR (BC EAO 2017):

- Ore Storage Management Plan;
- Waste Rock Management Plan;
- Borrow Pit and Quarry Management Plan; and
- Metal Leaching and Acid Rock Drainage (ML/ARD) Management Plan.

The above plans have been combined here since the environmental concerns and corresponding environmental protection measures and monitoring requirements are similar. This combined plan helps ensure consistency with the management of these different materials.

Related management plans also presented in Chapter 29 include the:

- AQDMP;
- Explosives Management Plan; and
- AEMRP.

IDM will update the document prior to construction to reflect relevant design changes during detailed engineering, and throughout the life of the Project based on the outcome of management reviews, incident investigations, regulatory changes, or other Project-related changes.

29.15.2 Applicable Legislation and Guidelines

The MHMP has been prepared to comply with the applicable federal and provincial legislation and guidelines. Most of the legislation applicable to the mine and quarries is provincial legislation.

Requirements for the design, operation, and closure/reclamation of ore storage areas, waste rock piles, and quarries/borrow pits on mine sites are regulated under the BC *Mines Act* (1996a) and under sections of the Code (BC MEM 2017), including the Amended Part 10. A BC *Mines Act* (1996a) permit is required before any work can be started.

The BC *Water Sustainability Act* (2014) and associated regulations regulates the diversion and use of water. Water discharged from Project infrastructure into the environment must meet water quality criteria set under the MMER of the *Fisheries Act* (1985a) as well as the discharge criteria outlined in the provincial Effluent Permit that will be issued to the Project under the provincial *Environmental Management Act* (2003a). The Metal Mining Technical Guidance for Environmental Effects Monitoring (Environment Canada 2012) assists metal mines to determine relevant environmental effects monitoring protocols for their project.

Under the *Canadian Environmental Protection Act* (1999), Environmental Canada's (2009) Environmental Code of Practice for Metal Mines details environmental best practices associated with the management of mining wastes and wastewater.

Legislation and guidelines specifically applicable to the development and operation of borrow pits and quarries include BC's *Land Act* (1996n) and the federal *Explosives Act (1985b)*; the latter includes regulations relating to the permitting, use, and storage of blasting materials.

Sections 19 and 28 of the *Land Act* (1996n) refer to the Aggregate and Quarry Materials Policy (BC MEM 2010). This Policy defines three types of land allocation, including a temporary license, which has a maximum term of two years; a license of occupation, which has a normal term of 5 years; and a lease, which has a standard term of 30 years. Based on the expected duration of use for the borrow pits and quarries for the Project, temporary licenses will likely be sufficient, with the exception being the quarry used for the TMF embankment raises. IDM will apply for the appropriate licenses to develop its aggregate sources following completion of the environmental assessment process.

Finally, BC's *Heritage Conservation Act* (1996f) applies to ground disturbance activities, and defines the permitting procedures associated with any potential excavation, alteration, or damage to heritage sites.

29.15.3 Relevant Project Activities

29.15.3.1 Geochemistry of Materials to be Handled

29.15.3.1.1 Waste Rock and Ore

The primary rock types in the Mine area include the Stuhini Group mudstones, siltstones and cherts (sedimentary rocks), the Hazelton Group clastics and volcanoclastics, and three intrusive (igneous) suites: the Hillside Porphyry, the Goldslide Porphyry, and the Biotite Porphyry.

The four major mineralized zones are called the Marc, AV, JW, and 141 zones, found as crudely tabular gold and silver bearing iron-sulphide stockworks. These are developed primarily in the Hillside Porphyry and to a lesser extent in the rafts of sedimentary and volcanoclastic rocks. Pyrite is the most abundant sulphide, associated with the stockwork, and as an alteration mineral, although pyrrhotite and sphalerite are both locally important.

Geochemical testing for the Project to date has included 53 ore samples and 400 waste rock samples (Appendix 1-B). All samples were classified as potentially acid generating (PAG) based on Neutralizing Potential / Acidic Potential (NP/AP) and Total Inorganic Carbon / Acidic Potential (TIC/AP) tests.

Data from two field cribs indicate that the upper bound of onset to acidity in mudstone (intermixed with some volcanic rock) is 20 years. This lag time is longer for volcanic rocks and may be shorter for unmixed mudstone samples.

When organized by lithology, four out of 53 ore samples are igneous (Hillside Porphyry), 45 are volcaniclastic (tuffs), one is from the fault zone, and the remainder are of unknown or composite lithology. During lab tests, three samples of bedded tuffs and mixed rock developed acidity over 30 to 55 weeks.

When organized by lithology, 36 out of 400 waste rock samples are igneous (Hillside Porphyry or Goldslide Porphyry), 269 are volcaniclastic (fragmented tuffs/ bedded tuffs/ contact breccia), 84 are sedimentary (mudstone), and the remainder are of unknown or composite lithology. Humidity cell tests show that waste rock samples remained pH neutral for the duration of the test except for one fragmented tuff sample, which was acidic for all cycles of the test.

With regard to metal leaching, manganese leaching was observed at a rate of or greater than 0.4 milligrams per kilogram per week (mg/kg/week) for both acidic and neutral samples of waste rock. Zinc and cadmium leaching is associated with the presence of sphalerite (zinc/iron sulphide), although acidic samples showed higher release rates of both zinc and cadmium irrespective of sphalerite content. Copper leaching appears to be directly proportional to acidic conditions. Lead leaching appears to be related to the presence of solid-phase lead content (likely, the mineral galena) in waste rock samples. Selenium leaching appears to be related to sulphide content.

Two ore samples showed increased nickel leaching under acidic conditions, although these results were within the range of analytical uncertainty.

One waste rock sample possibly showed increased nickel leaching under acidic conditions, although these results were within the range of analytical uncertainty. Cobalt leaching levels were highest for two waste rock cycles during initial acidic cycles after which they decreased to near or below detection limits.

In the field cribs, HC-2 showed increasing levels of cadmium, nickel, and zinc in the leachate since 2010 and increasing levels of cobalt and manganese since 2015. Trace element levels in HC-1 remain stable.

Geochemical properties appear to be consistent between the historic waste rock and newly generated and tested waste rock (Volume 7, Appendix 1-B).

29.15.3.1.2 Quarried Talus for Mine Backfill

Of 543 samples analyzed for ARD potential, 90 were talus samples; 56% were classified as PAG, 26% as “Uncertain”, and 19% as NPAG according to TIC/AP tests. According to NP/AP tests, 24% were classified as PAG, 34% as “Uncertain”, and 41% as NPAG (Volume 7, Appendix 1-B).

One-third of fine fraction samples were already acidic when tested; additionally, it was found that talus fines are a source of acidity and soluble metals under both reducing and oxidizing conditions. Acidic talus samples indicate cadmium, cobalt, copper, nickel, and zinc leaching.

29.15.3.1.3 Aggregate Sources and Rock Cuts

The geochemical characteristics of construction materials is presented in Volume 7, Appendix 1-L.

Table 29.15-1 summarizes the geological units that will be encountered by various components of the Project, along with a summary geochemical description of each geological unit. More descriptive geochemical summaries of each geological unit follow.

Bromley Area Intrusives

The Bromley Area Intrusives consists of mainly gabbro as well as Goldslide Porphyry, mafic dikes, one or more unclassified dikes, and a fault zone. Each of these intrusive materials sampled were classified as non-PAG. Elemental analysis indicated enrichment of gold, cobalt, chromium, and nickel in most samples, and silver, bismuth, copper, and selenium in a few samples. Except for selenium, which was only slightly enriched in two samples, these elements are not expected to be mobile under neutral pH conditions, indicating these samples have a low metal leaching potential. The Gabbro Intrusives are suitable for general use in construction and do not require special management measures.

Table 29.15-1: Geological Units Present at Aggregate Sources and Rock Cuts

Aggregate Source / Excavation Area	Geological Units					
	Bromley Area Intrusives	Hazelton Group Sediments	Coast Plutonic Complex Monzonite	Hazelton Group Volcanics	Sand and Gravel	Mine Site Talus
Geochemical Characteristics	Not ARD; possible selenium ML	One-third ARD; possible ML	Not ML/ARD	Up to 50% PAG and ML	Not ML/ARD	ML/ARD
Process Plant Foundation		X				
Access Road Rock Cuts[1]	X	X	X	X		X
Hartley Gulch Borrow					X	
Otter Creek Quarry[2]		X				
Highway 37A Quarry			X			
Roosevelt Creek Borrow					X	
Talus Quarries (2)						X

Notes:

1. While each of the indicated geological units have been identified along the Access Road, the geological units at specific rock cut locations has not been reconciled.
2. Otter Creek Quarry's current location is partially within the Hazelton Group Sediments (see Figure 2-1 in Volume 7, Appendix 1-B). IDM is considering furthering the option to reposition the Otter Creek Quarry to target the gabbro in the Bromley Area Intrusives and avoid the Hazelton Group Sediments. This design will be provided as part of permit applications.

Hazelton Group Sediments

Approximately one-third of the Hazelton Group sediment samples are PAG or have an uncertain potential for ARD. All of the PAG samples were logged as mudstone or siltstone, whereas most non-PAG samples were identified as greywacke, suggesting that differences in lithology could be used to classify the ARD potential of these materials. However, additional samples would be required to verify this finding. Elemental analyses indicate a few of the sediment samples are enriched in silver and selenium, with selenium leaching a potential issue for these materials. Based on these findings, the Hazelton Group sedimentary rocks require specific management measures to prevent or minimize ML/ARD.

Coast Plutonic Complex Monzonite

The Access Road will intersect a monzonite unit that is part of the Coast Plutonic complex at km 0 to km 4.5). Additionally, this geological unit is present at the Highway 37A Quarry. The monzonite is non-PAG and is somewhat enriched in gold, bismuth and chromium. These elements are not expected to be mobile under neutral pH conditions, indicating that the monzonite is suitable for road construction.

Hazelton Group Volcanics

The Access Road will intersect a mixture of rock types comprising the Hazelton Group volcanics at km 19 to km 23.4.

The Hazelton Group volcanics are comprised of a mixture of sedimentary, volcanic, volcaniclastic, and intrusive rocks. Samples from the Hazelton Group volcanics showed a variable potential for ML/ARD, with approximately 50% of the samples classified as PAG, and a number of samples showing enrichment of gold, cobalt, chromium, nickel, sulphur, and selenium and one sample showing significant enrichment of silver, arsenic, cadmium, and zinc. Arsenic, selenium, cadmium, and zinc can be relatively mobile under neutral pH conditions, and these and several other trace elements, as well as aluminum, iron, and manganese, may be mobilized under acidic pH conditions. Based on these findings, the Hazelton Group volcanic rocks require specific management measures to prevent or minimize ML/ARD, as outlined in 29.15.4.4.

29.15.3.2 Aggregate Extraction

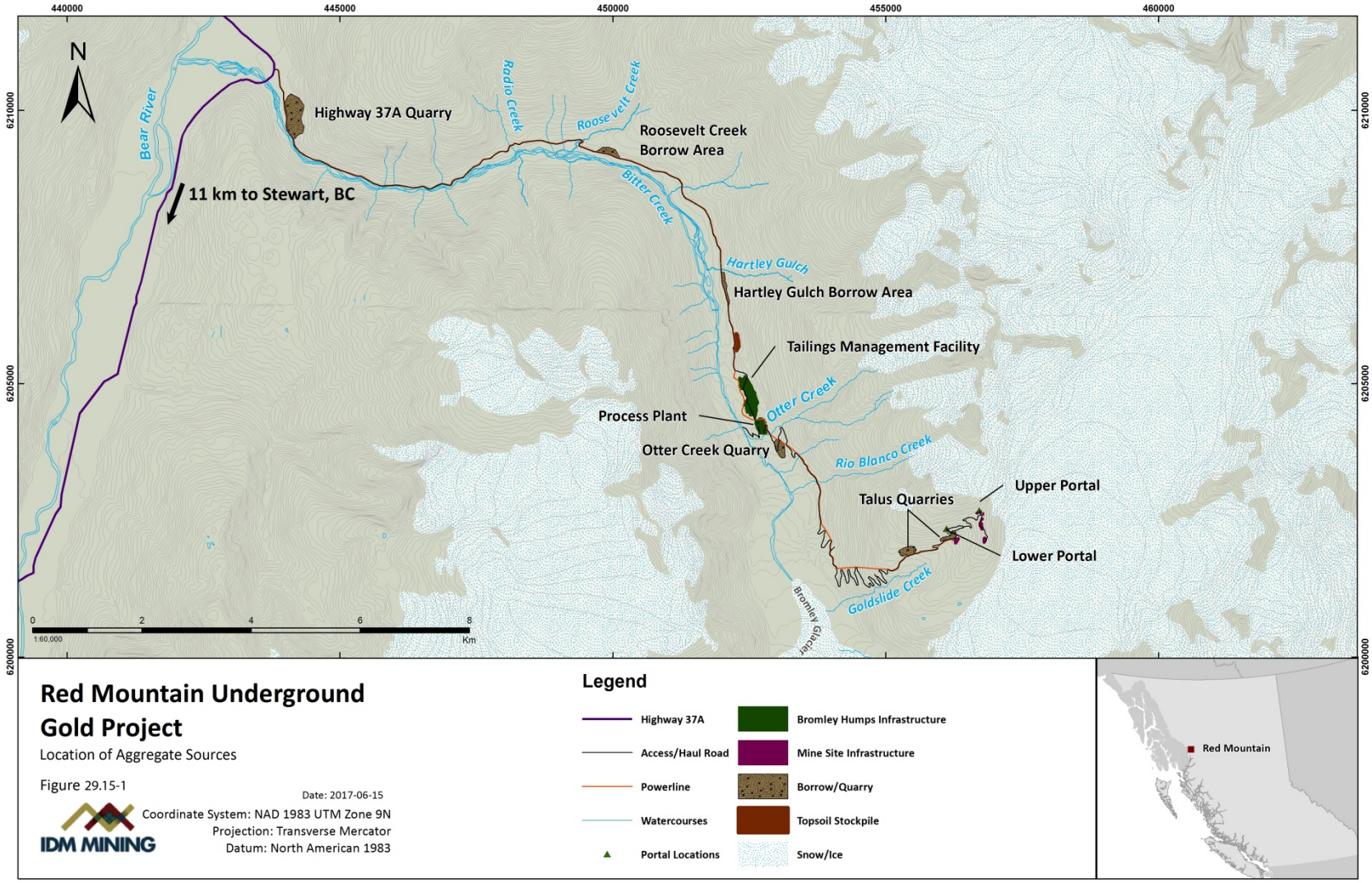
A total of four quarries and two borrow pits will be developed to support the Project. Table 29.15-2 lists the sources and summarizes the aggregate requirements of the Project by Phase. The locations of the aggregate sources (rock, gravel, and talus) are shown in Figure 29.15-1.

Table 29.15-2: Quantities of Aggregate by Project Phase

Aggregate Source	Destination/Use	Quantity (m^3)		
		Construction	Operation	Closure
Process Plant Foundation Excavation	TMF	160,000		
Hartley Gulch Borrow	TMF	63,000		40,000
Otter Creek Quarry	TMF		850,000	285,000
Highway 37A Quarry	Road	50,000		
Roosevelt Creek Borrow	Road	25,000		
Talus quarry #1	Mine Backfill		209,000	
Talus quarry #1	Mine Backfill		400,000	
Total Quantities (m^3)		298,000	1,459,000	325,000

Aggregate will be required during construction, mainly for construction of the TMF, the Access Road, and Haul Road; for subsequent TMF embankment raises and for mine backfilling during the Operation Phase; and to construct a final cover on the TMF during the Closure Phase.

Figure 29.15-1: Location of Aggregate Sources



Construction along the pre-existing Access Road will be generated from cut and fill operations, supported by the Highway 37A Quarry for rockfill and the Roosevelt Borrow for surfacing material (Section 29.15.3.3). Most of the aggregate required for Haul Road construction will be generated from cut and fill operations along the length of the Haul Road.

The TMF will consume the majority of fill at the Mine Site, supplied initially by the Process Plant foundation excavation and from the Hartley Gulch Borrow and Otter Creek Quarry.

Local talus deposits will also be used to fill the material demand for mine backfill, as described in Section 29.15.3.6.

Overburden removal will occur during the preparation of mining and construction activities. Depending on the geochemical characteristics of the overburden, the material will be segregated. The site overburden material and excavated material will either be handled as run of mine waste and stored accordingly or segregated and used where possible in construction and reclamation activities.

Ammonium nitrate (AN) and fuel oil (FO) will be used as the explosive for quarries. Details regarding storage and handling of explosive products are provided in the Explosives Management Plan.

29.15.3.3 Cut and Fill Operations Associated with Road Construction

The Mine will be accessed via an all- season road that follows the Bitter Creek valley. The access road follows a pre-existing resource road from Highway 37A to Bromley Humps through valley bottom for 15 km along the North/North-East side of Bitter Creek (Figure 29.15-2 and Figure 29.15-3).

An additional 11 km of Haul Road will be constructed to link the Process Plant at Bromley Humps to the underground mine.

The access road overall right-of-way (RoW) will be typically 25 m, except for where site-specific conditions such as cut and fill slopes necessitate a wider RoW.

Most of the pre-existing road, which is significantly overgrown with alder, will require clearing to open the RoW, followed by regrading and resurfacing. Washed out sections of the existing road will need to be rebuilt with significant armoring of the fill slopes to protect the fills from further erosion by Bitter Creek.

The new Haul Road will be cleared, grubbed, and stripped prior to construction. Wherever possible, conventional cut and fill construction techniques will be implemented to minimize material movement. Following site preparation, the road prism will be constructed with a portion of the roads cross section built in a cut, generating suitable subgrade material to fill the remaining portion of the road's cross section, and ideally generating zero excess material. A number of alternative construction methods will be used as the terrain requires, including:

- Full bench end haul construction: In areas of steep terrain, stripped soil will be end-hauled to a stable location for storage;
- Buttressed Cut Slopes: In areas where the cut bank is composed of weaker material that cannot maintain the slope required for the road design, a stable interlocking riprap material will be placed at the base of the cut to stabilize the toe;
- Stacked Rock Fills: Stacked rock fills are required in areas where the fill slope is required to be steeper than standard fill materials will allow. The toe of the fill section is excavated to competent mineral soil or bedrock and large riprap is selectively placed to create an interlocking fill slope. Road subgrade is then filled and compacted in lifts against the upper edge of the rock fill;
- Bitter Creek Interference Areas: To avoid destabilizing sensitive slopes and putting road users and workers in an unsafe position, portions of the pre-existing Access Road will encroach on the high-water line of Bitter Creek; and
- Bitter Creek Re-alignment: One 150 m section of the access road requires re-alignment of Bitter Creek at the toe of a weak fractured bedrock face. Riprap fill will be placed into the river with a 1.5 m high rock berm constructed on the upslope side. The surface will be finished with compacted granular surfacing. Riprap weirs extending from the toe of the fill slope will be constructed above the high-water line to reduce excessive scouring at the toe of fill slope. The stream bed will be excavated and re-graded along the south side to allow for creek realignment.

The AMP provides further details and figures illustrating the road network.

29.15.3.4 Excavation at the Process Plant Area

The Process Plant will be constructed at Bromley Humps with a slab on grade foundation on bedrock (Figure 29.15-2). It will be necessary to drill, blast, and remove rock to construct a level pad. To provide the construction materials necessary to build the nearby TMF, the Process Plant area excavation will produce a surplus of material (200,000 m^3) that will be used as embankment fill for the TMF construction.

29.15.3.5 Overburden Stockpiling

Overburden removal will occur during the preparation of mining and construction activities. Depending on the geochemical characteristics of the overburden, the material will be segregated and stockpiled for use in reclamation. Overburden including topsoil that is

removed from the Bromley Humps will be stockpiled at the location shown in Figure 29.15-2. Further details on overburden testing and storage is provided in the Terrain and Soil Management Plan.

29.15.3.6 Mining and Backfilling

Mining will be conducted through two access portals (the Upper and Lower Portals) at the upper elevations of Red Mountain (Figure 29.15-2 and Figure 29.15-3).

Figure 29.15-2: Project Footprint – Bromley Humps

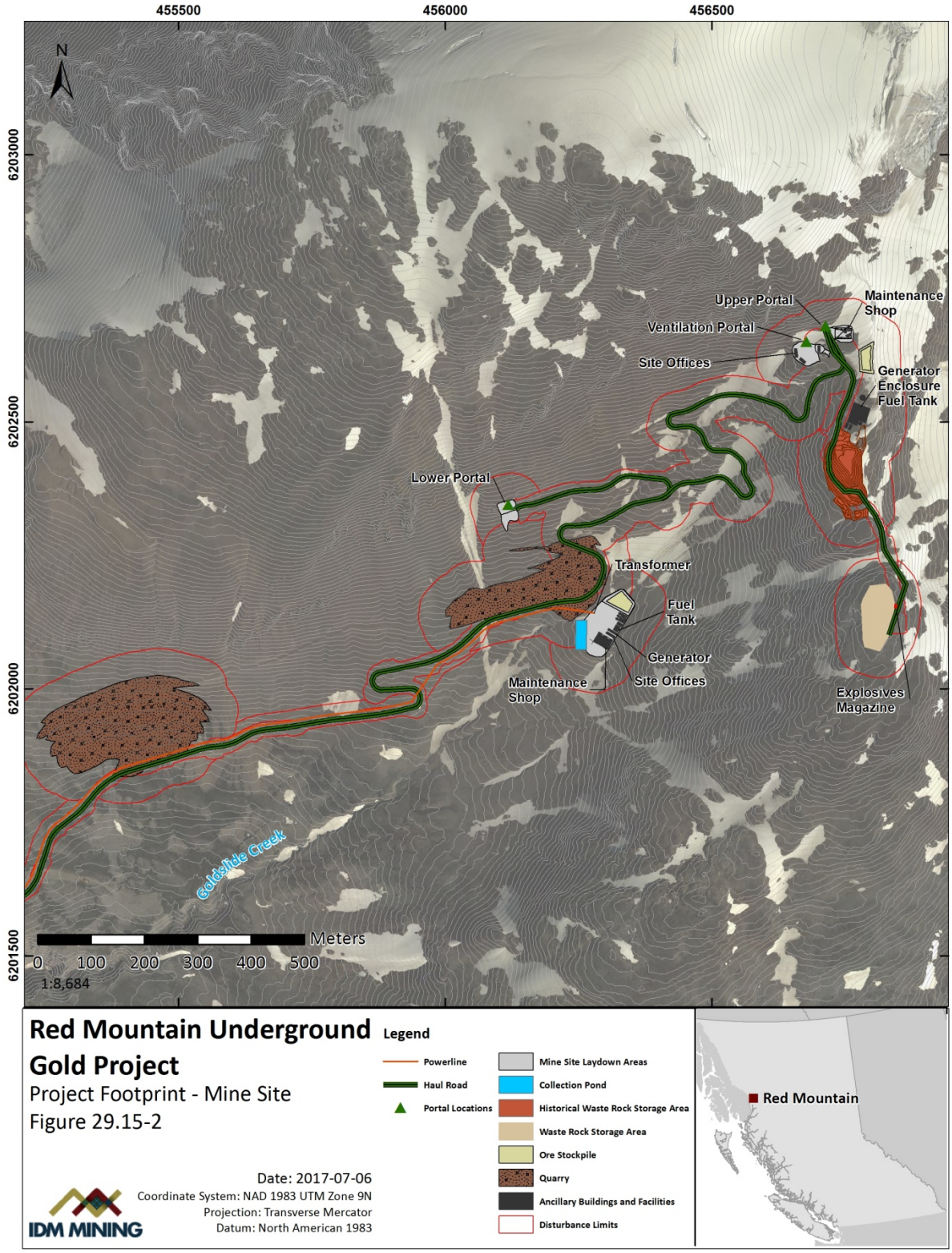
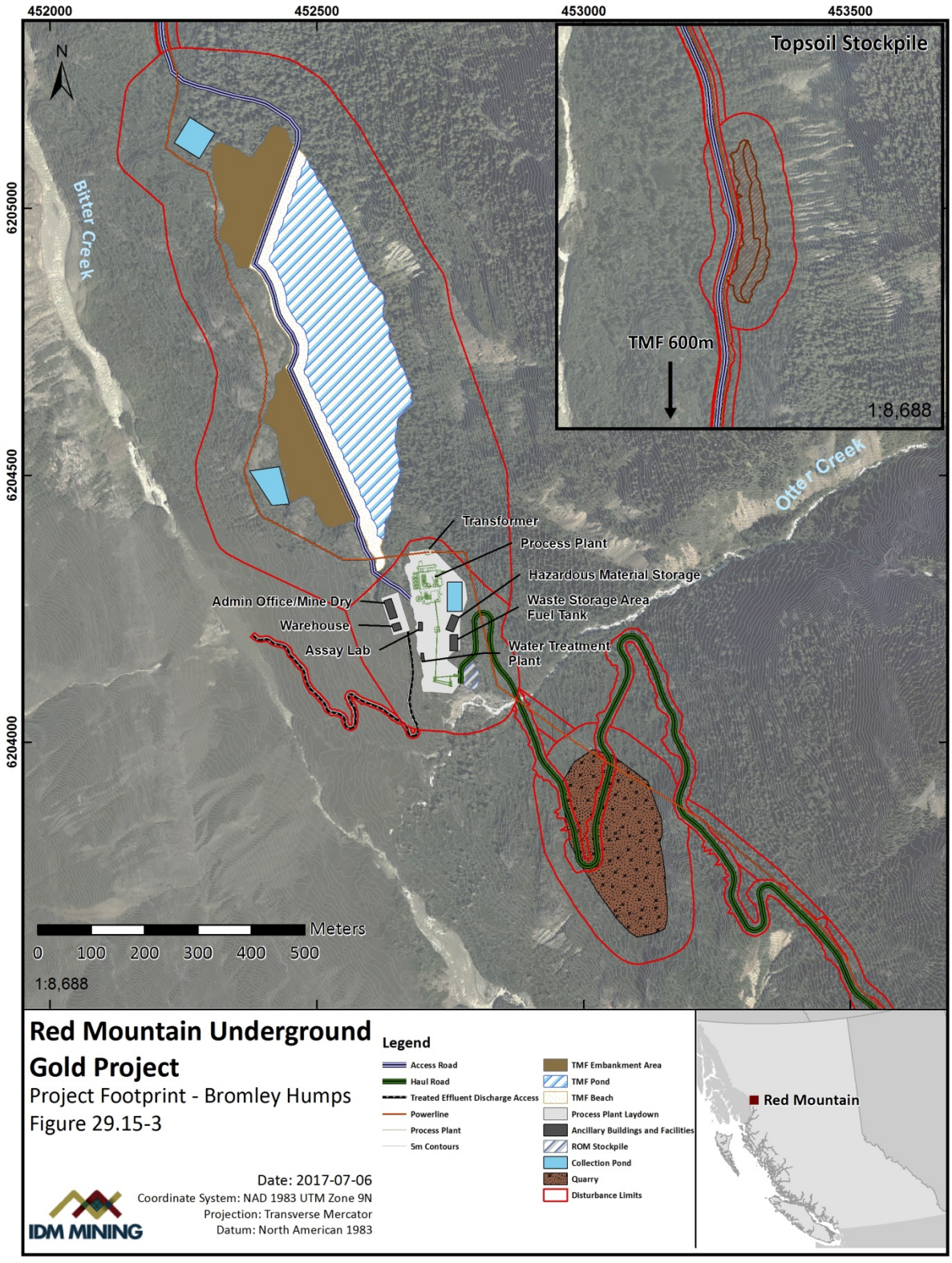


Figure 29.15-3: Project Footprint – Mine Site



Over a 6-year mine life, the underground workings will be accessed through the Upper Portal for the first year and a half of operations and through the Lower Portal for the remainder of the mine life. Ore will be brought to surface using underground haulage trucks and temporarily stockpiled adjacent to the access portal. Front end loaders will load haul trucks that will transport the ore to the larger Run Of Mine (ROM) Stockpile located next to the Process Plant at the Bromley Humps Area.

The underground mine will be backfilled using unconsolidated waste rock in the secondary stopes and cemented rock backfill (CRF) in the primary stopes. Table 29.15-3 illustrates the backfilling schedule at Red Mountain. All waste rock generated during the mining process, as well as the existing historical waste rock pile, will eventually be used as backfill during the operations phase, and additional talus material will be quarried to make up the shortfall.

Table 29.15-3: Ore Production and Backfilling Schedule

Activity	Unit	Mining Year							Total
		-1	1	2	3	4	5	6	
Backfilling Schedule									
Waste Fill Placed UG	m^3	0	41,000	93,000	90,000	78,000	79,000	49,000	429,000
CRF Placed UG	m^3	0	61,000	27,000	37,000	24,000	38,000	24,000	211,000
Total	m^3	0	102,000	120,000	128,000	102,000	117,000	72,000	640,000
Waste Material Balance									
Mined Waste to Backfill	Kt	0	144	188	94	76	130	87	720
Waste from Temporary Storage to Backfill/	Kt	0	52	0	0	0	0	0	52
Waste from Historical Waste Dump to Backfill	Kt	0	29	61	0	0	0	0	90
Quarried Talus Rock to Backfill	Kt	0	0	10	182	144	124	70	530
Total Material placed Underground	Kt	0	225	259	276	220	254	157	1,392

29.15.3.7 Ore Handling

Mining and processing will both occur year-round. For the first 1.5 years of mining, while the underground workings are being accessed through the Upper Portal, ore will be temporarily stockpiled outside it. After this period, the Upper Portal will be reclaimed. Following this, a temporary ore stockpile will be located outside active mining at the Lower Portal. The size of

the ore stockpile outside of each portal will be about 3,000 to 5,000 tonnes, representing 3-5 days of production.

Ore from the portal stockpiles will be transported to a larger ROM Stockpile located adjacent the Process Plant in the Bromley Humps Area. The ROM Stockpile will provide sufficient storage so that processing can occur during periodic temporary winter shut-downs due to weather. There is no expected annual carry-over from the ROM Stockpile, i.e., the stockpile will be exhausted annually.

29.15.3.8 Waste Rock Management

Approximately 719,000 tonnes of waste rock will be generated during mine development. Geochemical study and monitoring have indicated that all waste rock will be PAG; however, the ARD onset time is more than 20 years (Volume 7, Appendix 1-B). All waste rock generated during mining will eventually be used as backfill.

A temporary stockpile containing approximately 52,000 tonnes of waste rock will be established starting in Year -1 and will be entirely consumed as backfill by approximately the end of Year 1 of mining. The temporary waste rock stockpile will be constructed in accordance with the Interim Guidelines referenced in Parts 10.1.6 and 10.6.7 of the Code (BC MEM 2017). Runoff from the temporary waste rock stockpile will report to the glacier east of the lower portal.

An existing 90,000 tonnes waste rock stockpile generated during exploration at the Upper Portal, will also be consumed to backfill the underground stopes before the end of Year 2.

29.15.3.9 Reclamation and Closure Activities

Material handling activities associated with reclamation and closure activities include:

- Extraction and screening of sand and gravel from the Hartley Gulch Borrow Pit for use as a bedding material over the geomembrane liner installed over the TMF;
- Extraction and crushing/screening of rock from the Otter Creek quarry for construction of the shedding cover over the TMF;
- Reclamation of quarries and borrow pits (i.e., regrading, applying cover materials); and
- Consumption of stockpiled overburden and topsoil over development areas as part of reclamation.

Reclamation activities are described further in the Reclamation and Closure Plan (Volume 2, Chapter 5).

29.15.4 Environmental Protection Measures

29.15.4.1 Environmental Issues Related to Material Handling

The primary environmental concern related to the extraction and handling of materials, such as ore, waste rock, and aggregate, is the potential for these materials to leach metals or generated acid rock drainage, and consequently for runoff from these materials to adversely affect water quality and aquatic life in local receiving waters. Environmental protection measures to address ML/ARD effects are based on the following hierarchy:

- Geochemical Testing: Conducting representative geochemical testing to further delineate and characterize materials that are potentially ML/ARD. Testing has already been completed on representative materials (see Section 29.15.3.1) and additional testing will be required;

- Avoidance: This includes avoiding geochemically unfavourable materials (those that may leach metals or generate acid rock drainage), to the extent practical, based upon geochemical testing and design limitations. There will be instances when complete avoidance of ML/ARD materials is not possible;

- Minimizing Use: This includes minimizing the use of geochemically unfavourable materials (those that may leach metals or generate acid rock drainage), to the extent practical, based upon geochemical testing and design limitations;

- Isolation: ML/ARD materials can be isolated from air and water to prevent the onset of ARD and/or the leaching of metals. Isolation may be achieved by placing ML/ARD materials underground, into the TMF, or within the core of a lined TMF embankment;

- Diversion: To reduce the quantity of adverse quality runoff requiring management, precipitation or runoff can be diverted; and

- Blend: To mitigate the onset of ML/ARD, blending geochemically unfavourable material with material that has neutralizing potential (NP).

Dust is a secondary concern for each of these materials. Dust will be generated mainly from crushing and screening operations at rock quarries. Stockpiles are also potentially a source of wind-blown materials. Most of the material handled, however, will be larger sized ROM or run-of-quarry and will generate little dust. Finally, the materials will be loaded, trucked, and unloaded, which can generate modest amounts of dust.

Additional environmental issues are associated with the development or quarries and borrow areas. These are described below.

29.15.4.2 Siting, Planning and Permitting of Aggregate Sources

Environmental protection for quarries and borrow pits begins at the planning stage, and involve the following:

- Conducting geochemical evaluations on representative materials to be quarried, and avoiding materials that are potentially metal leaching or acid generating, where possible;
- Conducting an appropriate level of geotechnical investigation to confirm the suitability of materials for construction;
- Siting quarries and borrow pits a minimum of 31 m from local watercourses and preserving any vegetated buffer between the quarry site and local watercourse;
- Implementing sediment and erosion control measures, as described in the Erosion and Sediment Control Plan; and
- Implementing measures to avoid bird nesting, including developing the quarry footprint outside of the nesting season, and establishing a setback of 100 m from known bird nests.

These environmental protection measures will be considered when IDM prepares its Sand & Gravel/Quarry Operation Notice of Work (NoW) and Reclamation Program Application. A NoW Application is required to obtain a *Mines Act* permit for aggregate sources. The BC MEM (2010) outlines the information required within a NoW application, summarized as follows:

- Maps at various scales, showing land ownership, access and location with respect to local communities and drainages, existing and/or proposed access routes, proposed mine site with primary features (excavation area, stockpile area, processing area), proximity to watercourses and important topographical features;
- Documentation of public and Aboriginal Group consultation; and
- Descriptions of the property and quarry development and reclamation plans, including: the material quality and quantity; mining and processing methods; soil salvage and stockpiling; anticipated noise and dust impacts; geotechnical considerations; groundwater impacts and mitigation; surface water management; sediment and erosion control; ML/ARD predication and management; and reclamation cost estimates and final land capability.

The BC MEM (2010) provides guidance on additional planning and design required to support a Mines Act permit for borrow pits and quarries in various terrain classes. The NoW application will be supported by the appropriate studies and design per terrain class.

29.15.4.3 Geochemical Testing

Geochemical testing completed to date, as described in Section 29.15.3.1.1, has identified the need to implement mitigation measures in accordance with the mitigation hierarchy described in Section 29.15.4.1. Specific geochemically related issues and mitigation measures are described in Section 29.15.4.4.

Additional geochemical testing of aggregate sources will be conducted to complete the appropriate level of screening so that the appropriate mitigation measures described in this plan can be implemented.

29.15.4.4 Specific Mitigation Measures to Address ML/ARD Issues

A proportion of each of the Hazelton Group Sediments and Hazelton Group Volcanics are potentially ML/ARD. One or both of these materials will be encountered along the Access Road, at the Plant Site, and at the Otter Creek Quarry. The following mitigation measures will be implemented to address potential ML/ARD issues at each of these locations.

29.15.4.4.1 Otter Creek Quarry

The Otter Creek Quarry will be re-positioned to selectively extract gabbro and avoid the Hazelton Group sediments.

29.15.4.4.2 Process Plant Site Excavation

During drilling, blasting, and excavation of material from this location runoff will be diverted away from the plant site to minimize contact with the broken rock.

A portion of the material to be extracted from the Process Plant site for use in construction of the initial TMF embankments is Hazelton Group sediments, a portion of which is potentially ML/ARD. This material will be selectively placed within the core of the initial embankment, with geochemically stable material to be placed on the outside face. At this location, the potentially ML/ARD material will be isolated from both water and air by the geomembrane liner and subsequent embankment raises.

During detailed engineering, the option of using additional gabbro rock from the Otter Creek Quarry and minimize the quantity of rock excavated at the Process Plant site will be evaluated.

29.15.4.4.3 Access Road

Both the Hazelton Group Sediments and Hazelton Group Volcanics are located along the road corridor. A number of strategies will be employed to minimize the amount of potential ARD/ML rock that is disturbed by road construction:

- Minimize the amount of road cut through PAG rock;
- Construct fill areas with non-PAG materials, where practical. This will be highly effective, but may require non-PAG materials to be transported larger distances at a higher cost;

- Divert runoff away from the road bed to minimize contact with broken rock. Such diversions would need to be constructed from non-PAG materials. Where runoff will cross the road, culverts can be used rather than rock drains. This option is most applicable when contact with PAG materials is unavoidable; and

- Blend high sulphide rock with rock that contains excess neutralizing potential (NP). This may be a favourable approach in certain instances.

The following mitigation measure was considered and determined to not be feasible due to the significant increase to construction costs:

- Haul PAG material from road cut areas to the TMF or temporary waste rock stockpile and haul non-PAG material as road fill material. This alternative will be prohibitively expensive and would only be considered if all other mitigation measures were determined to be ineffective.

As the road design is advanced, additional geochemical evaluations will be undertaken and the mitigation measures refined at specific locations as required.

29.15.4.5 Runoff Management

29.15.4.5.1 Ore and Waste Rock Stockpiles

Drainage that comes in contact with the ore and waste rock stockpiles has the potential to contain dissolved metals.

The drainage from ore and waste rock stockpiles located at the Lower Portal, along with flows from underground dewatering activities at the Lower Portal, will be collected at a Contact Water Collection Pond located to the south of the Lower Portal. From here, it will be discharged directly into Goldslide Creek.

Drainage from ore and waste rock stockpiles at the Upper Portal, along with flows from underground dewatering activities at the Upper Portal, will be discharged directly onto the Cambria Ice Field.

Drainage from the ROM Stockpile will be collected at a Contact Water Collection Pond located just to the northwest of the stockpile and then directed to the TMF to be handled with other contact water.

29.15.4.5.2 Talus Quarries at the Mine Area

Runoff from the two talus quarries will be directed to sediment ponds located at each respective quarry site. The runoff will be discharged directly into Goldslide Creek after the settlement of TSS in the sediment ponds.

29.15.4.5.3 Other Quarries and Borrow Pits

Water management measures at other quarries and borrow pits will be described in the NoW Application submitted as IDM seeks a *Mines Act* permit to develop the aggregate

sources. it is expected that water management at each quarry and borrow pit will focus primarily on the management of sediment, as geochemical testing will be completed and sources that are not geochemically benign will be avoided where possible.

29.15.4.6 Dust Control

29.15.4.6.1 Ore and Waste Rock Stockpiles

Dust associated with the stockpiles is not expected to be significant, as both the ore and waste rock will be run-of-mine sized material. Crushing and screening of ore will occur in the Process Plant. Stockpiles will be visually monitored for meaningful dust emissions and any necessary mitigation will be undertaken in accordance with the AQDMP.

29.15.4.6.2 Aggregate Sources

The development of aggregate sources will involve drilling and blasting (rock quarries), crushing and screening, stockpiling, transportation, and fill placement. These operations will be visually monitored for dust and mitigation measures applied in accordance with the AQDMP.

29.15.4.7 Adaptive Management

The activities and mitigation measures described in this plan may need to be adapted based on monitoring undertaken in accordance with the AQDMP and the AEMRP.

The need for any corrective actions to on-site management or installation of additional control measures will be determined on a case-by-case basis, based on monitoring conducted in accordance with the AQDMP and the AEMRP. The Aquatic Effects Monitoring Program (AEMP) under the latter plan will include monitoring of discharges to the environment. Evidence of adverse effects indicated by the AEMP will also be investigated.

Additionally, IDM will pay close attention to relevant issues raised by on-site staff, regulators, and local communities.

29.15.4.8 Closure and Post-Closure Phases

29.15.4.8.1 Ore Stockpiles

The following summarizing the mining and scheduling of ore stockpiles:

- The Upper Portal Stockpile will be used up in Year 1, and, as part of IDM's Progressive Reclamation Plan, the site will be reclaimed by Year 2.

- The Lower Portal Stockpile will be used up annually, and the laydown area will be reclaimed at the end of the mine life. In case of early closure, the stockpile will be managed as described in the Reclamation and Closure Plan (Volume 2, Chapter 5).

- The ROM Stockpile located adjacent to the Process Plant will be used up annually, and the site will be reclaimed at the end of the mine life. In case of early closure, the

stockpile will be managed as described in the Reclamation and Closure Plan (Volume 2, Chapter 5).

29.15.4.8.2 Waste Rock

The waste rock stored in stockpiles adjacent to the Portals will be relocated to the underground mine workings during the operations phase, and the sites will be reclaimed. Once the waste rock at the temporary surface storage areas has been used up, all future waste rock will be placed in the underground mine directly during the remainder of the operating phase.

29.15.4.8.3 Aggregate Sources

Most quarries and borrow pits will be progressively reclaimed following construction (i.e., early in the operation phase). It will be necessary to leave one or more quarries or borrow pits open to support ongoing operations (for example, annual TMF embankment raises, maintenance of the access road and site roads) or to support mine closure. The talus quarries will not be required as a source of backfill after the final year of operations (Year 6 in Table 29.15-3). All ARD/ML waste rock and extracted talus material will be placed into the underground stopes as cemented rock fill. Quarries and borrow pits remaining at closure will be reclaimed in accordance with the Reclamation and Closure Plan (Volume 2, Chapter 5). This includes ensuring physical stability with final contouring.

29.15.5 Monitoring Program

The monitoring program related to material handling includes both operational and environmental monitoring, as follows.

29.15.5.1 Operational Monitoring

The following will be monitored as part of this plan during mine operations:

- Recording of the number of truckloads and tonnage of ore, waste rock, and aggregate hauled and stockpiled;
- Visual monitoring of pit wall stability within active rock quarry areas;
- Surveying the extents of stockpiles and quarry operations to ensure each are confined to the areas set out in the permits and authorizations; and
- Confirming that all waste rock at surface is consumed as cemented rock backfill.

29.15.5.2 Environmental Monitoring

Monitoring for potential environmental effects will include:

- Visual monitoring of dust near hauling, stockpiling, and quarry operations, in accordance with the AQDMP;

- Visual monitoring to confirm runoff is being collected from stockpiles and quarries;
- Monitoring runoff quality from the stockpiles and quarries, in accordance with the AEMRP; and
- Photographing the site conditions and observations, as necessary.

The results will be tracked on site, available during inspection, and included in annual reports.

29.15.6 Reporting Requirements

IDM will submit one or more annual reports by March 31 for the previous year in accordance with Section 10.4.4 of the Code (BC MEM 2017). The annual report(s) will be presented in summary form as specified by the chief inspector or by the conditions of IDM's *Mines Act* Permit, containing the following information:

- Reclamation and environmental monitoring work performed under section 10.1.3 (e) of the Code;
- Performance of high-risk dumps under section 10.5.5 of the Code; and
- Other information as directed by the chief inspector.

These reporting requirements overlap with reporting related to the TMF, which are described in the TMP.

29.15.7 Roles and Responsibilities

The organizational structure proposed for the implementation of the MHMP is described in Table 29.15-4. Refinement and confirmation of the organizational structure will continue as the permitting process progresses and IDM eventually staffs the Project. Any changes to the above will be consistent with the requirements of the *Mines Act*/Code.

Table 29.15-4: Roles and Responsibilities

Title	Responsibilities within this Plan
Environmental Superintendent	Responsible for the development and application of this Plan, for communication with government and community, including Aboriginal Groups, and ensuring that the Plan reflects the results of these communications.
Mine Manager	The Mine Manager is accountable for the proper implementation and success of this Plan at the project site. Accordingly, he/she is responsible for approving monitoring programs and SOPs with support from the Mine Supervisor. The Mine Manager will review and act on compliance reports, and will communicate important outcomes to the Director of Environment corporately.

Title	Responsibilities within this Plan
Mine Supervisor	The Mine Supervisor will have functional responsibility for the implementation of this Plan. The Mine Supervisor will be responsible for communicating with relevant on-site personnel to ensure compliance with the Plan.
Environmental Monitors	The Environmental Monitors will be responsible for implementing the monitoring measures for this Plan. This includes day-to-day tasks, such as sample collection, onsite monitoring, and reporting.

29.15.8 Review of Plan Effectiveness

The adequateness of the mitigation measures and monitoring plans described in this Plan will be reviewed annually by the Environmental Superintendent, and the Plan will be revised in consultation with the Mine Manager if and as required.

29.16 Noise Abatement Plan

29.16.1 Introduction

This Noise Abatement Plan (NAP) details mitigation and management measures for noise-related adverse effects from mining activities. It defines mitigation measures to control noise effects from the mine and identifies current noise criteria that would trigger further potential contingency and adaptive measures if exceeded. A change in the noise environment has the potential to adversely affect people and wildlife in the local area. Although no residual adverse effects were identified in the Noise Effects Assessment (Volume 3, Chapter 8), the NAP sets forth the industry BMPs to control the noise sources and reduce the overall noise from the Project.

29.16.2 Scope and Objectives

This NAP focuses on limiting the adverse effects of the Project noise and includes the following key objectives:

- Legislation, guidelines, and/or industry standards relevant to Project noise;
- Mitigation measures planned to reasonably minimize effects from Project noise; and
- Outline of monitoring and reporting planned throughout the Project life.

This NAP focuses on limiting the area of effects from the Project noise sources to best adhere to the guidance from the Environmental Code of Practice for Metal Mines (Environment Canada 2009; see Section 29.18.3). The plan applies to the Project activities that produce noise and are applicable to the Construction and Operations Phases. Certain procedures in the NAP overlap with other Project management plans, including the Occupational Health and Safety Plan and the Wildlife Management Plan.

29.16.3 Applicable Legislation and Guidelines

The regulation of noise in Canada by federal, provincial, and municipal government does not provide a specific set of enforceable noise thresholds or standards for mine development projects in terms of wildlife, human, or other environmental effects. The NAP takes into account the industry BMPs, including those provided in the following relevant documents:

- The Environmental Code of Practice for Metal Mines (Environment Canada 2009);
- Useful Information for Environmental Assessments (Health Canada 2010);
- Directive 038: Noise Control (Alberta Energy Regulator (AER; 2007);
- BC Noise Control Best Practices Guideline (BC Oil and Gas Commission (OGC; 2009); and
- International Organization for Standardization (ISO) 1996-2:2007: Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels (ISO 2007).

These documents provide general noise mitigation measures specific to the mining industry as well as other large industrial operations in BC (i.e., oil and gas operations). The NAP addresses off-site effects only. Noise levels on-site will be regulated by WorkSafeBC and the Code (BC MEM 2017) under the *Mines Act* (1996a).

Noise criteria are considered in the Noise Effects Assessment (Volume 3, Chapter 8) to limit the area of effects of the Project noise sources. These criteria are from the guidance provided in the Environmental Code of Practice for Metal Mines (Environment Canada 2009) and are summarized in Table 29.16-1 with additional details in the Noise Effects Assessment (Volume 3, Chapter 8). In the context of this NAP, monitored exceedances of noise criteria at sensitive human or wildlife receptors will trigger further mitigation and adaptive management measures.

Table 29.16-1: Noise Criteria Considered from Environment Canada (2009)

Indicator	Description	Criteria Threshold
L_d – Daytime noise level	In residential areas adjacent to mine sites, the LA_{eq} from mining activities should not exceed the criteria threshold. Ambient noise can also affect wildlife, so sites in remote locations should also work to meet these objectives for off-site ambient noise levels	55 dBA
L_n – Nighttime Noise Level		45 dBA
L_{peak} - Blasting	Mines in areas where ground vibration and noise from blasting that are not regulated should design their blasts so that the criteria are not exceeded at or beyond the boundaries of the mine property	128 dB

Indicator	Description	Criteria Threshold
Mm/s – Vibration	No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than the threshold in a spawning bed during the period of egg incubation.	12.5 mm/s

29.16.4 Relevant Project Activities

The following are the potential relevant Project activities linked to implementing the NAP:

- Use of equipment;
- Mining and milling operations;
- Blasting; and
- Road use and other activities that may generate noise.

29.16.5 Protection Measures

29.16.5.1 Approach

Mitigation strategies for noise control typically focus on controlling noise:

- At the source;
- Pathway; and
- At the receptor.

Because the Noise Effects Assessment (Volume 3, Chapter 8) predicted limited spatial effect from noise levels, noise mitigation measures focus on BMPs and design mitigation primarily related to controlling noise at the source and controlling the noise pathway. Mitigations are provided broadly based on the types of sources considered as potential Project noise sources.

29.16.5.2 Mobile Equipment

The following BMPs concerning the use of mobile equipment at the Project site will be implemented for construction and operations activities:

- Equipment selected for use will have acceptable noise ratings;
- Equipment will be properly maintained to minimize noise, including lubrication and replacement of worn parts, especially exhaust systems, and will be documented in a scheduled maintenance program;
- Operation of equipment will be optimized to minimize noise, e.g., reducing vehicle speeds;

- The site layout will be optimized to minimize noise effects, e.g., by using natural screens such as buildings, locating doors away from noise sources and facing away from sensitive areas, and minimizing the need for mobile equipment to use their backup alarms;
- Site procedures will be optimized to minimize the noise effects, e.g., by keeping doors closed;
- Any loud procedures will be conducted indoors, where practicable;
- Barriers will be used where practicable to minimize noise effects, e.g. using excavated materials along hauling paths as berms; and
- Equipment will be turned off when not in use to avoid unnecessary idling.

29.16.5.3 Stationary Equipment

The following BMPs concerning the use of stationary equipment used in the mine development and process will be implemented where practicable for construction and operations:

- Equipment will be properly maintained to minimize noise, including lubrication and replacement of worn parts, and will be documented in a scheduled maintenance program;
- All diesel-powered equipment will be fitted with silencers (mufflers) meeting manufacturers' recommendations for optimal attenuation and maintained in effective working condition;
- Generators will be located within a noise enclosure, where practicable;
- Sound-muffling cladding will be used on bins, crushers, and conveyors; and
- Stockpiles will be located as berms to the extent practicable to minimize noise propagation from areas around the Process Plant and portals.

29.16.5.4 Blasting

The following measures will be implemented in planning and conducting blasts at the Mine Site during construction or operations activities:

- Blasting will be configured so that there are no simultaneous events across the site; and
- Blasts will be optimized to consider drilling quality analysis, emulsions filling quality analysis, and stemming analysis to minimize the noise effects.

29.16.6 Complaints and Response

Given the lack of permanent human receptor points within the Bitter Creek valley, the effects to people would be limited to those temporarily visiting the area for recreational or other purposes. Mine signage will identify contact numbers that the public can use to report noise concerns.

Should a noise complaint be received, an individual or department will be assigned the responsibility of the initial investigation to determine the likely causes with focus on identifying the possible source of noise. This may be accomplished by studying the description of the event provided by the complainant; the nature and types of activities taking place onsite during the complaint time; and prevailing climactic conditions.

Noise monitoring may form part of the investigation or response to complaints if there is active monitoring of noise being conducted concurrent with the complaint time. In addition, or alternatively, a spot check measure may be part of the investigation. The complainant would be contacted with the results of the investigation, which would be recorded for future reference.

29.16.7 Monitoring Program

Noise monitoring can be used as a tool to determine whether the guidelines for noise (Section 29.16.3) are adhered to at a particular location or receptor. Noise monitoring may be required if noise complaints cannot be resolved through other measures or if other indicator Project follow-up programs (i.e., for wildlife) show the potential for noise effects. If noise monitoring is required, it will follow the guidelines set out in the International Organization for Standardization standard (ISO 1996-2:2007), which provides guidelines for the measurement of noise and includes the following aspects:

- Instrumentation;
- Calibration;
- Selection of monitoring locations;
- Evaluation of measurement results;
- Measurement uncertainty; and
- Documentation.

The noise monitoring instrumentation used should comply with the class 1 or class 2 requirements as set out in the International Electrotechnical Commission (IEC; 2002) 61672-1 standard and equipment calibrations in accordance with the IEC (2003) standard 60942-2. Noise monitoring should be conducted when equipment, operating conditions, and weather conditions are representative of current operating conditions.

29.16.8 Reporting Requirements

Reporting will be conducted as per future permits, approvals, and authorizations relevant to noise management and will be delivered to the Mine Manager and/or delegates. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the

reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.16.9 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the NAP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.16.10 Review of Plan Effectiveness

Certain components of the NAP may need to be modified based on site experience and conditions and/or changes in legislation or BMPs. All aspects of the plan will be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Most importantly, review of this plan will include any aspects affecting protection of the environment, property, and persons.

Formal evaluations of the NAP shall be documented, with deficiencies noted, and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.17 Occupational Health and Safety Plan

29.17.1 Introduction

The Occupational Health and Safety Plan (OHSP) is one of many plans that form part of the Project's EMS. The EMS forms the basis of how IDM intends to minimize to an acceptable level the risk of adverse effects to the health and safety of the Project workers during all phases of the Project.

The OHSP addresses the management objectives, applicable legislation and guidelines, controls, monitoring, and roles and responsibilities that will be implemented as practicable to avoid and minimize the risk of occupational health and safety hazards at the Project's workplace, for the life of the Project. This is a conceptual plan and, prior to construction, IDM will revise it to include additional details relating to occupational health and safety measures, inspections, reporting, documentation, and details of continual improvement initiatives.

29.17.2 Scope and Objectives

The objective of the OHSP is for the implementation of reasonable control measures to avoid and minimize adverse effects to the health, safety, and well-being of people working in and near or at the Project site. The intent of this conceptual plan is to outline the policies and procedures IDM will follow to comply with provincial and federal regulatory

requirements and BMPs for workplace hazards. This plan is directly linked to the ERP, which outlines preventative measures and response procedures for emergencies related to the health and safety of people near or at the Mine Site.

29.17.3 Applicable Legislation and Guidelines

The health and safety of workers at mines in BC is regulated under the provincial Mines Act, specifically the Code (BC MEM 2017), established under the *Mines Act* (1996a). This applies to all BC mines and takes precedence over other provincial and federal laws and regulations pertaining to workplace health and safety. In addition to the *Mines* Act (1996a), there are several legislative statute requirements, industry standards and codes of practice applicable to the health and safety of humans, including:

- BC *Workers Compensation Act* (1996j):
  - Occupational Health and Safety Regulation (BC Reg. 296/97)
  - *Guidelines for Workers Compensation Act* (WorkSafeBC 2017a); and

- Workplace Hazardous Materials Information System.

29.17.4 Occupational Health and Safety Management Practices

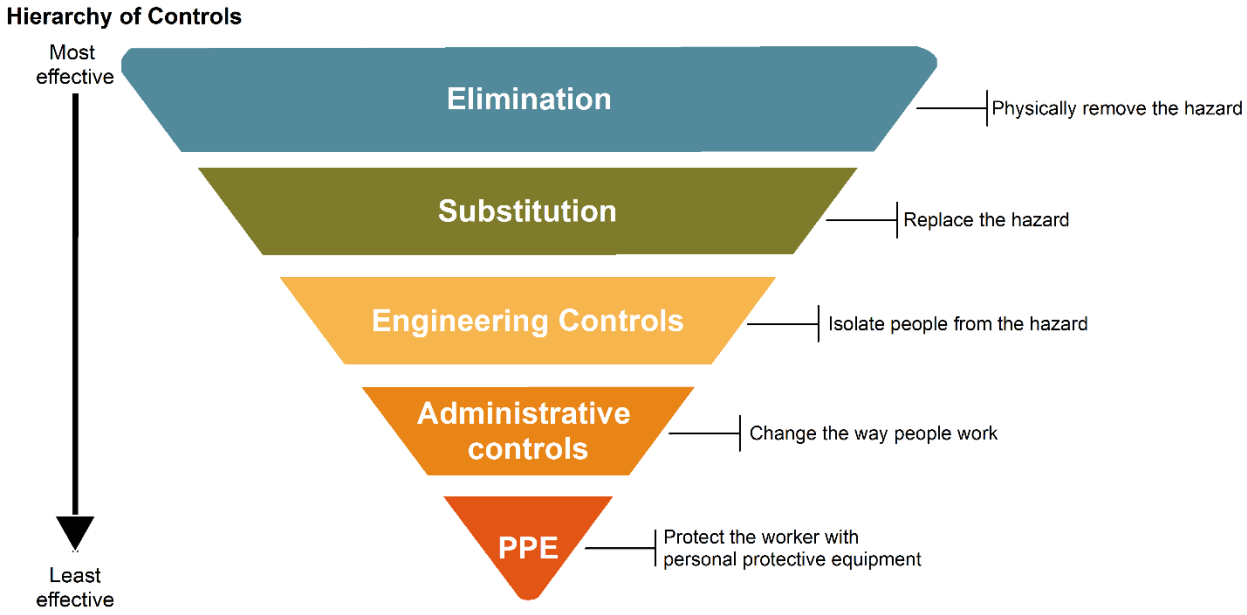
29.17.4.1 Prevention of Health and Safety Hazards

IDM will follow the hierarchy of controls reduce risks at the workplace for the Project (Figure 29.17-1), namely:

- Elimination;
- Substitution;
- Engineering controls;
- Administrative controls; and
- Personal Protective Equipment (PPE).

All types of controls will be considered and implemented, and in combination, where most effective.

Figure 29.17-1: Hierarchy of Controls (WorkSafeBC 2017b)



29.17.4.2 Hazard Elimination and Substitution

Eliminating hazards from the Project's workplace is the primary safety priority for IDM. If eliminating potential hazards is not an option, substitution can help to eliminate as it involves replacing the material or process with a less hazardous alternative. If hazards cannot be eliminated, substitution will be implemented where possible. Where these two options are not successful, engineering controls will be the next priority, followed by administrative controls and PPE.

29.17.4.3 Engineering Controls

If completely eliminating or substituting a potential hazard from the Project workplace is not possible, then appropriate engineering controls would be implemented where practicable. This will minimize the risks of workers being exposed to unacceptable levels of any chemical, physical, biological, ergonomic, or other hazard. All mine infrastructure and activities would be designed by a qualified professional/s and would meet required and acceptable standards of practice.

29.17.4.4 Administrative Controls

Administrate controls include work procedures, such as written safety policies, rules, supervision, training, etc., which aim to reduce workplace hazards. The Project will implement appropriate administrative controls with the goal to avoid and minimize adverse health and safety effects to workers and visitors at, near, or transporting to and from the Mine Site. Project health and safety policy rules include, but are not limited to, the following:

- Up-to-date mine plans would be kept at the Mine Site;
- Untrained and unauthorized persons would be prohibited to enter the mine;
- Only recognized means of entry and exit would be used and clear signs would be posted;
- Known potential risks of hazards would be signed and posted clearly where appropriate and practicable;
- Age restrictions would be implemented, e.g., only workers over the age of 18 would be permitted;
- Regular check-in procedures for all workers would be implemented;
- Regularly-scheduled safety meetings would be conducted to discuss the potential hazards associated with work activities and how those potential hazards are to be reasonably avoided, controlled, and emergency response procedures that apply;
- Drugs and liquor would be prohibited; impaired people would not be permitted to work;
- Improper conduct would be prohibited, which would be defined and communicated to each worker before starting (e.g., play or actual fighting, harassment, practical jokes that may create a hazard to a person);
- Tampering with safety devices and equipment would be prohibited;
- When working near machinery, equipment with moving parts, or equipment that is electrically charged, workers would be prohibited from wearing loose-fitting clothing, dangling jewelry, or long hair;
- Traffic safety rules would be communicated to workers and posted along vehicular travel routes;
- All workers would be familiar with the available safety reference materials that apply to all of their specific work activities, e.g., Job Safety Analysis forms, Standard Operating Procedures for equipment and tasks, Safe Work Practices, Safe Job Procedures, and MSDS; and

- All work involved in correcting an unusual hazard would be supervised by the manager or a delegate.

29.17.4.5 Personal Protective Equipment

When hazard elimination, substitution, administrative controls, and engineering controls are implemented, there is still a risk to workers at the Project site. All Project workers will have and wear appropriate PPE, which is a last line of defense for protection against potential health and safety hazards. This would include head protection, foot protection, eye protection, and hearing protection. Some equipment will require additional personal safety gear, which will be provided to and worn by workers.

Workers will be prohibited from working if they refuse to wear or use as appropriate, their PPE. Other personal safety equipment includes: first aid and survival kits, weather-appropriate clothing, communication equipment, and vehicle maintenance gear. All safety equipment would be used and maintained in accordance with manufacturer specifications.

29.17.4.6 Types of Hazards

The Project would have several types of potential hazards applicable, for which the hierarchy of controls would be implemented, including:

- **Chemical hazards**, including but not limited to, airborne and inhalation hazards (e.g., dust, workplace contaminants, low oxygen content of air such as in confined spaces) and other hazardous materials and wastes;

- **Physical hazards**, which include but not limited to:
  - Ground or wall instability;
  - Building and infrastructure;
  - Vehicles, equipment and machinery;
  - Electrical;
  - Noise;
  - Blasting;
  - Thermal environment;
  - Explosives;
  - Underground wall stability;
  - Water in the underground mine;
  - Worker fatigue; and
  - Falls from elevation;

- **Biological hazards**, which include but are not limited to:
  - Bacteria, viruses, and mould; and
  - Wildlife, insects, and plants, e.g., bears, bees, and ticks;

- **Ergonomic hazards**, including activities that may lead to musculoskeletal injury; and
- **Bullying and harassment hazards**, including but not limited to, verbal aggression, personal attacks, and other intimidating or humiliating behaviours.

29.17.4.7 Worker Training

All employees and contractors (workers) will be trained on workplace health and safety and how to do their jobs and work equipment and machinery safely. Training would include all BMPs as per the Code (BC MEM 2017) and the final OHSP. Training on Workplace Hazardous Materials Information System (WHMIS) will be required for all employees as well as the *Mines Act* and its regulations, the Code, and emergency response procedures. Training would also include stop work rights and procedures for all employees, i.e., all workers on have the right to refuse unsafe work without employment consequences.

In addition to comprehensive training, health and safety orientations will be conducted for all who visit the Project area, including short-term visitors. The orientation will include the location and types of potential hazards, the emergency and first aid kit locations and procedures, and other health and safety policies, practices, and procedures.

29.17.4.8 Adaptive Management

The above procedures and potential workplace health and safety hazards will be reviewed on a regulator basis. The procedures will be compared to revised regulations and or guidelines to ensure they are up to date. Inspections and audits will help identify opportunities for improvement and overall effectiveness of this plan. A target threshold will be identified prior to implementation for reportable health or safety recordable incidents. A recordable incident above the target threshold will trigger a full review of the OHSP.

29.17.5 Monitoring and Reporting Requirements

Occupational health and safety records for the Project will be kept in a reporting system, which would include details on:

- Worker training activities (i.e., records of all workers who have completed training, who they were trained by, and when, will be maintained);
- Reports of unsafe work sites or practices, accidents, and dangerous occurrences;
- Vehicle maintenance;
- Other the Code (BC MEM 2017) requirements as applicable; and
- Occupational health and safety statistics for the site.

An occupational health and safety committee will be responsible for carrying out regular planned and unplanned safety inspections and investigations in the workplace, as well as attend safety meetings, and review the records of mechanical and electrical maintenance conducted. Meeting minutes will be recorded and filed for each regular meeting. Any health and safety concerns or incidents encountered will undergo a complete assessment and evaluation process to determine the cause, magnitude, follow-up required, and necessary reasonable changes required to avoid or mitigate hazards. These will be reported and adjustments made to the OHSP and its procedures as applicable.

An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.17.6 Roles and Responsibilities

The Mine Manager will be responsible for the overall implementation of the OHSP and designating an occupational health and safety committee. All employees, contractors, and contractor employees will be responsible for complying with the intent of this plan.

An occupational health and safety committee will be responsible for carrying out safety inspections and investigations in the workplace and correcting any safety hazards promptly. The occupational health and safety committee would regularly review the OHSP for completeness and effectiveness for the life of the Project. The occupational health and safety committee would be composed of management and worker representatives.

All workers will be responsible for following the OHSP and applicable BMPs. Employment repercussions may apply if negligence of health and safety procedures, policies and protocols is determined.

29.17.7 Review of Plan Effectiveness

Certain components of the OHSP may need to be modified based on site experience or changes in legislation or best practices. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment or upgrading. Formal evaluations of this plan will be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.18 Site Water Management Plan

29.18.1 Introduction

The Site Water Management Plan (SWMP) outlines IDM's strategies to responsibly manage surface water at the Project. The phases of the Project development that will be addressed in the SWMP include:

- Construction;
- Operation; and
- Closure and Reclamation.

The SWMP is considered to be a living document that will be updated periodically during subsequent stages of design and construction. Updates will supersede any prior description of site wide water management for the Project.

29.18.2 Scope and Objectives

The primary objective of the SWMP is to describe the Project facilities and strategies that will be implemented by IDM for managing surface water throughout the Project site.

Two types of surface water are identified for the site:

- Contact water, which is affected by mine workings or disturbed areas (groundwater inflows from the underground mine, waste rock, ore stockpile, quarry areas, tailings, laydown areas, etc.); and
- Non-contact water, which is runoff from undisturbed areas.

The objectives of the SWMP are to:

- Divert all non-contact water, as technically possible, around the Project footprint to Bitter Creek, Otter Creek, or Goldslide Creek, or their tributaries;
- Collect all contact water that does not meet total suspended solids (TSS) or other water quality objectives and direct it to collection ponds;
- Safely release water that meets TSS and water quality objectives; and
- Utilize groundwater dewatering systems to allow underground mining operations to progress safely.

Water will be managed with the objective of minimizing erosion in areas disturbed by mining activities and preventing the release of untreated contact water that could adversely affect the quality of receiving waters.

Water management structures are presented on Figure 29.18-1, Figure 29.18-2, and Figure 29.18-3. The details of these figures are discussed in the sections that follow.

Figure 29.18-1: Mine Site Water Management Structures

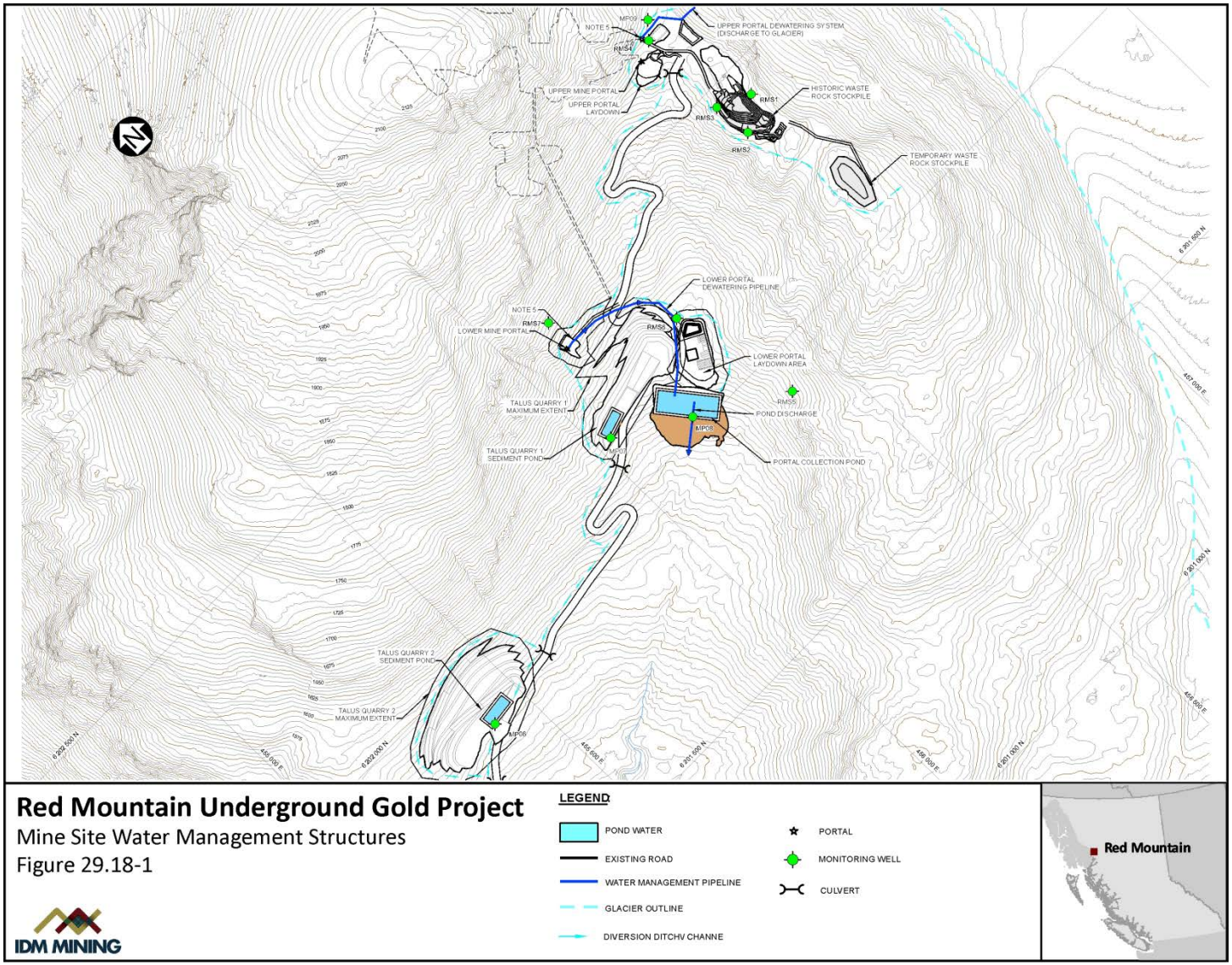


Figure 29.18-2: Bromley Humps Water Management Structures

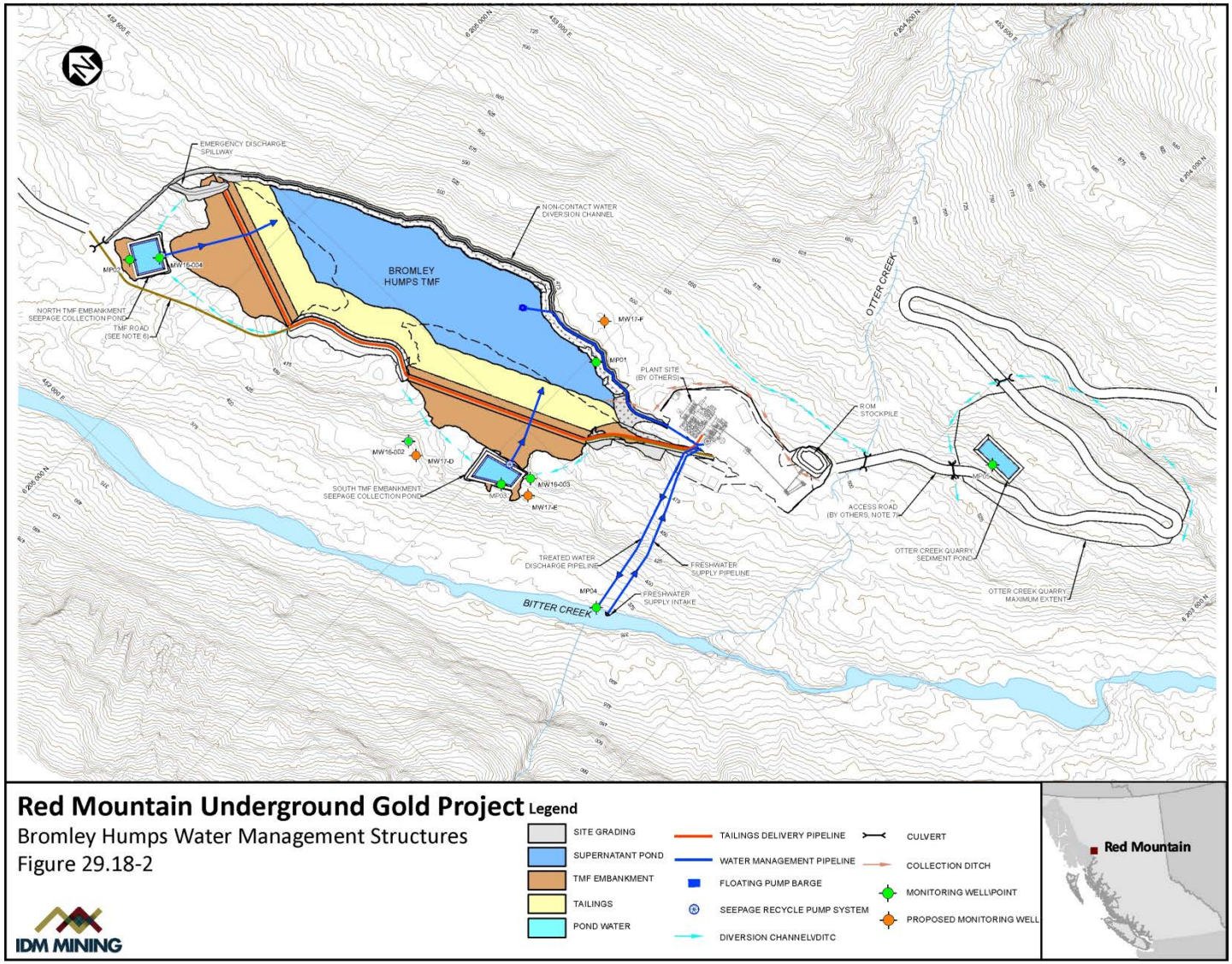
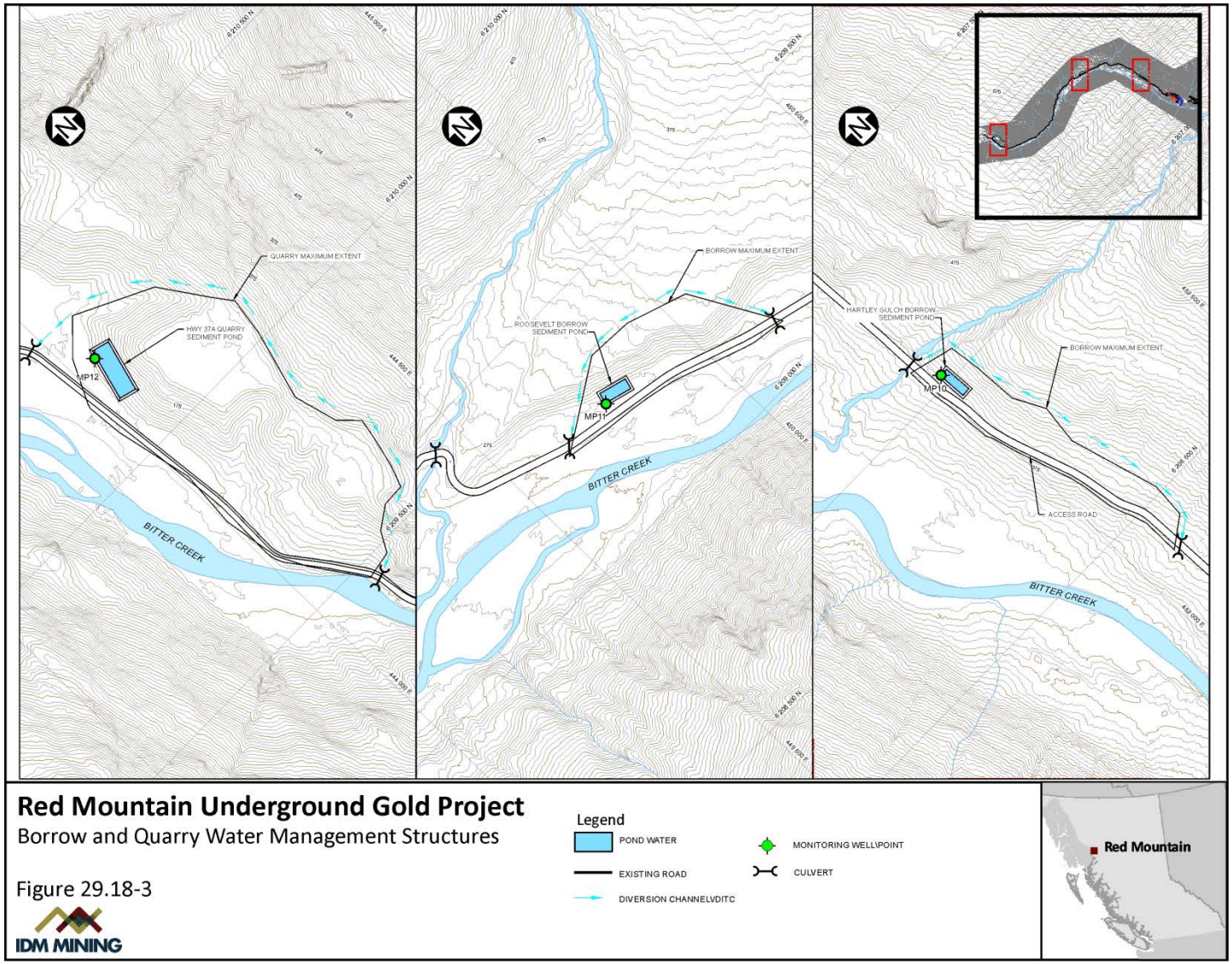


Figure 29.18-3: Borrow and Quarry Water Management Structures



29.18.3 Applicable Legislation and Guidelines

The relevant legislation and guidelines applicable to the SWMP include:

- BC *Mines Act* (1996a);
  - the Code (BC MEM 2017);
- BC *Environmental Management Act* (2003a);
- *Federal Fisheries Act* (1985a);
- *Canada Water Act* (1985);
- BC *Water Sustainability Act* (2016);
- Canadian *Environmental Protection Act* (1999);
- Canadian Water Quality Guidelines (CCME 2007, 2012);
- BC Approved Water Quality Guidelines (BC MOE, 2006, 2006, 2008, 2009, 2012); and
- MMER (SOR/2002-222).

29.18.4 Climate and Hydrology

29.18.4.1 Regional Climate and Hydrology

The Project area is characterized by steep mountainous terrain with incised glaciated valleys, and is situated at the toe of the Bromley Glacier. Orographically induced precipitation is expected due to the topographic variation of the area.

The Tailings Management Facility (TMF) and Process Plant are located at Bromley Humps, at an elevation of approximately 400 – 500 metres above sea level (masl). This area likely experiences more rainfall versus snowfall than the underground mine portals, situated at approximately 1,500 – 2,000 masl.

The baseline hydrometeorology data for the Project were presented by SRK Consulting Inc. (SRK) in the report "Red Mountain Underground Gold project – Baseline Climate and Hydrology" (SRK 2017a). Climate data from Environment Canada's (EC) Stewart Airport station were used in the SRK report to describe and quantify the meteorological characteristics of the Project area. The key data required for the SWMP are summarized in the sections that follow.

29.18.4.2 Mean Annual Precipitation

The long-term mean annual precipitation (MAP) for Bromley Humps was estimated using an orographic factor of 2.4% per 100 m of elevation change from the Mine Site to Bromley Humps, as presented in Knight Piésold Ltd (KP) Memo, "Additional Analysis on Precipitation Estimates for Engineering Design and Water Balance Inputs", which is included as Appendix-A with the KP Water Balance Report (Knight Piésold Ltd. 2017). An "Adjusted Case" MAP was estimated for the Project using PRISM (Daly. C. et al, 2002), a historical statistical climate data mapping tool from UBC. Both cases were used in water balance analyses and reporting to provide a range of anticipated conditions at the Project site.

The MAP for the Mine Site is estimated by SRK to be 1,847 millimetres per year (mm/yr; SRK, 2017a). The MAP for Bromley Humps was estimated to be 1,457 mm/yr using the orographic factor described above. The Adjusted Case MAPs were estimated to be 2,635 mm/yr at the Mine Site and 2,084 mm/yr at Bromley Humps.

The MAP distribution of rainfall to snowfall (as snow water equivalent) varies depending on elevation.

The monthly distribution of precipitation was estimated in the SRK memorandum, "Snowmelt Analysis at Red Mountain Project Based on Elevation" (SRK 2017b), and was adjusted by KP for the purpose of water management planning. The results are summarized for Bromley Humps and the Mine Site in Table 29.18-1 and Table 29.18-2. These percentages were applied to the MAPs above to produce monthly rainfall and snowfall estimates for water balance analyses.

Table 29.18-1: Monthly Precipitation Statistics for Bromley Humps, 500 masl

Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% of Annual Total	11.9	7.4	6.6	4.9	3.9	3.6	4.2	6.6	11.4	15.8	12.3	11.6
% Precipitation as Rain / Month	80	77	83	100	97	98	100	100	100	98	85	77

Table 29.18-2: Monthly Precipitation Statistics for the Mine Site, 1500 masl

Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
% of Annual Total	11.9	7.4	6.6	4.9	3.9	3.6	4.2	6.6	11.4	15.8	12.3	11.6
% Precipitation as Rain / Month	3	1	6	7	51	95	100	100	99	70	15	5

29.18.4.3 Return Period Frequency

Rain on snowpack storm events are not expected to be the critical events for design since the maximum effective combined rainfall intensity and snowmelt rates in the fall, winter, or spring periods are estimated to be less than the equivalent effective rainfall intensities in summer months for the small basins considered for the design areas. Snowmelt events are also considered unlikely to produce peak discharges of the same order of magnitude as for the fall storms.

The design rainfall storm events were developed using the Intensity Duration Frequency (IDF) data for the Stewart A station, which was assumed to apply to the Mine Site at an elevation of 1,500 masl. The return period events shown in Table 29.18-3 are adjusted

based on the ratio of mean annual precipitation estimates, as outlined in the KP Memorandum, "Additional Analysis on Precipitation Estimates for Engineering Design and Water Balance Inputs", and are to be used in design to represent site conditions at Bromley Humps. IDFs for the Mine Site are presented in Table 29.18-4.

Table 29.18-3: Intensity-Duration Frequencies for Bromley Humps, 500 masl

	1	2	5	10	25	50	100	200	PMP
24 Hour Rainfall (mm)	70	81	108	122	143	157	172	183	530

Notes:
1. Source: SRK, 2017a
2. Values not provided in the SRK reference were interpolated using the Gumbel Distribution from the provided return period storm events.

Table 29.18-4: Intensity-Duration Frequencies for the Mine Site, 1,500 masl

	1	2	5	10	25	50	100	200	PMP
24 Hour Rainfall (mm)	58	67	89	101	118	130	142	151	481

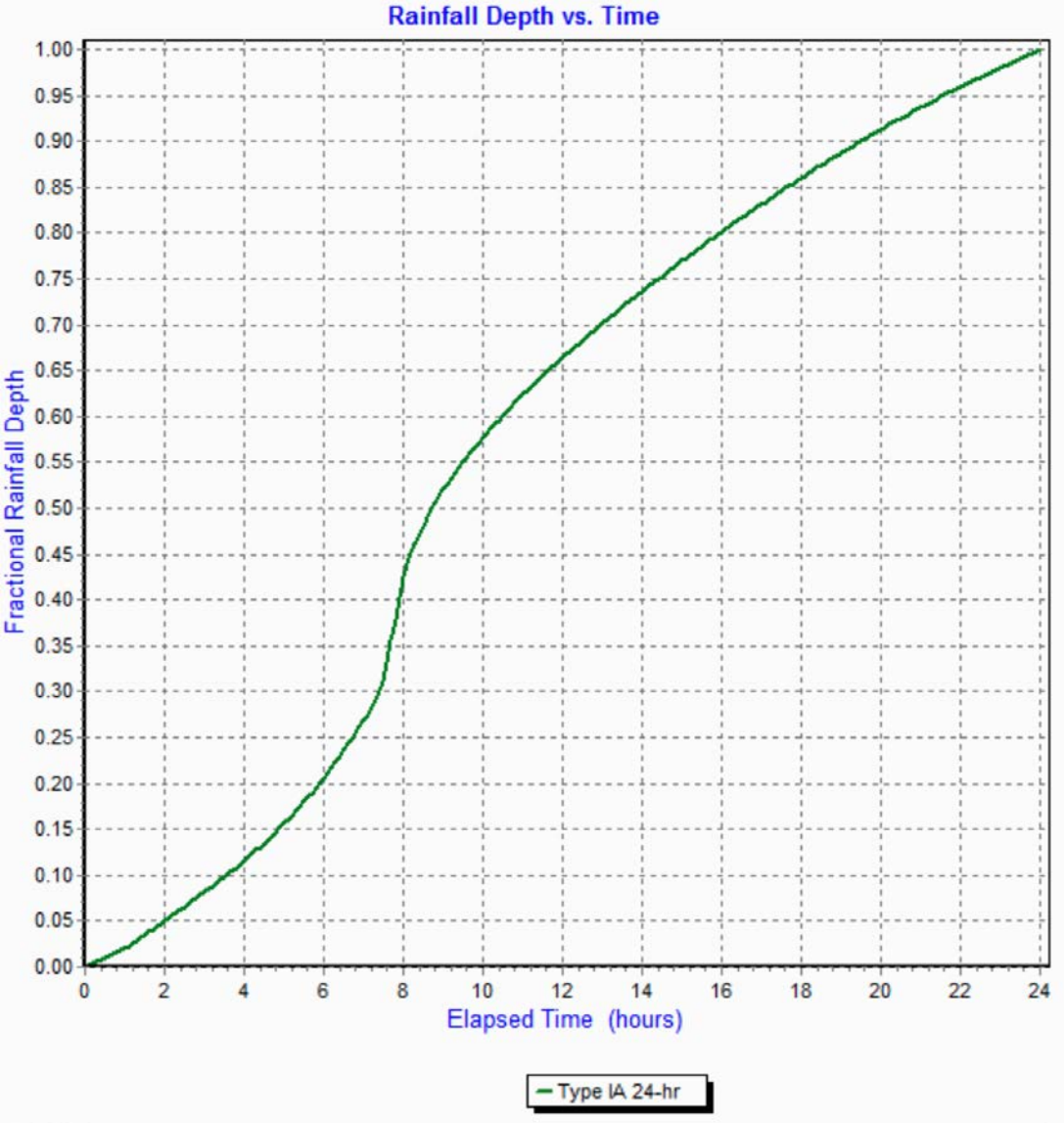
Notes:
1. Source: SRK, 2017a
2. Values not provided in the SRK reference were interpolated using the Gumbel Distribution from the provided return period storm events.

29.18.4.4 Runoff Modelling

Storm peak flow estimates will be calculated using suitable rainfall-runoff modelling software such as HydroCAD® (HydroCAD, 2015), based on the following:

- Rainfall depths based on Table 29.18-3 and Table 29.18-4;
- The 24-hour storm distribution derived from SCS Storm Type 1A unit hydrograph, or an approximated hydrograph for other storm durations Figure 29.18-4);
- Time of concentration will be calculated using either:
  - SCS curve number/lag time method for overland flow and flow velocity for channel flow;
  - BC Ministry of Environment (BCMOE) equation (Coulson, 1991); or
- SCS curve numbers according to the vegetation, surface treatment, and hydrologic soil group for each contributing catchment (HydroCAD, 2015).

Figure 29.18-4: SCS Type 1A 24-Hour Unit Hydrograph (HydroCAD, 2015)



29.18.5 Relevant Project Activities

29.18.5.1 Water Management – General Site Runoff

Mine infrastructure and upstream catchments for the Project were delineated based on 1 m topography data and available footprints of facilities. The total infrastructure area, not including roads and collection and sediment pond areas, is estimated to be 401,000 m^2 at Bromley Humps and 265,000 m^2 at the Mine Site. There will also be an additional 388,000 m^2 in borrow and quarries downstream of Bromley Humps.

Contact and non-contact water are managed separately throughout the Project. Contact water is contained in collection ponds and the TMF and is transferred through collection ditches and pipelines. Groundwater inflows from the underground mine are considered contact water as well. Non-contact water is diverted off-site through diversion ditches, berms, and culverts.

General site drainage measures include collection and diversion structures that will be used throughout the Project site. Measures for road drainage include collection ditches, diversion ditches, culverts alongside or through roads, and clear span bridges. The design criteria for temporary and permanent general site drainage structures are:

- Temporary structure design flow event: Peak flow resulting from the 1 in 10 year, 24-hour rainfall event; and

- Permanent structure design flow event: Peak flow resulting from the 1 in 200 year, 24-hour rainfall event, or smaller if necessary due to topographical constraints with appropriate contingency measures if the flow event surpasses the design flow, such as routing overtopping flow toward the TMF.

Guidelines for design and layout of drainage diversion and collection ditches are as follows:

- Ditches will be designed as open channels to pass design flows without overtopping for the given design return period;

- Ditches will be lined where needed to resist erosion (materials include, but are not limited to, grass, riprap, concrete, steel, and HDPE);

- The minimum ditch slope will be -0.5%, but preferably greater than -1% to avoid sedimentation; and

- Ditches will include a minimum freeboard of 300 mm.

Riprap will be designed using the following methods:

- U.S. Army Corps of Engineers (USACE, 1994);
- Smith and Kells (Smith and Kells, 1995);
- Robinson (Robinson et al., 1998); and
- Khan and Ahmad (Khan and Ahmad, 2011).

The calculated D50 will include a factor of safety of 1.2.

Sediment control ponds will be designed in accordance with the “Guidance for Assessing the Design, Size and Operation of Sedimentation Ponds Used in Mining”, prepared by the BC Ministry Environment (BCMOE, 2015).

The Erosion and Sediment Control Plan is described in detail in Section 29.9, and will be implemented along with erosion control measures described in this section.

29.18.5.1.1 Discharge Criteria

Contact runoff from site facilities is assumed to contain suspended solids due to the erosion of ground surfaces as well as oils and grease from heavy equipment. Discharge water quality for concentrations of suspended sediment, nutrients, metals, and pH levels will meet the Federal Metal Mining Effluent Regulations (MMER, 2016) and additional criteria that will be established using provincial and federal water quality guidelines.

29.18.5.1.2 Acid Rock Drainage and Metal Leaching

Geochemical characteristics of overburden, waste rock, ore, tailings, and quarry materials at the Project have been developed by SRK to ascertain the Acid Rock Drainage (ARD) and/or Metal Leaching (ML) potential through each phase of the Project. The water management strategies outlined in this report have been developed to manage each type of rock, overburden. or tailings based on these geochemical characteristics.

29.18.5.2 Water Management – Construction Activities

Construction activities are expected to elevate TSS in runoff. Specific surface water control elements and measures will be implemented to minimize erosion and prevent sediment discharge into surrounding areas. Surface water sediment mobilization and erosion will be managed throughout the site by:

- Installing sediment controls prior to construction activities;
- Limiting the disturbance to the minimum practical extent;
- Reducing water velocity across the ground, particularly on exposed surfaces and in areas where water concentrates;
- Progressively rehabilitating disturbed land and constructing drainage controls to improve the stability of rehabilitated land;
- Applying slope roughening to the surface in rehabilitation areas to promote infiltration;
- Protecting natural drainages and watercourses by applying erosion control BMPs, such as collection and diversion ditches, sediment traps, and sediment ponds;
- Restricting access to rehabilitated areas; or
- Constructing surface drainage controls to intercept surface runoff.

Subsurface water will be controlled by the use of sump pits, wells, or removable pumping stations to draw down the natural water table and provide dry stable construction areas. Excavations will be kept stable and workable by pumping water collected in the excavation sump pits to sediment control devices, such as temporary holding ponds, sediment basins, or sediment filter bags where required. A flocculent may be used, if required, for settling clay or silt particles that may exceed water quality discharge requirements. An adaptive

management approach will be implemented that allows sediment and erosion control works to be field fit to suit conditions encountered during construction.

29.18.5.3 Water Management – Mine Operations

The objective of water management during operations is to protect groundwater and surface water resources while meeting the Project water demands for mine waste management and providing water to the Process Plant to support processing.

The main sources of water contributing to water supply and site water management during the operations phase are described below.

29.18.5.3.1 Tailings Management Facility

The TMF will be used to manage tailings solids and supernatant water from the slurry tailings discharge process. The TMF is located north of the Process Plant site at Bromley Humps.

Contact runoff water in the TMF area will be routed to the TMF via appropriate grading of the areas, or with pumping. The TMF has a geomembrane liner to minimize seepage, and seepage from the facility will be collected in sumps and pumped back to the TMF.

Collected runoff from the Process Plant area, ROM Stockpile, and seepage from the facility will be managed in the TMF prior to being used in the Process Plant for mill water requirements or being discharged if the volume is in surplus. Surplus water will be treated at the Water Treatment Plant as detailed in the SRK memo “Conceptual Mine Contact Water Treatment Process for Red Mountain” (SRK, 2017c).

29.18.5.3.2 North TMF Embankment Seepage Collection Pond

The North TMF Embankment Seepage Collection Pond will be used to manage seepage and flows from TMF basin underdrain at the North TMF embankment. Surface runoff from the North TMF Embankment and a small local area will also be collected. Potential seepage from the TMF (through defects in the geomembrane) has been conservatively estimated at 32,000 m^3/year, and 40% (13,000 m^3/yr or 0.4 L/s) is assumed to report to the North TMF Embankment Seepage Collection pond. The seepage collection systems for the North TMF Embankment are assumed to be 80% efficient with the remaining 20% assumed to be unrecoverable and therefore report to the downstream receiving environment. Seepage collection will be optimized during detailed design and may result in a higher recover efficiency.

29.18.5.3.3 South TMF Embankment Seepage Collection Pond

The South TMF Embankment Seepage Collection Pond will be used to manage seepage from the South TMF embankment. Surface runoff from the South TMF Embankment and a small local area will also be collected. Potential seepage from the TMF (through defects in the geomembrane) has been conservatively estimated at 32,000 m^3/year, and 60% (19,000 m^3/yr or 0.6 L/s) is assumed to report to the North TMF Embankment Seepage Collection pond. The seepage collection systems for the South TMF Embankment are

assumed to be 80% efficient with the remaining 20% assumed to be unrecoverable and therefore report to the downstream receiving environment. Seepage collection will be optimized during detailed design and may result in a higher recover efficiency.

29.18.5.3.4 Process Plant Site

The Process Plant site is located on the southern boundary of Bromley Humps, near Otter Creek. Contact runoff water from the Process Plant area and the ROM Stockpile will be routed toward the TMF via appropriate grading and collection ditching.

29.18.5.3.5 TMF Diversion Ditch

Non-contact runoff upslope of the TMF pond will be diverted north of the Project to discharge to Bitter Creek. The ditch will convey up to a 1 in 5-year peak runoff, with an extra 0.3 m of freeboard. In the event that inflows exceed the 5 m^3/s design capacity of the diversion ditch, excess water will spill over the ditch berm into the TMF. The storm storage criteria in the TMF (i.e. the environmental design flood) has the capacity to manage this additional potential inflow from the diversion ditch during peak runoff events.

29.18.5.3.6 Existing Upper Mine Portal

Dewatering of the Upper Mine Portal will be achieved from start of operations to Year 1.5 via pumping with the discharge to the glacier east of the portal, outside of the Project area.

The Upper and Lower Mine Portals will be physically connected after Year 1.5 through to closure, and therefore there will be no more surplus water from the Upper Mine Portal after Year 1.5.

Runoff from facilities adjacent to the Upper Mine Portal will be directed east to the nearby glacier via diversion ditches.

29.18.5.3.7 Lower Mine Portal

Dewatering of the Lower Mine Portal will be achieved by routing surplus water to the Portal Collection Pond and discharged to Goldslide Creek.

29.18.5.3.8 Portal Collection Pond

The Portal Collection Pond (PCP) will collect pumped surplus water from the Lower Mine Portal, as well as runoff from the lower laydown area. The PCP is located near the lower laydown area, upslope from Goldslide Creek. Surplus water from the PCP will discharged to Goldslide Creek.

29.18.5.3.9 Talus Quarry Sediment Ponds

The Talus Quarry Sediment Ponds (TQSPs) will collect contact runoff from the Talus Quarry areas. Surface runoff will be routed to the sediment ponds via appropriate grading of the area or sumps and pumps. Surplus water from the TQSPs will discharge to Goldslide Creek.

29.18.5.3.10 Additional Quarry Sediment Ponds

In addition to the two Talus Quarries above, there are four additional borrow and quarry areas that will be used for source materials for the Project:

- Otter Creek Quarry;
- Roosevelt Borrow;
- Hartley Gulch Borrow; and
- Highway 37A Quarry.

Sediment ponds will collect contact runoff from each of the quarry areas. Surface runoff will be routed to the sediment ponds via appropriate grading of the area or sumps and pumps, and upslope non-contact runoff will be diverted around the quarry areas. Surplus water from the sediment ponds will discharge to Bitter Creek.

29.18.5.4 Water Management – Mine Closure

The primary objectives of the closure and reclamation activities will be to return the Project area to a self-sustaining state, protecting the downstream environment, and managing surface water. This will be accomplished through active and passive closure phases. Active closure is defined as the period during which water quality objectives are achieved by active management on site. Passive closure is when the site facilities have been reclaimed, water quality is suitable for release, and the final water regime reaches a steady-state.

29.18.6 Monitoring Program

29.18.6.1 Monitoring Locations

Water quality monitoring sites fall into two categories: surface water monitoring sites and groundwater monitoring sites. The locations of monitoring sites for the Project are presented on Figure 29.18-5, Figure 29.18-6, and Figure 29.18-7. Monitoring locations are detailed in Table 29.18-5.

Figure 29.18-5: Mine Site Water Monitoring Locations

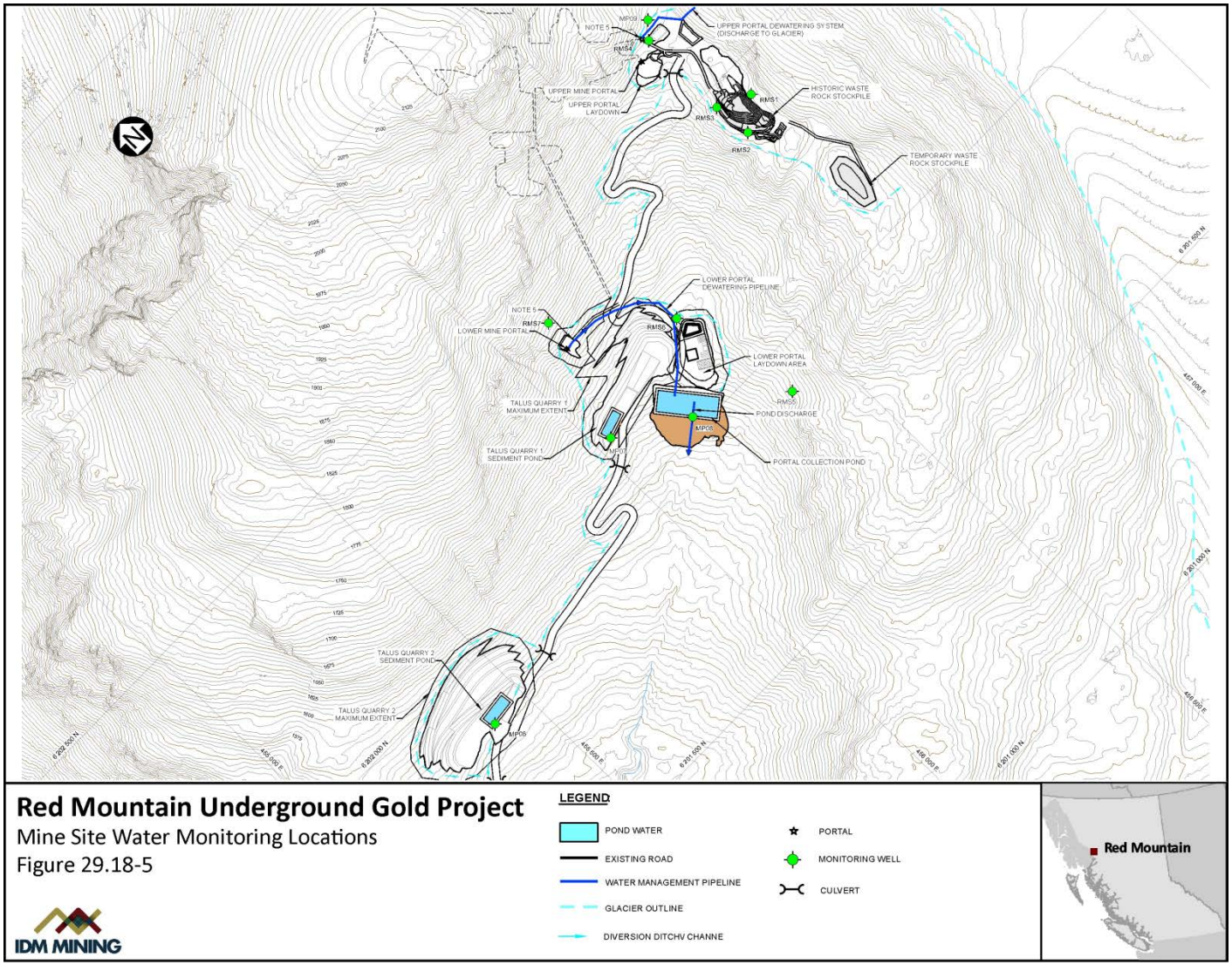


Figure 29.18-6: Bromley Humps Water Monitoring Locations

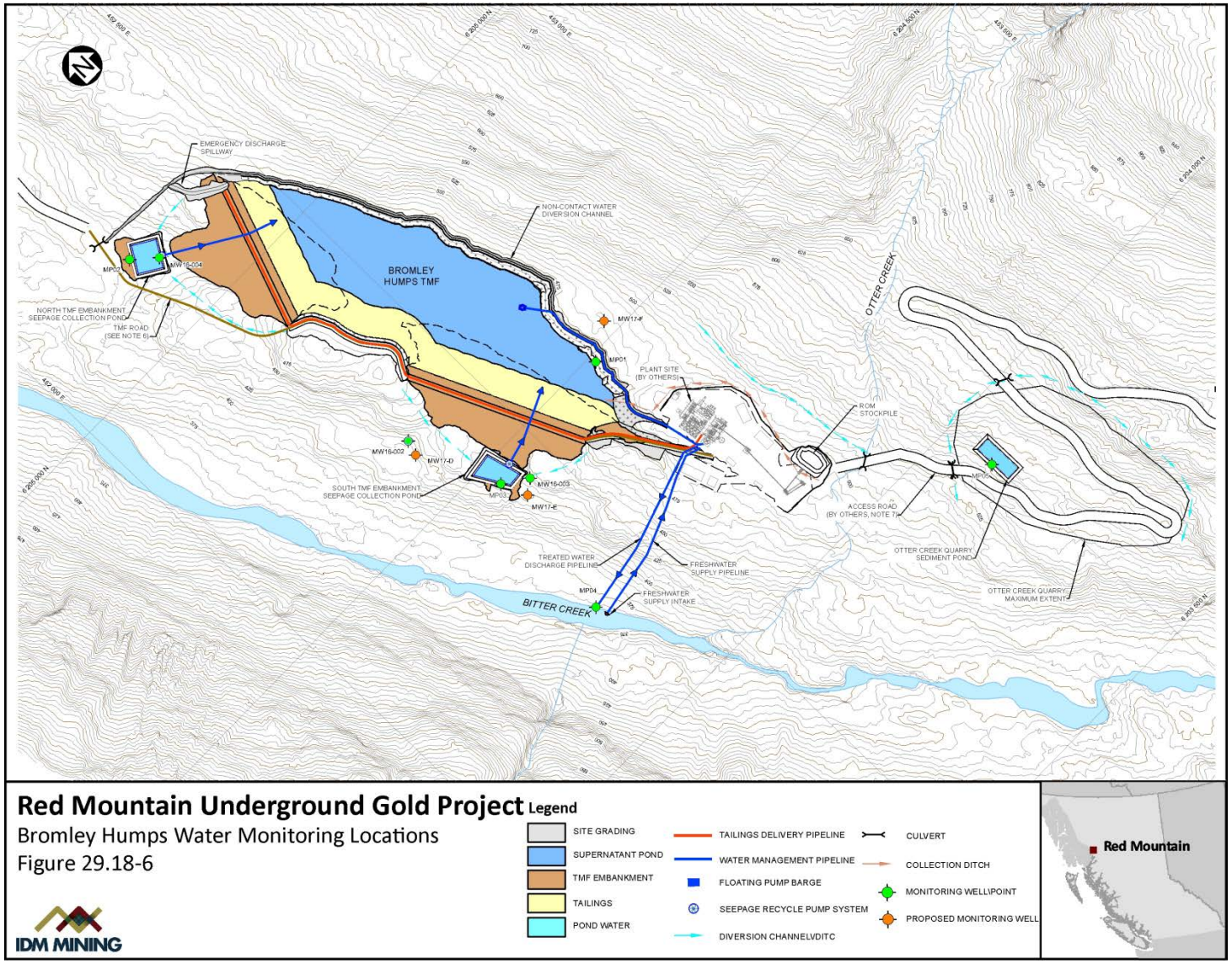


Figure 29.18-7: Borrow and Quarry Water Monitoring Locations

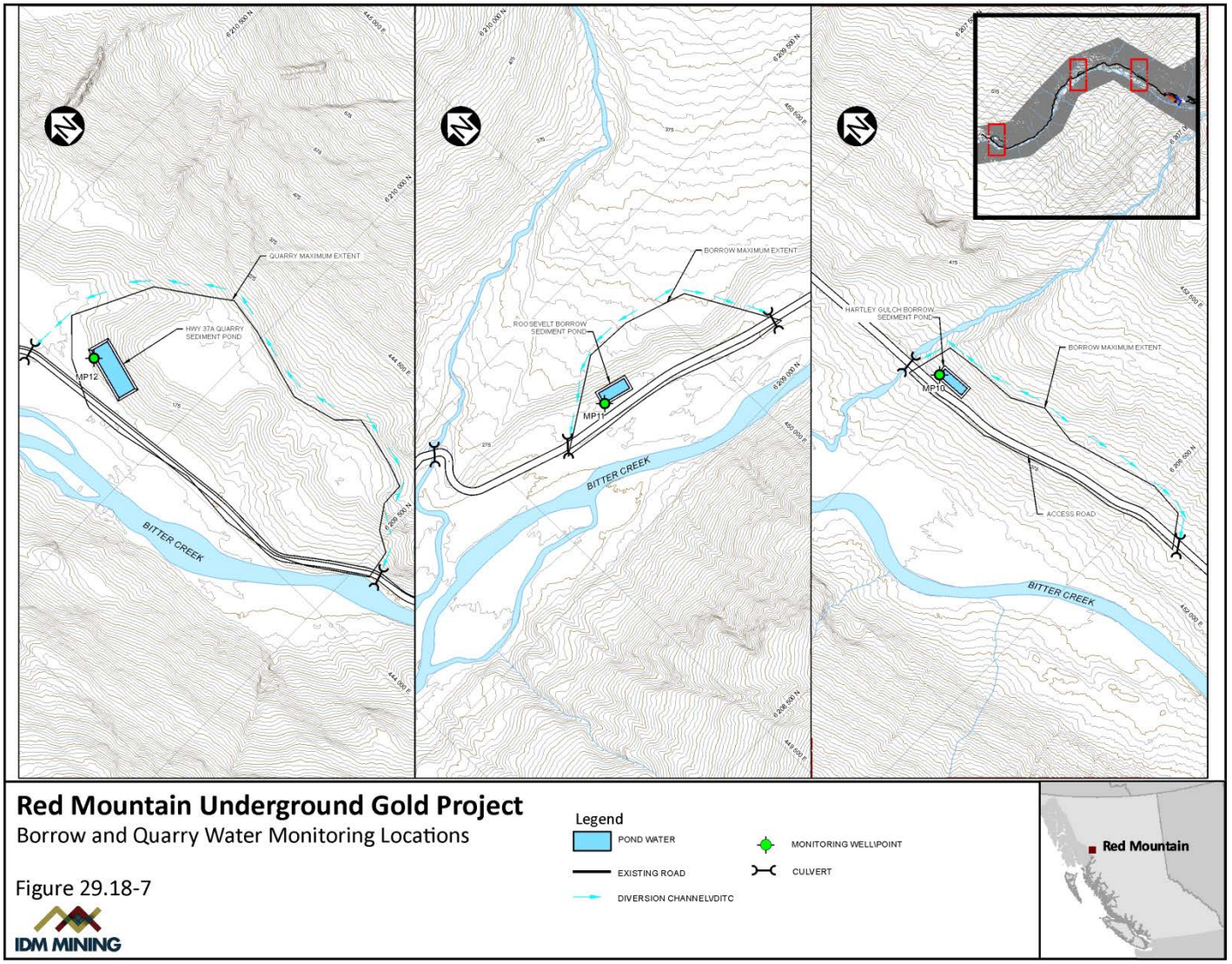


Table 29.18-5: Surface and Groundwater Monitoring Locations

Station Name	Northing (m)	Easting (m)	Description
MP01	452,656	6,204,487	Monitoring point at TMF supernatant pond
MP02	452,247	6,205,147	Monitoring point at North Embankment Seepage Collection Pond
MP03	452,406	6,204,459	Monitoring point at South Embankment Seepage Collection Pond
MP04	452,370	6,204,208	Monitoring point for water treatment discharge to Bitter Creek
MP05	452,985	6,203,907	Monitoring point at Otter Creek Quarry Sediment Pond
MP06	455,409	6,201,870	Monitoring point at Talus Quarry 2 Sediment Pond
MP07	456,036	6,202,125	Monitoring point at Talus Quarry 1 Sediment Pond
MP08	456,194	6,202,028	Monitoring point at Portal Collection Pond
MP09	456,750	6,202,704	Monitoring point for Upper Portal Dewatering Discharge to Glacier (ending Operations Phase Year 1.5)
MP10	451,999	6,207,021	Monitoring point at Hartley Gulch Borrow Sediment Pond
MP11	449,760	6,209,255	Monitoring point at Roosevelt Borrow Sediment Pond
MP12	444,057	6,210,235	Monitoring point at HWY37A Quarry Sediment Pond
MW17-D	452,343	6,204,591	Proposed monitoring well west of South Embankment
MW17-E	452,423	6,204,412	Proposed monitoring well southwest of South Embankment
MW17-F	452,713	6,204,523	Proposed monitoring well east of TMF supernatant pond
MW16-002	452,351	6,204,616	Monitoring well near TMF South Embankment
MW16-003	452,446	6,204,431	Monitoring well near TMF South Embankment
MW16-004	452,283	6,205,114	Monitoring well near TMF North Embankment
RMS1	456,790	6,202,428	Seep on east side of waste rock pile
RMS2	456,725	6,202,375	Seep on southwest side of waste rock pile
RMS3	456,717	6,202,462	Seep on northwest side of waste rock pile
RMS4	456,718	6,202,671	Ponded water in underground decline
RMS5	456,386	6,201,910	Artesian drillhole on steep southern side of cirque
RMS6	456,324	6,202,203	Artesian drillhole on southern side of cirque
RMS7	456,121	6,202,398	Artesian drillhole on northern side of cirque

29.18.6.2 Surface Water Monitoring Program

The success of the SWMP is dependent on monitoring of implemented BMPs. The Contractor, Field Engineers, and Environmental Monitoring Technicians will inspect erosion control measures periodically and after each significant runoff-producing rainfall event.

Silt fences, sediment traps/basins, ditches, culverts, and sediment control ponds will be visually inspected for the following:

- Excess sediment build-up;
- Structural/physical integrity; and
- Anticipated wear and tear.

Sediment removal and proper disposal will be performed as required.

Inspections to confirm that the mitigation measures identified in this document are implemented satisfactorily are as follows:

- Visual inspections to monitor the effectiveness of sediment and erosion control and runoff collection measures on a regular basis (daily or weekly as appropriate);

- Monitor treated effluent discharges on a weekly basis for key indicators (i.e., TSS and turbidity) and monthly sampling using in-situ monitoring devices (pH, temperature, specific conductivity) as well as laboratory analysis for parameters listed in the permits issued by the regulatory agencies;

- Periodically sample runoff at active construction and operations areas to monitor discharge concentrations with respect to discharge water quality permit limits;

- Recording daily and monthly water consumption; and

- Monitoring of water quantity and quality will occur during dewatering activities.

Volume of water transferred will be measured on a continuous basis using appropriate flow meters. Field turbidity and TSS will be monitored as required. As data become available, a TSS and turbidity curve will be generated to manage dewatering activities. Water transferred during dewatering activities will meet a TSS or turbidity threshold similar to the MMER and provincial permit limits for TSS.

During construction, the emphasis of monitoring will be on the implementation and success of mitigation at construction areas. Toward the end of the Construction Phase, Operation Phase monitoring activities will be implemented and monitoring will shift to include the relevant aspects of operations. Operation Phase activities beginning before the end of the Construction Phase will include the installation of operation phase water management facilities, milling, pre-stripping and mining of underground facilities, and the development of waste rock stockpiles.

In addition to the above efforts during construction, the following is proposed for monitoring during the Operation Phase:

- Recording daily and monthly water consumption;
- Regular visual monitoring of operations phase water management facilities;
- Visual inspections and monitoring of construction areas;
- Daily monitoring of the tailings discharge and the supernatant water level within the reclaim barge;
- Monitoring of effluents prior to discharge in relation to the criteria identified for various effluents;
- Underground mine inflows will be sampled to verify water quantity predictions and verify storage requirements; and
- Monitoring of mine contact water discharges as prescribed by a study design developed under the MMER and/or provincial permits.

Closure monitoring at receiving waters will be measured against water quality objectives. The following items are planned for monitoring during closure:

- Regular inspections to confirm that closure activities are being undertaken as identified in the final approved Mine Closure and Reclamation Plan;
- Construction-type monitoring is undertaken during decommissioning activities; and
- TMF water quality monitoring until water quality guidelines are met.

Post-closure monitoring is expected to be required after completion of closure activities. Post-closure monitoring is expected to include:

- Water quality sampling at mine contact water discharge locations in accordance with water quality objectives; and
- Final environmental effects monitoring studies in accordance with water quality objectives needed to obtain status as a recognized closed mine from Environment Canada and/or the BC Provincial Ministry of Energy and Mines.

A summary of the surface water monitoring stations, parameters and sample frequency are presented in Table 29.18-6.

Table 29.18-6: Surface Water Monitoring Parameters

Monitoring Location	Description	Parameters and Frequency
MP01	Monitoring point at TMF supernatant pond	Flow: During emergency discharge only, 1 minute intervals TSS and In-Situ: Monthly Anions and Nutrients: Monthly Total and Dissolved Organic Carbon: Monthly Total and Dissolved Metals: Monthly
MP02	Monitoring point at North Embankment Seepage Collection Pond	Flow: During emergency discharge only, 1 minute intervals TSS and In-Situ: Monthly Anions and Nutrients: Monthly Total and Dissolved Organic Carbon: Monthly Total and Dissolved Metals: Monthly
MP03	Monitoring point at South Embankment Seepage Collection Pond	Flow: During emergency discharge only, 1 minute intervals TSS and In-Situ: Monthly Anions and Nutrients: Monthly Total and Dissolved Organic Carbon: Monthly Total and Dissolved Metals: Monthly
MP04	Monitoring point for water treatment discharge to Bitter Creek	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily (Development of Turbidity / TSS Calibration Curve) Anions and Nutrients: Weekly Total and Dissolved Organic Carbon: Weekly Total and Dissolved Metals: Weekly
MP05	Monitoring point at Otter Creek Quarry Sediment Pond	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily until development of Turbidity / TSS Calibration Curve, daily starting two days prior to discharge thereafter Anions and Nutrients: Daily until established, then quarterly Total and Dissolved Organic Carbon: Daily until established, then quarterly Total and Dissolved Metals: Daily until established, then quarterly
MP06	Monitoring point at Talus Quarry 2 Sediment Pond	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily until development of Turbidity / TSS Calibration Curve, daily starting two days prior to discharge thereafter Anions and Nutrients: Daily until established, then quarterly Total and Dissolved Organic Carbon: Daily until established, then quarterly Total and Dissolved Metals: Daily until established, then quarterly

Monitoring Location	Description	Parameters and Frequency
MP07	Monitoring point at Talus Quarry 1 Sediment Pond	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily until development of Turbidity / TSS Calibration Curve, daily starting two days prior to discharge thereafter Anions and Nutrients: Daily until established, then quarterly Total and Dissolved Organic Carbon: Daily until established, then quarterly Total and Dissolved Metals: Daily until established, then quarterly
MP08	Monitoring point at Portal Collection Pond	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily (Development of Turbidity / TSS Calibration Curve) Anions and Nutrients: Weekly Total and Dissolved Organic Carbon: Weekly Total and Dissolved Metals: Weekly
MP09	Monitoring point for Upper Portal Dewatering discharge to glacier (ending Operations Phase Year 1.5)	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily (Development of Turbidity / TSS Calibration Curve) Anions and Nutrients: Weekly Total and Dissolved Organic Carbon: Weekly Total and Dissolved Metals: Weekly
MP10	Monitoring point at Hartley Gulch Borrow Sediment Pond	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily until development of Turbidity / TSS Calibration Curve, daily starting two days prior to discharge thereafter Anions and Nutrients: Daily until established, then quarterly Total and Dissolved Organic Carbon: Daily until established, then quarterly Total and Dissolved Metals: Daily until established, then quarterly
MP11	Monitoring point at Roosevelt Borrow Sediment Pond	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily until development of Turbidity / TSS Calibration Curve, daily starting two days prior to discharge thereafter Anions and Nutrients: Daily until established, then quarterly Total and Dissolved Organic Carbon: Daily until established, then quarterly Total and Dissolved Metals: Daily until established, then quarterly

Monitoring Location	Description	Parameters and Frequency
MP12	Monitoring point at HWY37A Quarry Sediment Pond	Flow: Continuous, 15 minute intervals TSS and In-Situ: Daily until development of Turbidity / TSS Calibration Curve, daily starting two days prior to discharge thereafter Anions and Nutrients: Daily until established, then quarterly Total and Dissolved Organic Carbon: Daily until established, then quarterly Total and Dissolved Metals: Daily until established, then quarterly

29.18.6.3 Groundwater Monitoring Program

Groundwater quality and quantity monitoring will be conducted during the Construction and Operations Phases at existing and proposed monitoring locations, as per Figure 29.18-5, Figure 29.18-6, and Figure 29.18-7. The Water Quality Monitoring Program and sampling methods will be based on protocols described in the following documents:

- Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. Version 2. (British Columbia Ministry of Environment 2016); and
- British Columbia Field Sampling Manual (BC MWLAP 2013).

Sampling parameters will be consistent with those collected for the baseline study by SRK Consulting (SRK, 2017d). A summary of the groundwater monitoring stations, parameters and sampling frequency are presented in Table 29.18-7.

Table 29.18-7: Groundwater Monitoring Parameters

Station Name	Description	Monitoring Type and Frequency
MW17-D	Proposed monitoring well west of South Embankment	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
MW17-E	Proposed monitoring well southwest of South Embankment	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly

Station Name	Description	Monitoring Type and Frequency
MW17-F	Proposed monitoring well east of TMF supernatant pond	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
MW16-002	Monitoring well near TMF south embankment	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
MW16-003	Monitoring well near TMF south embankment	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
MW16-004	Monitoring well near TMF north embankment	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
RMS1	Seep on east side of waste rock pile	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
RMS2	Seep on southwest side of waste rock pile	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
RMS3	Seep on northwest side of waste rock pile	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
RMS4	Ponded water in underground decline	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly

Station Name	Description	Monitoring Type and Frequency
RMS5	Artesian drillhole on steep southern side of cirque	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
RMS6	Artesian drillhole on southern side of cirque	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly
RMS7	Artesian drillhole on northern side of cirque	Flow: Continuous, hourly intervals TSS and In-Situ: Quarterly Anions and Nutrients: Quarterly Total and Dissolved Organic Carbon: Quarterly Total and Dissolved Metals: Quarterly

29.18.7 Reporting Requirements

Reporting requirements will be developed and described in the BC provincial permits to be issued by MOE and MEM. These reporting requirements will also be aligned with those outlined in the MMER (2015) regulations, which state that the owner or operator of a mine will submit an effluent monitoring report for all tests and monitoring conducted during each calendar quarter to the authorization officer within 45 days after the end of each quarter.

The effluent monitoring report will include:

- Tests for acute lethality for rainbow trout and Daphnia magna;
- The concentration and monthly mean concentration of deleterious substances contained in effluent samples;
- The pH of the effluent samples;
- Whether a composite or grab sample collection method was used for each effluent sample;
- The number of days that effluent was deposited during each month of the calendar quarter;
- The total volume of effluent deposited during each month of the reporting quarter;
- The mass loading of the deleterious substances; and
- The results of the effluent characterization.

If no effluent is deposited in a calendar quarter, the report needs only to include a statement to that effect. Each report will be submitted electronically via the Effluent Regulatory Reporting Information System (ERRIS) in the format provided by Environment and Climate Change Canada.

The Environmental Superintendent or Mine Manager will notify an inspector without delay if the results of the effluent monitoring tests conducted indicate that the limits are being, or have been, exceeded, the pH of the effluent is less than 6.0 or greater than 9.5, or effluent is or has been acutely lethal.

The Environmental Superintendent will be responsible for providing a written report of the test results to the inspector within 30 days after the tests have been completed.

29.18.8 Roles and Responsibilities

Environmental management at the Project is the responsibility of all site personnel, including employees and contractors. This philosophy will be communicated to all Project site personnel. Table 29.18-8 lists some basic roles and responsibilities of the SWMP.

It should be noted that refinement and confirmation of the organizational structure will emerge as the permitting process progresses.

Table 29.18-8: Water Management Plan Roles and Responsibilities

Title	Responsibilities Within This Plan
Mine Manager	A Mine Manager will: • Ensure that this water management plan is implemented; • Ensure all applicable execution plans, and relevant drawings are approved for use with this water management plan; • Coordinate as required with the Mine Supervisor and other contractor construction managers to ensure that the water management efforts are coordinated; • Monitor and report all daily activities; and • Make the shutdown decision if necessary, advised by the Mine Supervisor.
Mine Supervisor	A Mine Supervisor will: • Ensure that this water management plan is implemented; • Coordinate dewatering as required with the Area Foremen and other contractor superintendents; • Ensure erosion and sediment controls are in place; • Maintain all erosion and sediment controls by means of manual labor and adequate equipment; • Monitor and report as applicable; • Ensure all dewatering structures are built and maintained; and • Advise the Mine Manager to shut down specific works if deemed necessary.

Title	Responsibilities Within This Plan
Qualified Environmental Professional	A QEP or Professional Engineer will be appointed to review and approve the implementation of the onsite erosion and sediment control (ESC) measures including activities associated with: • Stripping, grading and site preparation; • Erosion control: storm water management; • Erosion control: temporary soil stabilization; and • Sediment control.

29.18.9 Review of Plan Effectiveness

The Environmental Manager or designate will conduct regular evaluations of the monitoring activities. This plan may be updated if additional methods for monitoring are found to be more appropriate.

The QA/QC for relevant monitoring programs will include the preparation of a standard operating procedure (SOP) for each of the activities within the program and auditing operations against this plan and any relevant SOPs.

29.19 Skills, Training, and Employment Plan

29.19.1 Introduction

IDM is committed to maximizing local benefits realized from the Project, including the development of a planned approach and set of measures to support skill development, training, and local employment.

This section provides a framework for a Skills, Training, and Employment Plan (STEP) that will be further developed in consultation with the community of Stewart, Nisga'a Nation, key training service providers, and stakeholders.

29.19.2 Scope and Objectives

The purpose of the STEP will be to enhance and support employment opportunities and benefits of the Project primarily for residents of Stewart and the Nisga'a Villages and secondarily for residents of regional communities. Training and employee retention will contribute to the success of the Project and help develop a skilled and experienced regional workforce that will be of benefit to future projects.

The STEP will have three linked objectives to:

- Maximize direct employment and training of employees from the District of Stewart and Nisga'a Nation;

- Develop opportunities for training of the regional workforce, provide on-the-job training, and support career advancement; and

- Minimize employee turnover through provision of career advancement and supportive employment conditions.

For clarity, "employees" refers to direct IDM employees as well as any contractors or sub-contractors who are engaged by IDM and who are active in Stewart or on site.

29.19.3 Applicable Legislation and Guidelines

Local and Aboriginal employment is an important strategic objective for IDM and one of the key socio-economic issues for community members and the Project.

The STEP will include IDM's commitment to meet or exceed provincial standards and requirements outlined in the applicable legislation and guidelines:

- The Code (BC MEM 2017);
- BC *Employment Standards Act* (1996k);
- Employment Standards Regulation (BC Reg. 396/95);
- BC *Mines Act* (1996a);
- BC *Public Health Act* (2008); and
- Industrial Camps Regulation (BC Reg. 70/2012).

29.19.4 Skills, Training and Employment Measures

29.19.4.1 Recruitment and Employment

IDM is committed to maximizing employment of the local workforce, including the community of Stewart and Nisga'a Nation. The hiring process will be open, merit-based, and competitive. However, within this context, IDM will take a proactive stance for the hiring of local and Nisga'a Nation candidates. Recruitment will include early communication activities and development of employment policies and programs to encourage local recruitment.

29.19.4.1.1 Communicating Opportunities

IDM's community engagement and communications initiatives will include a focus on raising community awareness and understanding around employment opportunities, training prerequisites, hiring schedules, and skills requirements.

IDM's employment coordinator(s) will work to communicate upcoming employment opportunities early and often through a variety of communication channels, which may include:

- Project newsletters;
- Project website;
- Email list serve;
- Social media;

- Recruitment events;
- Local and regional newspapers;
- Open houses and workshops;
- Nisga'a Nation Skills, Employment, and Training (NEST) initiatives; and
- Local and regional employment centres.

29.19.4.1.2 Employment Policies and Conditions

IDM will aim to provide competitive compensation and benefit packages for all employees, consistent with mining industry standards in BC. Employee benefits will include Health and Dental Care Plans, Employee and Family Assistance Program, and provisions for Professional Development.

The Construction Phase camp will be designed and built in compliance with relevant legislation and regulations, including the *BC Public Health Act* (2008) and the Industrial Camps Regulation (BC Reg. 70/2012). IDM will include design features and amenities to ensure a safe, healthy, and comfortable environment.

During the Operation Phase, IDM's goal is to encourage employees to live in Stewart on a full-time basis. IDM will work closely with the District of Stewart, service providers, and local businesses to discuss availability of adequate housing, amenities, and recreational facilities to help attract and retain new families to the community.

29.19.4.2 Skills Development and Training

IDM is committed to optimizing local employment and to that end will continue to develop and evolve a targeted skills development and training program as a component of the STEP. The development of this component will include engagement with various regional and local employment agencies, training institutions, the District of Stewart, and government and community groups, including but not limited to:

- Nisga'a Employment, Skills, and Training (NEST);
- Terrace and District Community Services Society (TDCSS);
- Northwest Community College (NWCC);
- Northwest Training Ltd. Career Counselling and Employment Centre; and
- Northwest Regional Workforce Table (NW RWT).

29.19.4.2.1 Skills Inventory

A skills inventory of the local workforce may be completed as needed to facilitate planning for training programs. IDM would coordinate with various partners and stakeholders to prioritize the most effective means of registering and tracking skills, expertise, qualifications, and certifications currently available and as they are achieved. Methods may include:

- Working with NEST;
- Job seeker surveys;
- Open houses or workshops;
- Development of candidate profiles; and

- Enhancing existing or developing employment centre databases.

Candidate profile templates may also be developed outlining key information needs. Candidate profiles can provide adequate information and skills assessments for IDM to gain an understanding of training needs and potential opportunities suited for each candidate. Other useful tools that may be developed if needed include a summary of job categories, positions, and the associated skills and expertise required. Job categories and positions which may be considered include:

- Entry-level positions, such as drill core technicians, driller's helpers, general labourers, or surveyor's assistants;
- Equipment and machine operators;
- Trades positions, such as camp cooks, millwrights, heavy duty equipment technicians, carpenters, or electricians;
- Services and supply, such as accountants, first aid coordinators, or transport truck drivers;
- Technicians and technologists, such as geological technicians, mapping and GIS technicians, or land surveyors; and
- Management positions, such as human resources managers, mine supervisors, or environmental managers.

29.19.4.2.2 Pre-Employment Training Strategy

A pre-employment training strategy may be developed as needed based on outcomes of the skills inventory and whether fundamental gaps are identified, including consideration for essential skills and employment readiness as highlighted in the NW RWT's Regional Skills Training Plan 2013–2018 (Northwest Regional Workforce Table, n.d). Training will address competencies required for Construction and Operation Phase employment. The training strategy would be guided by the following principles:

- Essential skill upgrading for low skilled employees;
- Enhancement of local and regional capacity to participate in mining and other natural resource projects in the region;
- Engagement of partner organizations, including Nisga'a Nation, TDCSS, NWCC, Northwest Training Ltd., local and regional communities, training institutions, and government agencies;
- Development of transferable skills; and
- Adherence to industry standards, best practices, and certificates that are universally recognized and accepted.

29.19.4.2.3 Employee Training Program

All employees will be required to complete mandatory training including, but not limited to:

- Health and Safety Orientation and Training, including health and wellness as well as occupational health and safety;
- Site-specific Orientation;
- Community and Employee Conduct Training; and
- Cross-Cultural Awareness Training.

These short courses will be completed in the beginning of employment and designed to meet occupational health and safety requirements.

In addition to these required courses and training, IDM is committed to the professional development of its employees and will strive to work closely with direct hires and contracting agencies to support skills development. Each employee will participate in a performance review and professional development with senior staff or a manager.

Programs and training sessions to meet plan targets may be organized on-site and offered to several employees at a time. Individuals may also have the option to participate in online or off-site courses.

29.19.4.2.4 On-the-Job Skills Development and Apprenticeships

A component of IDM's approach to skills development and training will be the development of on-the-job and apprenticeship programs.

New hires will be provided opportunities for hands-on experience and peer or supervisor mentoring and training. Where appropriate, formal apprenticeship programs may be implemented.

29.19.4.2.5 Scholarships and Training Accessibility

Several barriers may exist for low skilled and low income community members to participate in training and skill development programs. These barriers may include time off from current low-paying work, money to enroll in courses, finances to enable travel or living away from home while participating in the course, and others.

IDM understands that taking time for training or physically accessing training available in larger city centres may not be feasible for local community members. IDM is committed to finding ways to remove barriers and enable access to training.

To further support local hiring, IDM will consider offering scholarships to local community members interested in training programs and those pursuing education and careers in the resource development and environmental fields.

29.19.4.3 Retention

IDM will implement several activities and measures to ensure local employees are retained and non-resident employees remain in the community. These measures may include:

- Clear and transparent hiring practices and human resources policies;
- Safe working environment;
- Transparent, equitable, and fair workplace benefits and commitments;
- Availability of family and cultural leave;
- Provisions for on-the-job training and professional development;
- Policies for drug and alcohol use, including counselling and support services to help address problems such as substance dependency and/or abuse;
- Leisure and lifestyle programs to support employees and help in the management of work-related stress; and
- Camp and site amenities and facilities to support employee health and wellbeing.

29.19.5 Monitoring and Reporting

IDM will implement employee retention surveys to monitor and detect early potential issues with employees. The survey will include a voluntary section for those who self-identify as Aboriginal to provide information about their experience as an Aboriginal employee and potential social or cultural issues that might arise in relation to their employment at the Project.

29.19.6 Roles and Responsibilities

The Manager of Human Resources will be responsible for the overall and ongoing development and implementation of the STEP. The Human Resources Department will lead engagement with various employment agencies, training institutions, and their members, including NEST, TDCSS, NWCC, Northwest Training Ltd. Career Counselling and Employment Centre, and NW RWT.

IDM will explore the utility of hiring a Local and Aboriginal Employment Coordinator to help ensure maximum local and regional employment.

29.19.7 Review of Plan Effectiveness

The STEP will be a living document and may need to be modified based on site experience or management reviews, stakeholder feedback, employee retention surveys, regulatory changes, or other Project-related changes. All aspects of the plan shall be reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading.

Formal evaluations of the plan will be documented, with changes noted and corresponding progress in addressing any potential issues tracked in writing.

29.20 Social and Economic Management Plan

29.20.1 Introduction

IDM is committed to enhancing benefits and minimizing adverse social or economic effects of the Project in general, and in particular on the local communities of Stewart, the Nisga'a Villages, and Terrace.

29.20.2 Scope and Objectives

This Social and Economic Management Plan (SEMP) is a high-level strategic plan that describes IDM's approach to monitoring and managing the potential social and economic effects of the Project, with a specific focus on:

- Community health and wellbeing;
- Community safety;
- Community development and housing;
- Economic diversification;
- Community feedback mechanisms; and
- Monitoring of social and economic outcomes as measure of mitigation and management effectiveness.

This SEMP works in parallel with the related social and economic management plans for the Project, including:

- Community Involvement Plan;
- Health and Social Services Plan;
- Occupational Health and Safety Plan;
- Local Procurement Plan; and
- Skills, Training, and Employment Plan.

29.20.3 Applicable Legislation and Guidelines

The development of this SEMP is informed by industry standards, such as the International Finance Corporation Performance Standards (IFC 2012) and the Mining Association of Canada's Towards Sustainable Mining guiding principles (MAC 2016).

29.20.4 Social and Economic Management Measures

29.20.4.1 Community Health and Wellbeing

During Pre-Application Phase consultation with Northern Health Authority (NHA), NHA identified potential adverse effects to community health and wellbeing as a key concern, particularly given the existing socio-economic conditions in northwest BC. In response to this concern, IDM included community health and wellbeing as an assessment endpoint for many social valued components (VCs). The Social Effects Assessment (Volume 3, Chapter 20) outlines the various ways in which social VCs and, by extension, community health and wellbeing, may be adversely affected by the Project and highlighted the challenges and limitations of attempting to predict specific outcomes.

Community health and wellbeing is a broad concept that is often poorly defined and even more difficult to measure as it can mean different things to different people. Through participatory processes and community engagement, different measures can be identified to support and enhance community wellbeing, such as:

- Facilitation of community support groups;
- Support for community groups and initiatives;
- Promotion of community events that foster cohesion and the integration of existing residents with newcomers;
- Volunteer programs; or
- Capacity building for local community groups.

Specific measures proposed to manage the health and wellbeing of Project employees and, during Project operation, their families are discussed in the Skills, Training, and Employment Plan and Health and Social Services Plan. For clarity, “employees” refers to direct IDM employees as well as any contractors or sub-contractors who are engaged by IDM and who are active in Stewart or on site.

29.20.4.2 Community Safety

IDM will consult with the District of Stewart and the local detachment of the Royal Canadian Mounted Police (RCMP) to understand where and how it can be most helpful in supporting the community and effectively monitoring and managing any Project-related issues concerning the safety and security of Stewart residents. At a minimum, IDM will develop appropriate policies to help guide responsible behaviour and respectful interactions between community members and Project employees.

29.20.4.3 Community Development

IDM intends to maximize the potential benefits of the Project for local communities and community members, and anticipates that the Project may result in some economic

revitalization for the community of Stewart. By hiring as many qualified and available residents of Stewart as possible and by attracting others to relocate to the community during operation, IDM hopes to spur economic growth through employment, revenue, and induced economic effects.

IDM recognizes, however, that these outcomes are neither an inherent nor automatic outcomes of the Project. There are a number of interrelated issues related to the influx of new residents to Stewart, including the need for housing, additional demands on community infrastructure, and increased demand for community services and amenities. This SEMP will evolve and grow over time through engagement with, and feedback from, community members and stakeholders. As the Project advances, IDM will work with the District of Stewart and others to provide information on estimate of population influx and timelines and discuss social needs and consideration for how IDM can support the community.

29.20.4.4 Economic Diversification and Growth

IDM understands that the District of Stewart and the Nisga'a Villages are interested in exploring the potential role of the Project as a catalyst for sustainable economic growth and diversification. IDM would be willing to participate in a local taskforce to consider ways to attract additional businesses and people to the region.

29.20.5 Monitoring and Reporting

29.20.5.1 Community Feedback System Overview

Community feedback mechanisms are critical tools to facilitate open and ongoing communication between IDM, community members, and other stakeholders. From time to time, community members or groups might wish to raise an issue, concern, or even to file a formal (or informal) complaint with IDM about some aspect of its operation, personnel, contractors, or some other issue.

IDM's Community Feedback System is designed to facilitate community stakeholders' ability to ask questions or raise issues of any sort with IDM. It is strategically important as it demonstrates IDM's openness to community feedback and its commitment to working together to resolve problems or concerns in a mutually beneficial manner.

The purpose of the Community Feedback System is to provide a simple and direct process to hear community issues or concerns at the Project level and to seek solutions in a non-confrontational environment. The goal is to resolve issues to the satisfaction of those who raise them and for the community at large.

The system is intended to provide a familiar and accessible channel for community feedback and communication about grievances, information requests, questions, and/or suggestions. The Community Feedback System is a pillar of stakeholder engagement put in place to:

- Facilitate communication initiated by community members or groups;
- Track and records important communications with stakeholders;

- Ensure that issues are brought to the attention of the right people at the right time;
- Ensure issues are reviewed in a transparent and evidence-based manner; and
- Seek resolution through collaboration and dialogue.

To be effective, the Community Feedback System must not only be accessible, easy to use, cost-free, and transparent, but it must be seen to be so by potential users.

The system is not intended to replace, hinder, or obstruct community members or groups from, should they wish to, involving third parties or pursuing alternative ways to raise issues or resolve complaints, up to and including the judicial system.

29.20.5.1.1 Procedure

Dual goals of the Community Feedback System are to receive communication and feedback about issues at a point as close as possible to the incident, individual, or group in question and to respond in a clear and timely manner.

The typical sequence of steps for receiving, managing, and responding to feedback is outlined Figure 29.20-1 and includes:

- Receipt of feedback directly or via third parties, community relations staff, or employees or contractors in direct contact with community members;

- An IDM designate records details of feedback and sets review process in motion;

- Screening and validation involving a rapid assessment to quickly confirm whether feedback is valid, already under consideration, or falls under the jurisdiction of an external authority;[4]

- Investigation involving relevant personnel and departments to compile information and review details of the issue;

- Meetings held between relevant or affected persons/groups to discuss, verify, and explore options for resolution;

- Response from IDM, including the steps initiated to implement resolution and proposed measures to avoid recurrence; and

- An internal record of when, to whom, by whom, and how IDM's response was delivered and if any follow-up actions to monitor the issue are required.

These steps are not intended to impose rigid or a prescriptive process. The system will be implemented such that steps may be repeated, the sequence altered, or other considerations taken as more information becomes available or circumstances change.

[4] Only the most frivolous issues would be deemed not worthy of continuing through the feedback process at least to investigation. IDM will always provide a transparent and honest response and, within reason, will continue to communicate and engage with any party showing an interest, whether positive or negative, in the Project.

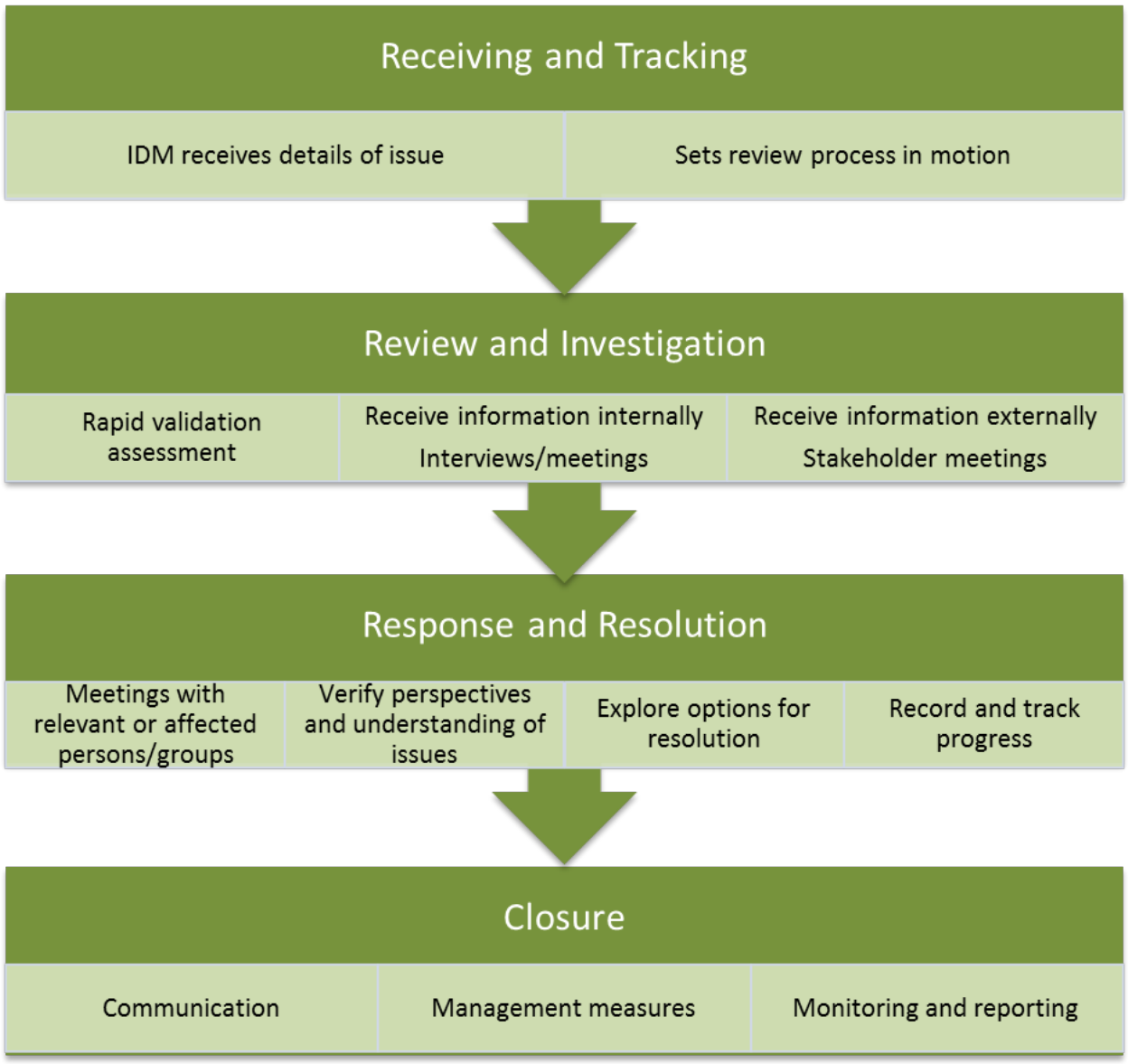
Minimum information to be recorded when receiving and tracking feedback should include:

- Name of person submitting feedback;
- Names of any other persons involved;
- Date;
- Relevant location; and
- Details of feedback.

When negative feedback is received, the designated responsible person may pursue a dialogue with all parties, including those directly involved, and those with specific knowledgeable about the issue. Relevant facts of the issue should be recorded and provided in writing to the person raising the issue and made available to appropriate IDM personnel. The person or persons who submitted feedback may be invited to meet and discuss it with relevant parties from IDM. The goal will be to resolve the issue as quickly as possible by coming to agreement on a fair and timely response and resolution. If a resolution cannot be reached, arrangements may be made in a fair and open manner to escalate the issue to a higher level of authority.

Community feedback is an important opportunity for IDM to communicate with community members and stakeholders and demonstrate its commitment to corporate responsibility and sustainability. To support this commitment, all IDM representatives will be encouraged and empowered to “own” any issue or feedback brought to their attention by a community member. In some instances, frontline IDM personnel may be able to resolve an issue with ease and without the need for extensive investigation. Such issues should still, as much as possible, be documented and registered in the system.

Figure 29.20-1: Summary of Community Feedback System Procedure



29.20.5.1.2 Documentation and Tracking

Documentation received will be entered in a designated database and stored on a secure IDM server. Records of feedback received, outcomes, and decisions will be kept for an appropriate amount of time. Metrics, such as the number and frequency of feedback submissions, average time to respond, and number or percentage of unresolved issues, can be tracked to help measure efficacy of the system and guide changes or adjustments.

29.20.6 Roles and Responsibility

The Manager of Human Resources will be responsible for the overall and ongoing development and implementation of the SEMP. The Human Resources Department will lead engagement with NHA, District of Stewart, Nisga'a Nation, community members and other stakeholders in relation to this plan.

29.20.7 Review of Plan Effectiveness

This SEMP is a living document that will grow and be further developed in partnership the District of Stewart, Stewart community members, Nisga'a Nation, Nisga'a citizens, and stakeholders. As it evolves, this SEMP will help identify appropriate adaptive management responses and will be an essential feature of the Project's approach to managing its social performance.

29.21 Spill Contingency Plan

29.21.1 Introduction

The Spill Contingency Plan (SCP) is one of many plans that form part of the Project's EMS. The SCP addresses spill contingency to minimize the risk of a spill of fuel, dangerous, and hazardous materials (e.g., reagents, contained liquid waste, chemicals, etc.), and the controls in place to respond to an emergency spill during the life of the Project. This is a conceptual plan and, prior to construction, IDM will revise the SCP to include additional details relating to spill preventative and emergency spill contingency measures, inspections, reporting, documentation, and details of continual improvement initiatives.

29.21.2 Scope and Objectives

This plan addresses spills, releases, or discharges of hydrocarbon or other contaminants to land, water, and snow. Protecting the environment and people from the potential effects of emergency spills requires the implementation of procedures for transportation, storage and handling of dangerous or hazardous materials; procedures for inspection, documenting, and reporting; and procedures for review and continual improvement of this plan throughout the mine life.

The SCP outlines the management strategy to be employed for the handling, transportation, and storage of solid and liquid materials to minimize risk of spills that might cause adverse effects to the biophysical and socioeconomic environment. It also outlines the course of action to be implemented in the event of an accidental spill. These steps will be practical and will include provision as to how to assess an incident safely and to implement an effective response with subsequent adaptive management and monitoring which includes any safe and efficient corrective action.

The objectives of the SCP are to, in prioritized order:

- Avoid or minimize accidental spills of solid and liquid materials; and
- Have a well-established sequence of actions to implement in the event of an accidental spill.

BMPs are assumed to be implemented with further Project-specific revision during final permitting and as needed throughout the life of the Project.

This plan will apply to the Project development areas, any areas that would be affected from the Project's development, and the Project's transportation routes. It will begin with construction and continue until end of closure and reclamation.

Depending on the type and quantity of the contaminant and relative locations of the spill, predetermined lines of response, plans of action, and roles and responsibilities will be developed prior to construction.

Certain procedures in the SCP overlap with other Project management plans, including:

- ERP;
- HMMP;
- WMP;
- FMP; and
- Explosives Management Plan.

An integrated approach will thus be adopted in the application of the various components of environmental management and reporting for the Project.

29.21.3 Applicable Legislation and Guidelines

There are several legislative statute requirements, industry standards and codes of practice applicable to accidental spills, including:

- BC *Environmental Management Act* (2003a):
  - Spill Reporting Regulation (BC Reg 263/90);
  - Spill Cost Recovery Regulation (BC Reg 250/98);
  - Contaminated Sites Regulation (BC Reg. 375/96);
  - Petroleum Storage and Distribution Facilities Storm Water Regulation (BC Reg 168/94);
- Canadian *Environmental Protection Act* (1999):
  - Environmental Emergency Regulations (SOR/2003-307);

- BC *Mines Act* (1996a):
  - The Code (BC MEM 2017);
  - Workplace Hazardous Materials Information System Regulation (BC Reg 257/88);
- *Fisheries Act* (1985a);
- BC *Transportation of Dangerous Goods Act* (1996i); and
- Canadian *Transportation of Dangerous Goods Act* (1992):
  - Transportation of Dangerous Goods Regulations (SOR/2001-286); and
  - A Field Guide to Fuel Handling, Transportation & Storage (MWLAP 2002).

29.21.4 Relevant Project Activities

The following are the potential materials and mechanisms of spills for the Project:

- Tailings spill, e.g., from a pipeline break;
- Small hydrocarbon spills through human errors, improper handling, or vehicular accidents;
- Process reagents, e.g. leaks from container breaks;
- Large diesel spills, e.g. break in pipeline or ruptures of container during storage or transport; and
- Ethylene glycol spill, during transport.

A more exhaustive Project risk assessment program will be detailed and implemented.

29.21.5 Environmental Protection Measures

This SCP provides initial guidance on how to reasonably avoid, control, and mitigate spills and implementation of emergency response procedures should an accidental spill occur. It will be further developed as part of the permitting process, including detailed adaptive management measures. With immediate and effective response to emergency spills, adverse effects and potential hazards to personnel, property, and the environment are minimized.

29.21.5.1 Spill Prevention

The first steps in control and prevention measures are to a) identify and understand the potential materials and spill mechanisms and b) implement proper storage, handling, and transportation measures.

The following initiatives will contribute to the effective prevention of spills:

- Site planning, including optimal site locations for storage of fuel, dangerous, and hazardous materials, and spill control and containment would be incorporated into the infrastructure;
- Facility design to incorporate BMPs for spill containment, such as:
  - Double-walled containment of all fuels and dangerous or hazardous products;
  - Protective barriers around dangerous or hazardous products where there is potential for impact from vehicles; and
  - Bermed storage areas for material containers, exceeding 110% capacity of the largest container;
- Maintaining spill response kits strategically located to be available and applicable to any type of spill material;
- Maintaining and implementing inspection schedules and practices for all storage areas and tanks;
- Implementing material handling procedures, including fueling procedures and fuel truck transfer procedures;
- Certification of all trucks and truck operators per the *Transportation of Dangerous Goods Act* and thorough inspections of trucks to ensure proper containment of cargo; and
- Regular and frequent maintenance of vehicle, roads, equipment, and storage facilities and berms.

Besides the customized spill response equipment, including the mobile unit, each vehicle will be outfitted with spill kits. The implementation of the Fuel Management Plan, Waste Management Plan, and Explosives Management Plan also contribute to the prevention and mitigation of spills.

29.21.5.2 Spill Response Plan

Despite the preventative control and mitigation measures implemented, a spill contingency and response plan is needed in case a spill occurs. Immediate and safe response to spills is important to minimize adverse effects.

An emergency spill is a spill of materials that can adversely affect the environment, the health, safety, or welfare of people, property, or operational efficiency. The spill is large or serious enough to require a controlled and coordinated response. Spills could occur from various sources or reasons, such as:

- Equipment malfunctions;

- Human error; and
- Natural events.

Educating and training employees and equipping them with relevant knowledge and tools increases the effectiveness of the plan, as well as emphasizing employee responsibilities under the plan. All employees will undergo training to identify hazards and potential spill receptors and pathways, however, specific staff would undergo additional training in the role of a Spill Response Team. Spill Response Team members will be available 24/7. Employees would be educated on the:

- SCP;
- Applicable regulations;
- Environmental receptors and pathways;
- Application of appropriate spill response mechanisms to be implemented in the field;
- Procedures in initial spill response and reporting; and
- Muster station locations around the site.

An important component of spill response is to have spill kits readily available and nearby to contain, reduce, or remove a spill in a prompt manner.

The site and vehicles will be equipped with spill kits. Spill kits will vary in size and contents depending on the type and volume of spills possible and environmental sensitivities of the surrounding areas. Basic contents will include oil absorbent pads and booms, absorbent socks, granular absorbent, and protective personal equipment (e.g. gloves, goggles, and suits). On-site kits will be stored in weather-resistant containers and located in strategic and visible locations. Kits will be inspected regularly, and a list of suppliers of specialized spill response services and materials will be maintained and updated to provide support on short notice or when replacement of materials is needed. Larger spill kits will be transportable to be contained on a trailer, truck, or helicopter for rapid deployment to any spill scene. In addition, a communication system will be implemented to ensure immediate and fast notification of any detected spills.

The following actions will be taken in the event of a spill in order of priority and response:

- Immediately identify and control:
    - Immediate dangers to human life or health; and
    - Spill material and source, as well as the potential for additional related sources of spills.
- Once safe to do so:
    - Take measure to stop the flow or removal of the spill and potential spill sources;
    - Contain the spill;

- Notification of authorities, stakeholders, Aboriginal Groups and communities, as appropriate, so that those groups may initiate response for their own interests or their assistance elicited;

- Recover and cleanup, rehabilitating the site to protect the environment;

- Investigate the incident;

- Notify appropriate stakeholders, including government agencies, particularly the BC Provincial Emergency Program as soon as possible, and any nearby communities or landowners; and

- Report the incident.

If the spill for some unforeseen reason cannot be handled by on-site trained personnel or spill response equipment on-site, a spill response contractor will be called to the site. A plan for cleanup and remediation will be developed by the Environmental Superintendent, or their delegate, in coordination with external consultants, if and as required.

29.21.5.3 Adaptive Management

The above procedures will be reviewed on a regulator basis. The procedures will be compared to revised regulations and/or guidelines to ensure they are up to date. Inspections and audits will help identify opportunities for improvement and overall effectiveness of the SCP. A reportable spill will trigger a full review of the SCP Plan.

29.21.6 Monitoring Program

Materials classified as dangerous, hazardous, or deleterious transported to and/or from or stored at the Project site will be inventoried regularly. This shall include reconciliation of total amounts received against amount ordered, measuring material volumes or other units of measurement, and monitoring the use of materials.

Equipment and storage containment facilities will be kept in good working condition. Facility monitoring and preventative maintenance activities and procedures shall be undertaken to prevent inadvertent releases of materials to the environment, including:

- Equipment and light vehicle operators shall conduct regular visual inspections to ensure equipment integrity, cleanliness, and the adequacy of spill prevention material;

- Storage containers and equipment shall be visually-monitored for signs of leakage of material (e.g., fuel tanks, excavation equipment, pipelines, etc.). This includes looking for signs of corrosion, staining on the ground, and cracks or breaks in hoses and other ancillary equipment during the visual inspection;

- Signs of contaminant materials (including fuel) will be clearly marked, visible, and legible;

- Piping shall be protected from traffic;

- Containment areas shall be kept clear of debris, snow, ice or standing water; and
- Emergency pumps and/or skimmers shall be tested on a regular basis.

Minimum inspection frequencies for fuel will occur as outlined in the Fuel Management Plan and for all else at a minimum voluntary frequency of every two (2) years. Monitoring will also be conducted during and after an emergency, should one arise, to identify resulting health, safety, or environmental risks, and adapt the SCP accordingly.

29.21.7 Reporting Requirements

A reportable type and amount of a spill related to the Project will be reported within 24 hours of its occurrence to the BC Provincial Emergency Program at 1-800-663-3456.

Reportable types of substances and amounts are listed in a schedule to the Spill Reporting Regulation (BC Reg 263/90) of the BC *Environmental Management Act* (2003a). Reporting of a spill will be reported to the Environmental Superintendent, Mine Manger or designates, who will externally report the spill to the BC emergency spill program. The following information will be provided in the reporting:

- The reporting person's name and phone number;
- The company's name and phone number;
- Location and time of the spill;
- Type and quantity of the substance spilled;
- Cause and effect of the spill;
- Details of action taken or proposed; and
- Description of the spill location and the surrounding area.

An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.21.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the SCP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.21.9 Review of Plan Effectiveness

Certain components of the SCP may need to be modified based on site experience or changes in legislation or best practices. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Most importantly, review of this plan shall include any aspects affecting protection of the personnel and the environment.

Formal evaluations of the SCP shall be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be maintained.

29.22 Tailings Management Plan

29.22.1 Introduction

The Tailings Management Plan (TMP) outlines IDM's strategies to responsibly manage tailings generated at the Project. The Project will generate tailings that will be stored in a TMF located at Bromley Humps Figure 29.22-1).

The TMP is a discipline-specific biophysical management plan that forms part of the Project's EMS. IDM will update this plan prior to construction to reflect relevant design changes resulting from detailed engineering. It will also be refined throughout life of the Project based on the outcome of management reviews, incident investigations, regulatory changes, or other Project-related changes.

Related management plans also presented in Chapter 29 include the following:

- AQDMP;
- SWMP; and
- AEMRP.

29.22.2 Scope and Objectives

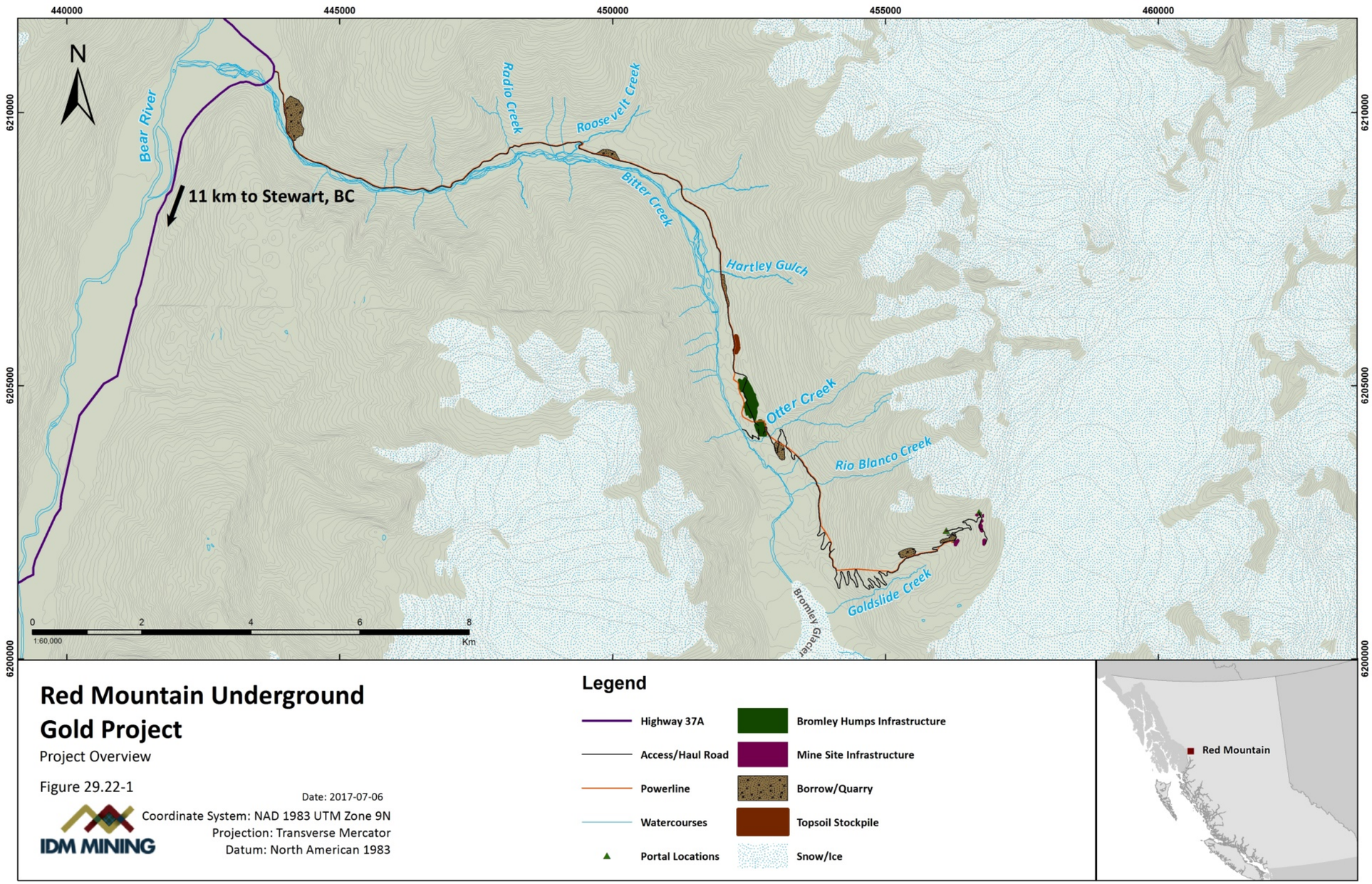
The primary objectives of tailings management activities are to ensure the long-term physical and chemical stability of the tailings, and prevent contamination of groundwater and surface waters proximal to the TMF.

This plan outlines the:

- Applicable legislation and guidelines;
- Design basis and operating requirements of the TMF;
- Environmental protection measures to be implemented;
- Proposed monitoring to confirm the effectiveness of the mitigation strategies; and
- Responsibilities of IDM and its contractors.

This plan applies to the Construction and Operation Phases of the Project. At closure, the TMF will be reclaimed as described in Volume 2, Chapter 5.

Figure 29.22-1: Project Overview



29.22.3 Applicable Legislation and Guidelines

This plan has been prepared to comply with existing regulations and follow the available guidelines provided by the federal and provincial governments.

Requirements for the design, operation, and closure of tailings management facilities on mine sites are regulated under BC's *Mines Act* (1996a) and under sections of the Code (BC MEM 2017). Prior to constructing the TMF, IDM will submit an application seeking a *Mines Act* Permit to construct the TMF in accordance with the recently prepared Guidance Document issued under the *Mines Act* (BC MEM 2016a).

BC's *Water Sustainability Act* (2014) and associated regulations oversee the diversion and use of water. Water discharged from Project infrastructure into the environment must meet water quality criteria set under the MMER of the federal *Fisheries Act* (1985a) as well as the discharge criteria outlined in the provincial Effluent Permit that will be issued to the Project under the BC *Environmental Management Act* (2003).

Under the *Canadian Environmental Protection Act, 1999*, the Environmental Code of Practice for Metal Mines (Environment Canada, 2009) details environmental best practices associated with the management of mining wastes and wastewater.

The confining embankments for the TMF will be designed in accordance with the Canadian Dam Association's *Dam Safety Guidelines* (CDA, 2013) and the CDA Technical Bulletin *Application of Dam Safety Guidelines to Mining Dams* (CDA, 2014).

29.22.4 Relevant Project Activities

29.22.4.1 Tailings Production

The proposed Process Plant throughput is approximately 1,000 tonnes per day (tpd). Tailings will be thickened in the Process Plant to a slurry solids content of approximately 50% by weight before being pumped to the TMF. The tailings will be conveyed in a single overland pressure pipeline and discharged from the TMF embankments via spigoted offtakes.

A total of 1.95 million tonnes (Mt) of tailings will be discharged to the TMF over the 6-year mine life. The initial density of the settled tailings is estimated to be 1.2 tonnes per cubic metre (t/m^3) in Year 1, consolidating to 1.3 t/m^3 by Year 6, for a total volume of 1.5 Mm^3 of tailings at a density of 1.3 t/m^3.

29.22.4.2 Tailings Geochemistry

IDM conducted a geochemical characterization program on metallurgical tailings from the AV, JW and Marc zones of the deposit (Volume 7, Appendix 1-K). Tailings to be produced from ore of all zones are classified as potentially acid-generating (PAG).

The potential for acid rock drainage (ARD) generation and metal leaching (ML) will be mitigated by strategically depositing new tailings over the existing tailings, and by maintaining a water cover over much of the TMF area.

Elemental analysis indicates enrichment of silver, gold, arsenic, bismuth, cadmium, cobalt, copper, lead, sulphur, antimony, selenium, and zinc relative to ten times the crustal abundance for low- and high-calcium granite.

Humidity cell test work on the Marc zone tailings has been initiated. At the time of writing, after 11 cycles, the leachate was noted to be neutral to alkaline, and sulphate was starting to stabilize. Ongoing humidity cell test work will define the time frame to the onset of acidic conditions for the tailings and metal leaching, if present.

29.22.4.3 Tailings Management Facility

The TMF will contain tailings for the life of the Project. While this plan describes the TMF, the following supporting information is included in this Application/EIS:

- 2016 Geotechnical Site Investigation Report (Appendix 1-A);
- Bromley Humps TMF Seepage and Stability Analysis (Appendix 1-D);
- Tailings and Water Management Feasibility Study Design Report (Appendix 1-H);
- Feasibility Study Design Drawings (Appendix 1-I);
- Tailings Best Available Technology (BAT) Assessment (Appendix 1-J); and
- Geochemical Characterization of Metallurgical Tailings (Appendix 1-K).

29.22.4.3.1 General Description and Filling Schedule

The general arrangement of the TMF is presented in Figure 29.22-2, and its location is at UTM 452,450 E and 6,250,325 N (Zone 9 NAD 83). The TMF will utilize natural topographical containment provided at Bromley Humps and the slope to the east of the facility to minimize embankment construction requirements. The TMF has two rock/earthfill embankments consisting of the North TMF Embankment and the South TMF Embankment:

- North TMF Embankment is 275 m long at its centerline with a maximum height of 37 m. The embankment is oriented in a SW-NE direction; and

- South TMF Embankment is 310 m long at its centerline with a maximum height of 26 m. The embankment is oriented in a SE-NW direction.

During the Construction Phase, a starter dam will be constructed using material generated from excavation of the Process Plant Site pad and will provide approximately 12 months of tailings storage. An embankment raise is scheduled to take place during the first year of operations. The TMF embankments will be progressively expanded at scheduled intervals during operations, utilizing the downstream method of construction. The TMF filling curve is presented as Figure 29.22-3. A total of four stages are proposed.

Materials from a number of borrow pits and rock quarries located between the Highway 37A junction and the Bromley Humps TMF location will be used to construct the expansions. The TMF (basin and upstream faces of the embankments) will be lined with a geomembrane to minimize the potential for seepage from the facility.

29.22.4.3.2 Design Basis and Operating Criteria

The design of the TMF has considered the following requirements:

- Permanent, secure, and total confinement of all solid waste materials within an engineered disposal facility;
- Control, collection, and removal of free draining liquids from the tailings during the Operation Phase for recycling as process water to the maximum practical extent; and
- The inclusion of monitoring features for all aspects of the facility to ensure performance goals are achieved and design criteria and assumptions are met.

The following factors have been considered in the design of the TMF:

- Physical and chemical characteristics of the tailings material, including metal leaching and acidic drainage potential as well as the potential for liquefaction;
- Hydrology and hydrogeology, including local climatic conditions and extreme weather events (including projections of increased extreme weather events as a result of global climate change);
- Foundation geology and geotechnical considerations as well as seismic data and earthquake risk;
- Availability and characteristics of construction materials; and
- Topography of the TMF footprint and adjacent areas.

The TMF will store runoff from an Environmental Design Flood (EDF) as per CDA Dam Safety Guidelines (CDA, 2013 & 2014). The EDF for the facility is equivalent to the runoff experienced by a 1 in 50-year return period event with an event duration of one month plus a 1 in 200-year return period 24-hr precipitation event that bypasses the Non-Contact Water Diversion Channel. Flood events exceeding the EDF, up to the Inflow Design Flood (IDF), will be safely conveyed from the TMF through an emergency discharge spillway, located in the North TMF Embankment.

All contact water ditches and collection ponds will be designed and sized to manage the 1 in 200-year 24-hr precipitation event (160 mm of rainfall).

A diversion channel that will divert non-contact water from the upstream catchment on the eastern side of the TMF will be designed and sized to manage the peak flow from a 1 in 5-year 24-hour precipitation event.

Figure 29.22-2: TMF General Arrangement (Final – Stage 4)

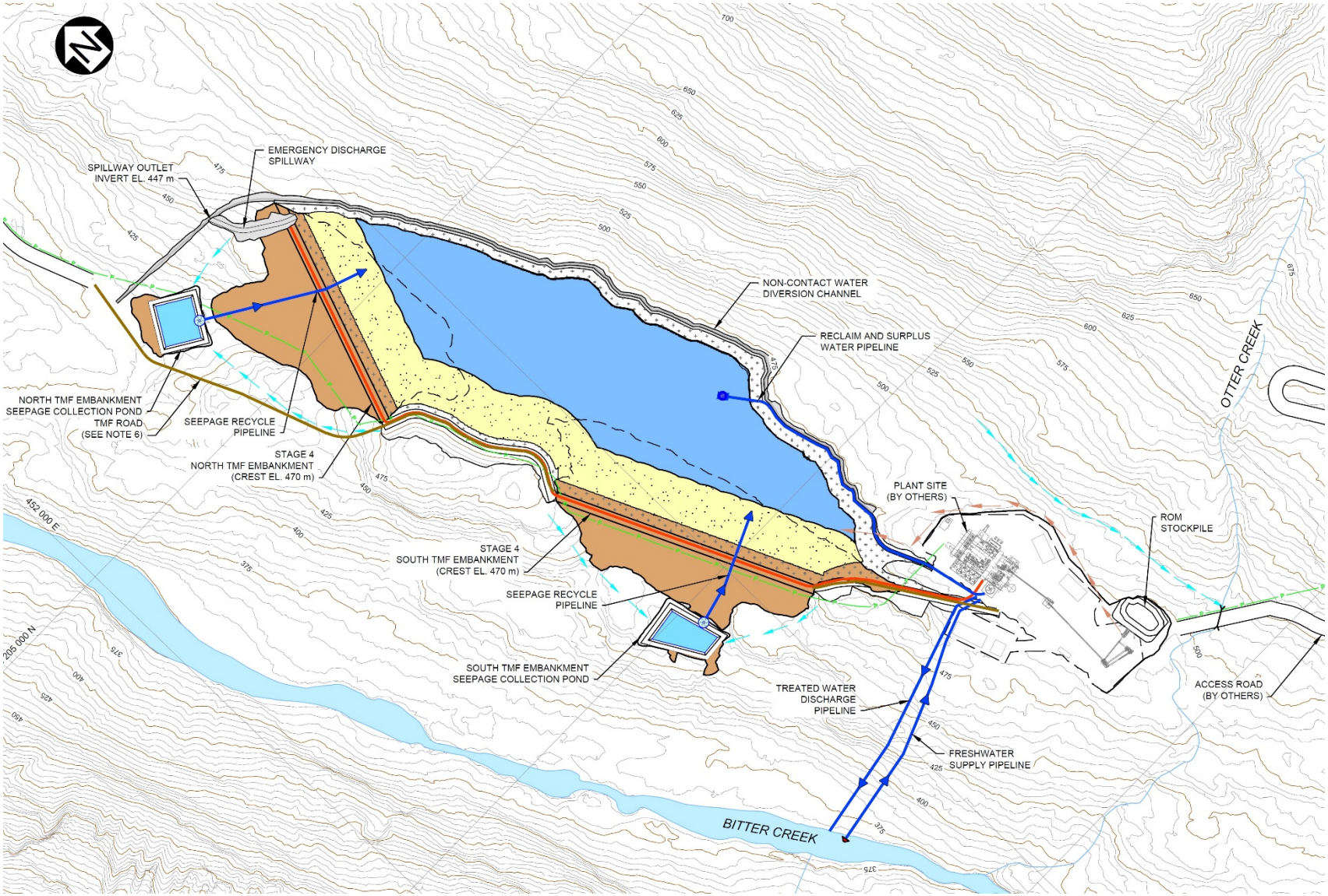
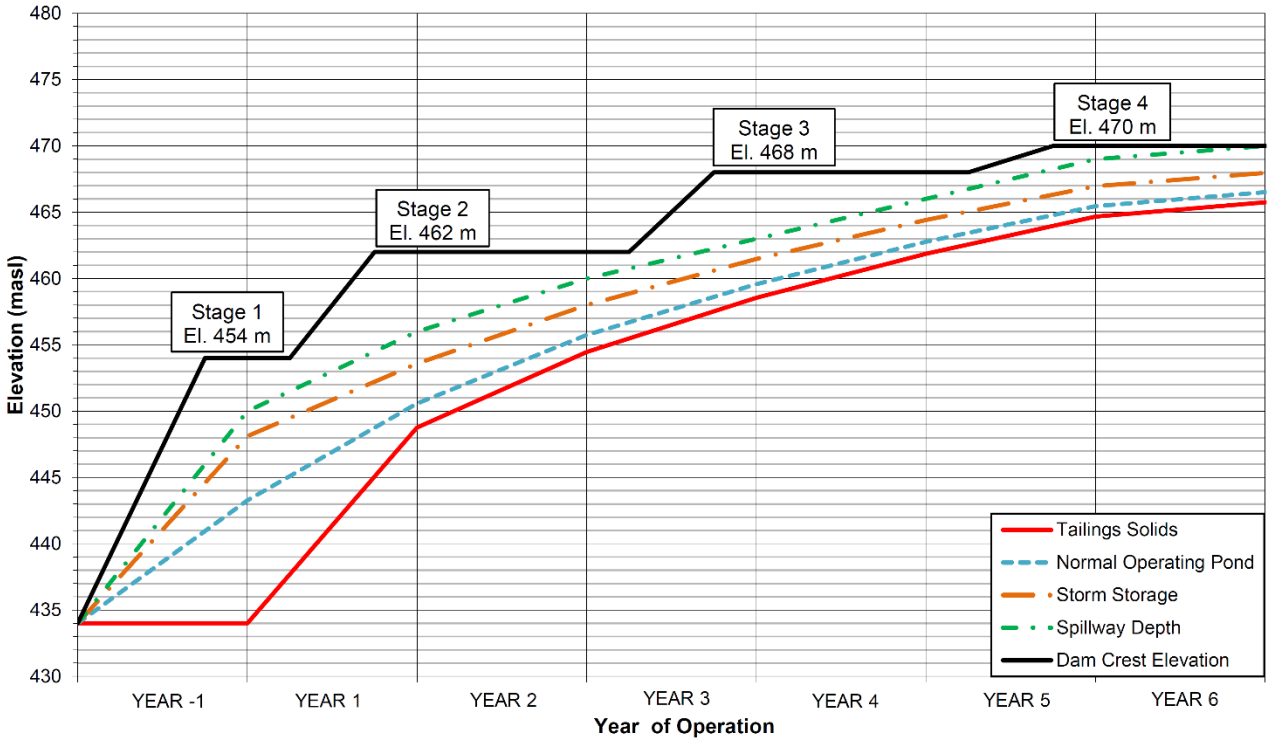


Figure 29.22-3: TMF Filling Schedule



29.22.4.3.3 Dam Classification

The design, construction, operation, and monitoring of dams, including tailings embankments, must be completed in accordance with appropriate provincial and federal regulations and industry best practices. The primary guidance document is the Dam Safety Guidelines published by the Canadian Dam Association (CDA, 2013).

A key component of these guidelines involves assigning the dam into a classification category (Low, Significant, High, Very High, or Extreme) using the following criteria:

- Population at risk;
- Loss of life;
- Environmental and cultural values; and
- Infrastructure and economics.

The overall dam classification is defined by the criterion with the highest (i.e., most severe) rating. The dam classification helps to identify appropriate geotechnical and hydrotechnical design criteria. It is important to note that the classification refers to the downstream consequences in the inundation zone of a dam breach.

With regard to the Bromley Humps TMF, a dam classification of 'VERY HIGH' will be adopted due to anticipated effects to downstream population (anticipated loss of life of 100 or

fewer), fish habitat (expected loss to important fish habitat with restoration possible but impractical), and major infrastructure (potential risk to major highway entering Stewart).

29.22.4.3.4 Inflow Design Flood

The Canadian Dam Association Dam Safety Guidelines (CDA, 2014) and the Code (BC MEM, 2017) both state that for tailings dams of a 'VERY HIGH' dam classification, the minimum design criteria for design flood events corresponds to the following return period events:

- Construction and Operations Phases: 2/3 between 1/1,000 year return period event and the Probable Maximum Flood (PMF).
- Post Closure Phase: Probable Maximum Flood.

29.22.4.3.5 Seismicity

The Canadian Dam Association Dam Safety Guidelines (CDA, 2014) and the Code (BC MEM, 2017) both state that for tailings dams of a 'VERY HIGH' dam classification, the minimum design criteria for seismic loading corresponds to the following return period events:

- Construction and Operations Phases: 1/2 between 1/2,475 year and 1/10,000 year return period seismic events (Peak Ground Acceleration (PGA) = 0.092 g).
- Post Closure Phase: 1/10,000 year return period seismic event (PGA = 0.120 g).

The Earthquake Design Ground Motion (EDGM) for the Construction and Operations Phases is the Operating Basis Earthquake (OBE). The OBE is the earthquake that a structure must safely withstand no damage and has a reasonable probability of occurring during the life of the structure.

The EDGM for the Post Closure Phase is the Maximum Design Earthquake (MDE) for the life of the TMF. The MDE is the earthquake that would generate the most critical ground motions for evaluation of the seismic performance of a structure among those loadings to which the structure might be exposed.

29.22.4.3.6 TMF Embankments

The main design features of the TMF embankments are as follows:

- Starter dam sized to provide approximately 12 months of tailings storage; starter dam crest elevation at 454 m;
- Progressive embankment raises throughout operations using downstream expansion methods;
- Geomembrane liner on upstream face of dam and TMF Basin;
- Bedding layer (Zone F) on upstream face of dams and across TMF basin using processed material from borrow/quarry sources; and

- Shell zone material (Zone C) sourced from local quarried/borrow material.

A typical embankment cross-section is shown as Figure 29.22-4.

Potential seepage will be collected through the following components:

- **TMF Lining System**: The upstream face of the embankments and the TMF basin will be fully lined with a geomembrane to minimize potential seepage from the facility. The liner system will be anchored into the foundation and embankment;

- **Foundation Drains:** Foundation Drains will be constructed beneath the geomembrane to allow for dewatering of any groundwater seeps. The Foundation Drains will also collect potential leakage through the geomembrane. Water collected in the Foundation Drains will report to Seepage Collection Ponds and will be pumped back to the TMF. Flow rates and water quality in the Foundation Drains will be monitored. The Foundation Drains are shown in plan view and cross-section on Figure 29.22-4, Figure 29.22-5, Figure 29.22-6, respectively; and

- **Basin Underdrain**: A Basin Underdrain will be installed above the geomembrane liner system on the basin floor to promote consolidation of the tailings. Water collected in the Basin Underdrain will be returned to the impoundment. The Basin Underdrain is shown in plan view and cross-section on Figure 29.22-7 and Figure 29.22-8, respectively.

Figure 29.22-4: Embankment Cross-section

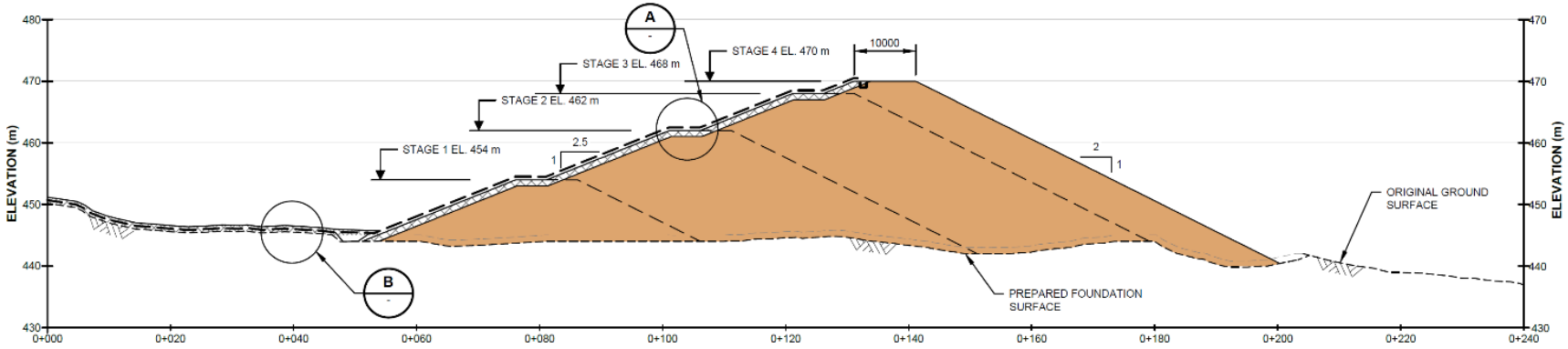


Figure 29.22-5: Foundation Drains Plan

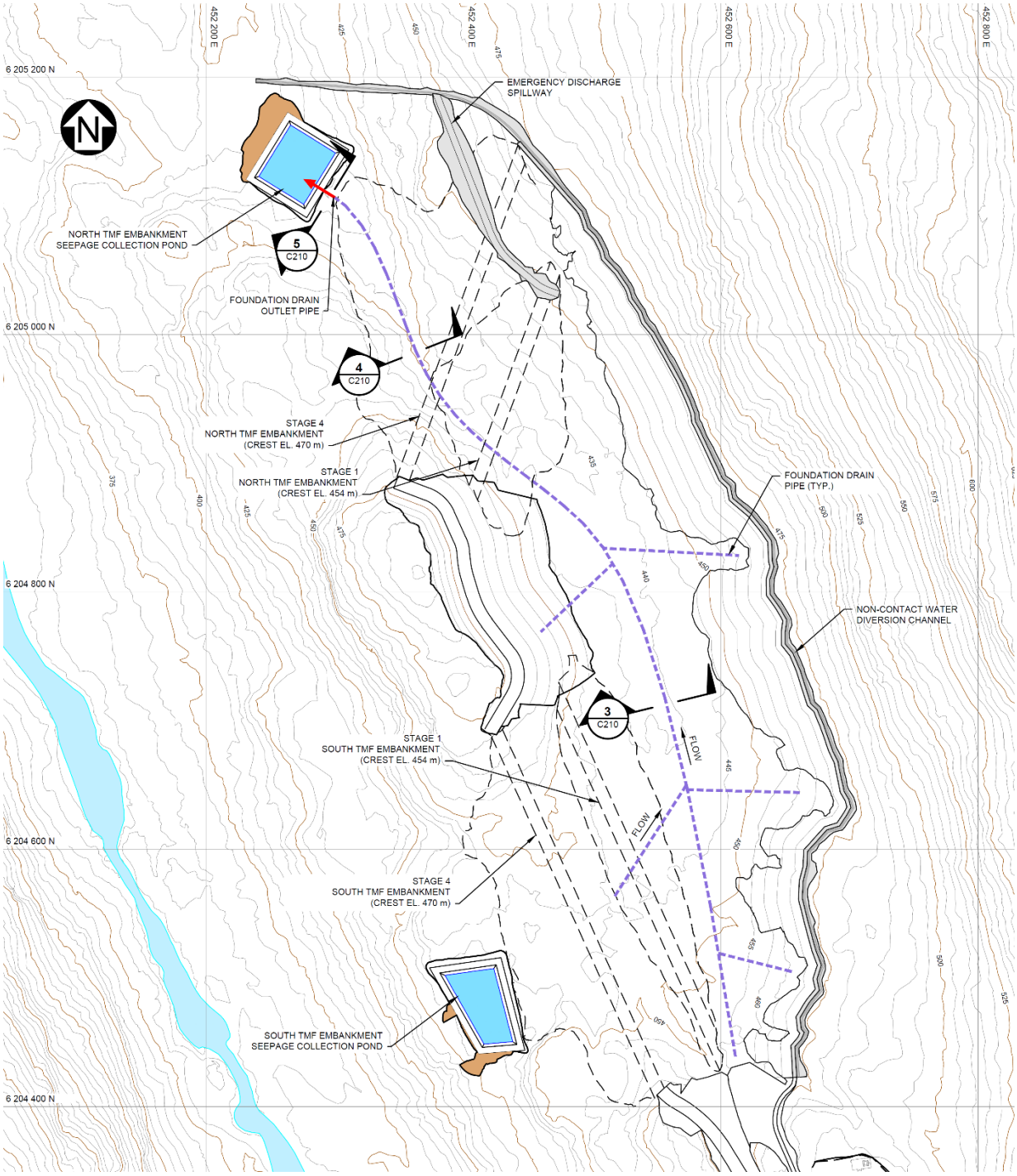
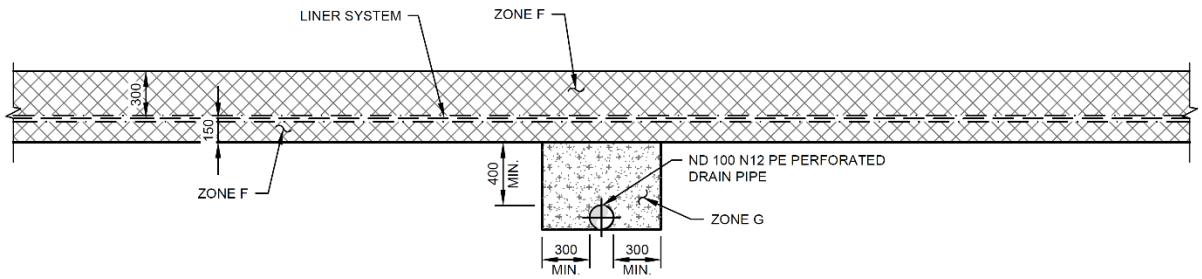
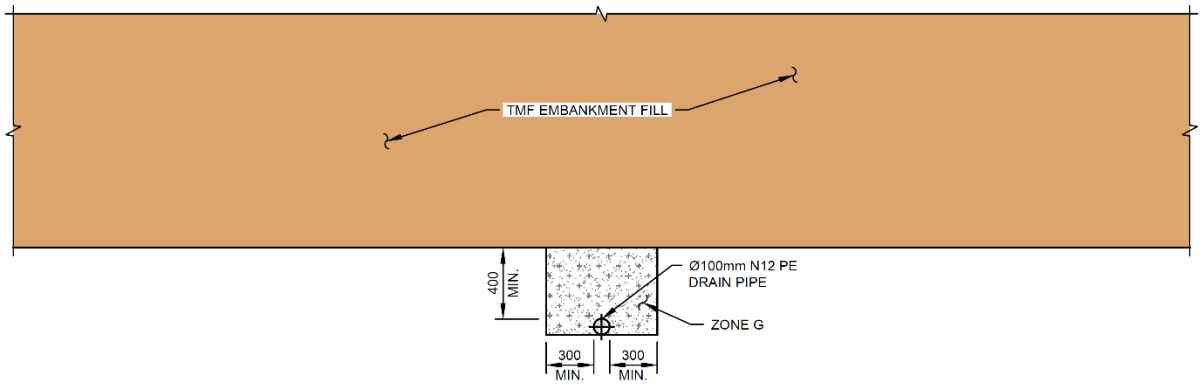


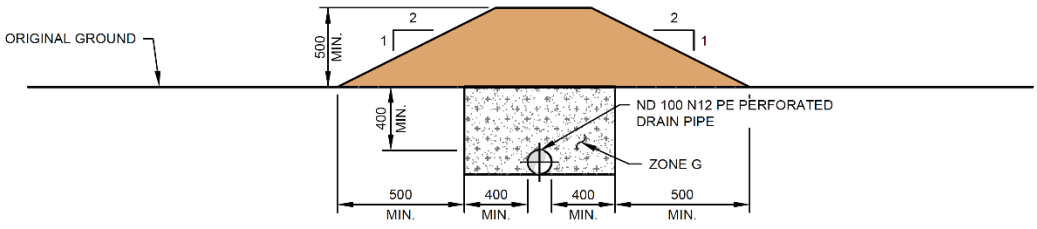
Figure 29.22-6: Foundation Drains Cross-section



3 C209 **FOUNDATION DRAIN TRENCH - TYPICAL SECTION**
BASIN FLOOR (BELOW LINER)
SCALE A



4 C209 **FOUNDATION DRAIN TRENCH - TYPICAL SECTION**
BELOW EMBANKMENT FILL
SCALE A



5 C209 **FOUNDATION DRAIN - TYPICAL SECTION**
OUTLET PIPE (NO OVERLYING EMBANKMENT FILL)
SCALE A

Figure 29.22-7: Basin Underdrain Plan

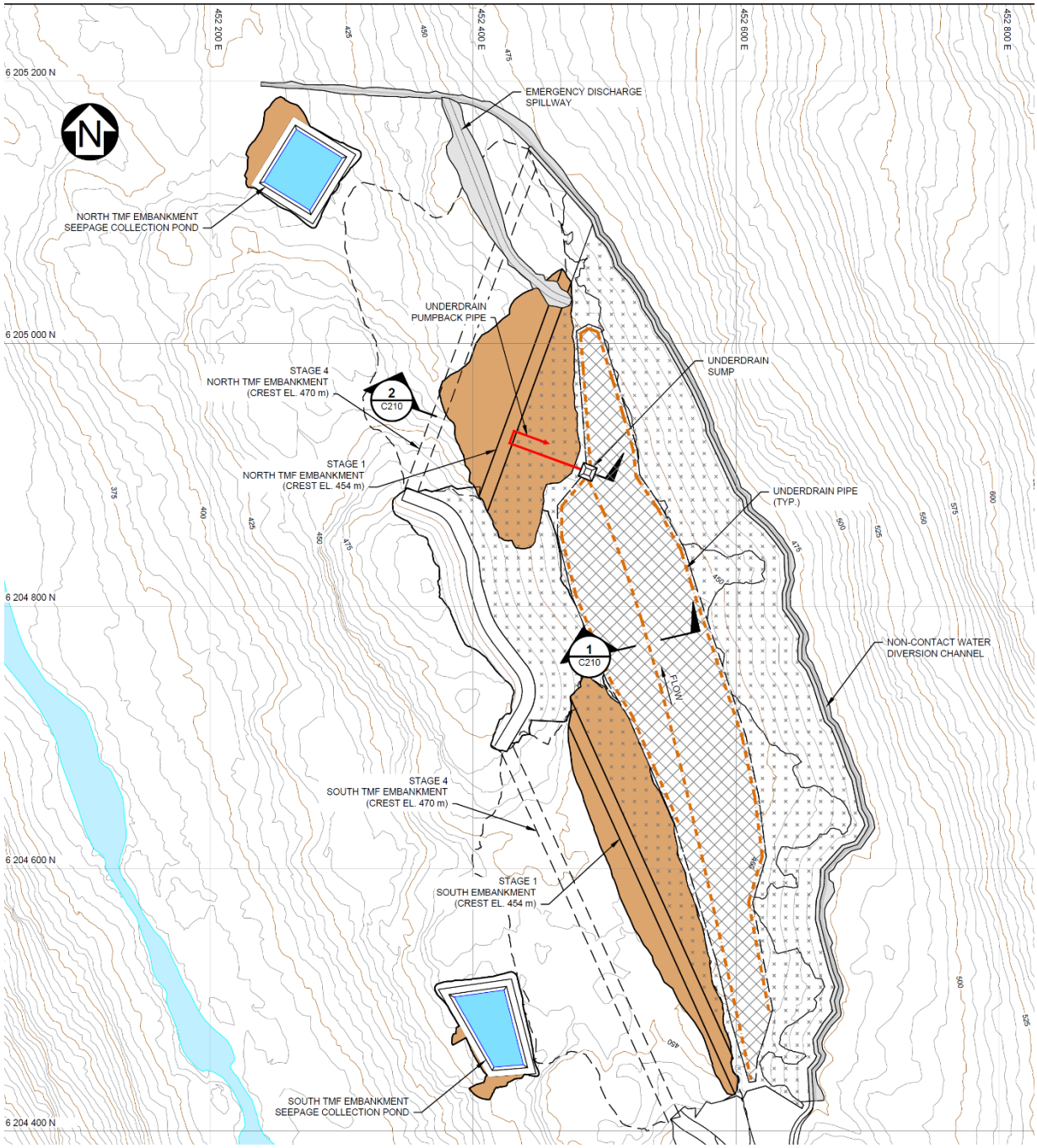
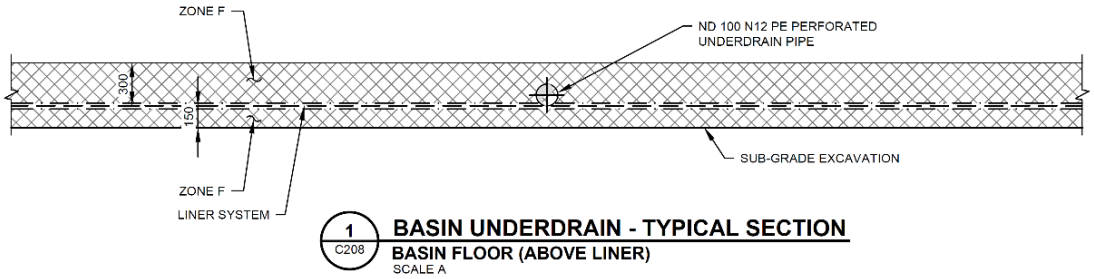
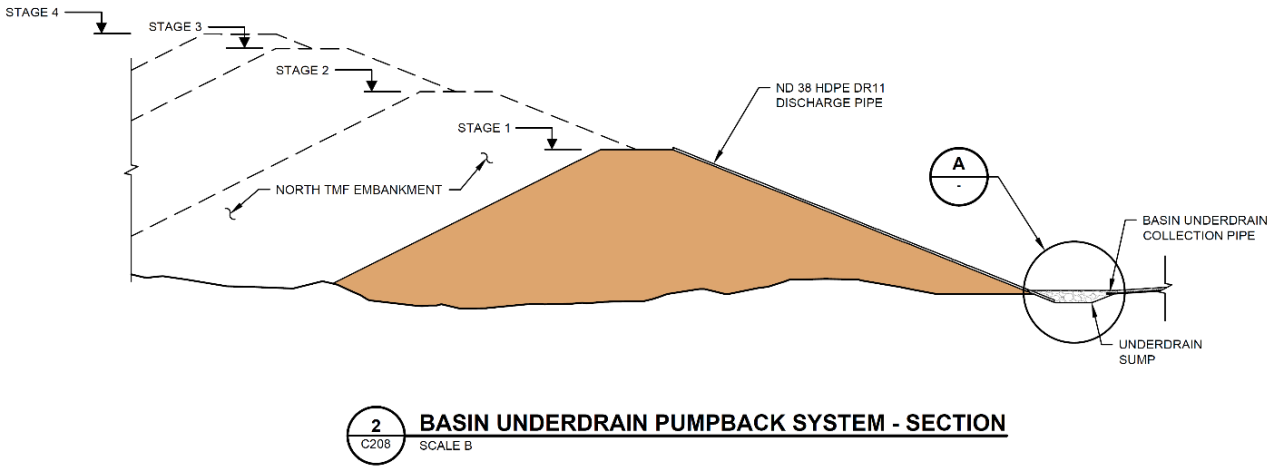
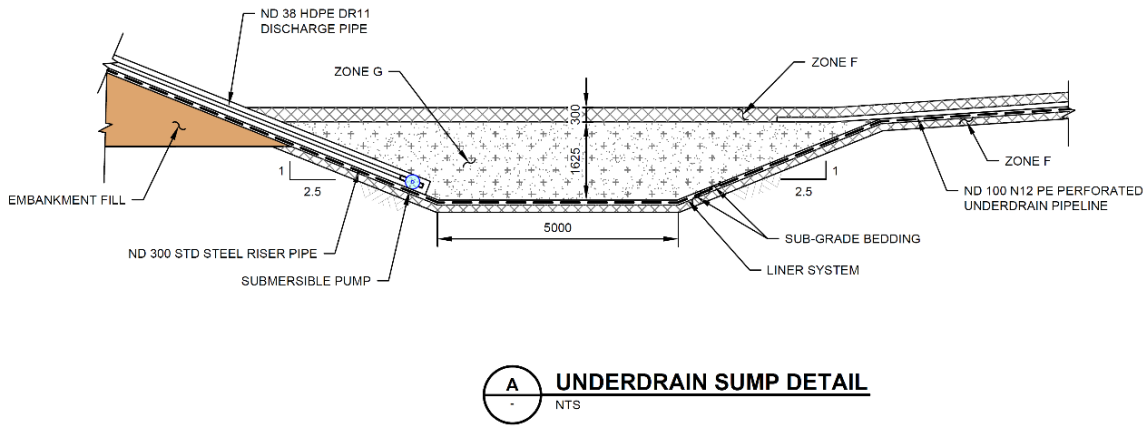


Figure 29.22-8: Basin Underdrain Cross-section







29.22.4.3.7 Water Management

The following water management components are associated with the TMF:

- Non-contact water from the upstream catchment on the eastern side of the TMF will be diverted through a Diversion Channel;
- Flood events will be managed through a combination of embankment freeboard (to contain the EDF event) and an emergency discharge spillway located in the North Embankment for larger flood events that exceed the EDF (up to the IDF);
- Foundation Drains will be installed below the geomembrane liner, and a Basin Underdrain will be installed above the geomembrane liner to promote consolidation of the tailings mass;
- Seepage collection ponds located downstream each embankment will collect seepage from the Foundation Drains and Basin Underdrain, and collected seepage will be pumped back to the TMF;
- Tailings supernatant water will be reclaimed using a floating pump/barge and a single overland pipeline to the Process Plant;
- A process water tank located at the Process Plant will store reclaim water from the TMF for processing; and
- Standby pumps will be available for use in the event of extreme precipitation events and in the case of pump failure.

A water balance developed for the TMF has indicated that the TMF will operate in a net positive surplus throughout operations for the base case and adjusted case (Figure 29.22-9 and Figure 29.22-10). The base and adjusted cases are derived from two Mean Annual Precipitation (MAP) Estimates that were developed using a Parameter-elevation Regressions on Independent Slopes Model (PRISM) to account for orographic effect at the Project site. Two cases were developed due to available site and applicable regional climate and streamflow datasets for developing baseline climate conditions and precipitation estimates for the Project site.

Surplus supernatant pond water will be pumped to a Water Treatment Plant, located at the Process Plant, and discharged to the environment. The Site Water Management Plan (Chapter 29.20) describes the water management strategies as well as effluent monitoring that will be undertaken.

Figure 29.22-9: TMF Water Balance Results – Base Case

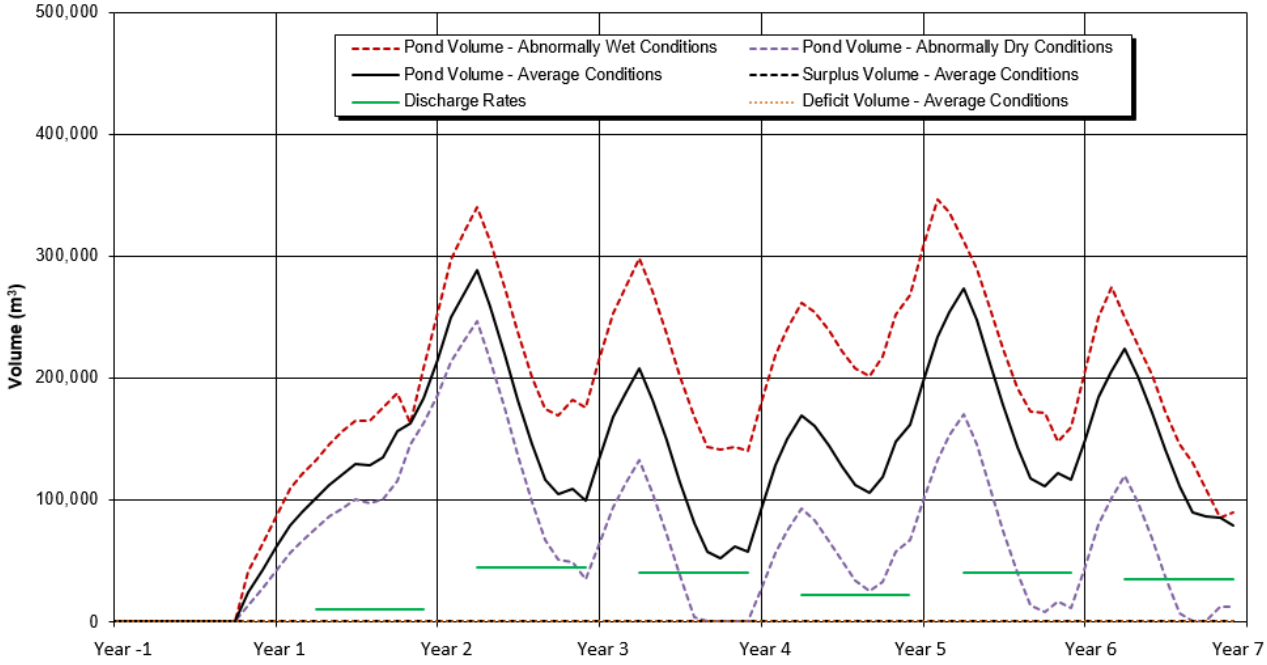
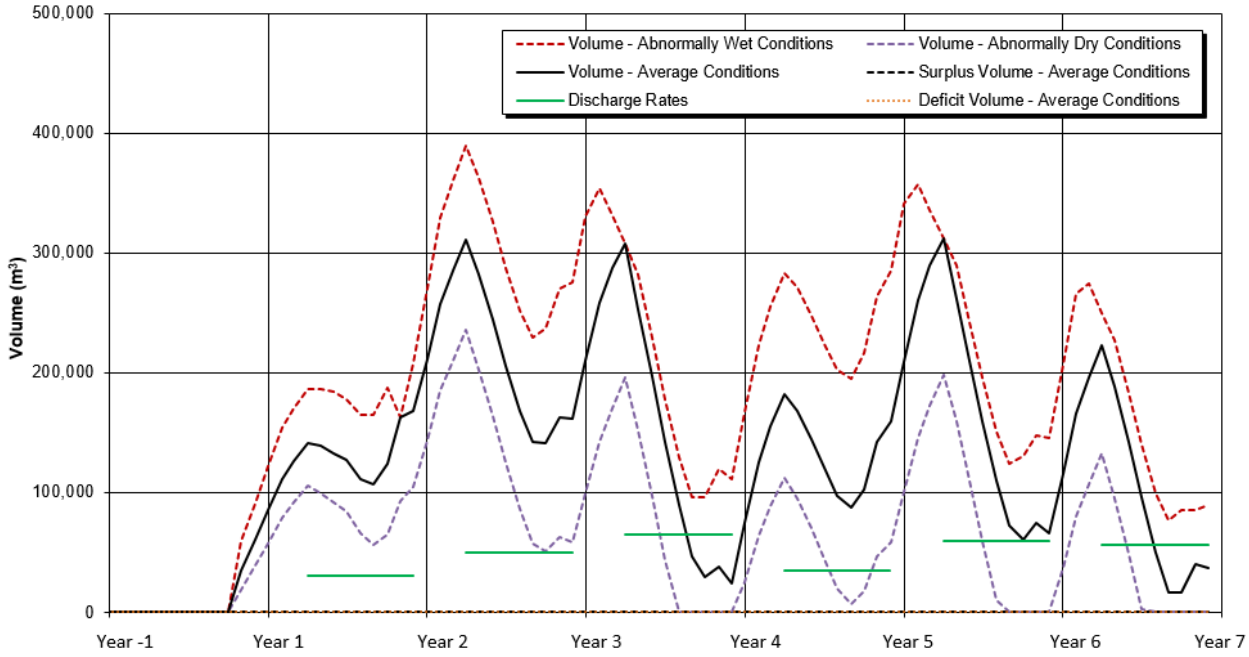


Figure 29.22-10: TMF Water Balance – Adjusted Case



29.22.5 Environmental Protection Measures

Measures will be taken to:

- Minimize exposure of the tailings to the atmosphere, to reduce ML/ARD, and also reduce potential dusting;
- Prevent runoff and seepage from interacting with surface or groundwater;
- Stabilize the TMF embankments; and
- Prevent harm to wildlife.

These measures are described in more detail below.

29.22.5.1 Minimize ML/ARD Generation

The potential for the tailings within the TMF to leach metals and generate acid will be minimized by reducing exposure of the tailings to atmospheric conditions. This will be accomplished by strategically depositing new tailings over the existing tailings and by maintaining a water cover over much of the tailings in the TMF.

29.22.5.2 Runoff Management

Non-contact water will be diverted around the TMF through the Non-Contact Water Diversion Channel. All direct precipitation on the TMF footprint, up to a volume from the EDF event, will be stored within the TMF. Flood events exceeding the EDF (up to the IDF) will be conveyed through an emergency discharge spillway in the North TMF Embankment.

Contact runoff water from the Process Plant area and the ROM Stockpile will be routed toward the TMF via appropriate grading and collection ditching.

29.22.5.3 Seepage Management

Potential seepage from the TMF will be largely controlled by the geomembrane liner and low permeability tailings mass. Two seepage collection ponds, the North TMF Embankment Seepage Collection Pond and the South TMF Embankment Seepage Collection Pond, will be constructed at topographic low points downstream of the North and South TMF Embankments.

Seepage that is intercepted in the foundation drain will be routed to the North TMF Embankment Seepage Collection Pond while seepage collected in the Seepage Collection Ditches, constructed at the toe of each embankment, will convey collected seepage and embankment runoff to the respective ponds. Water collected in the ponds will be continuously monitored and returned to the TMF to ensure it does not adversely affect the receiving environment.

29.22.5.4 Dust Control

Selective tailings deposition and management of the operational supernatant pond volume will ensure that the beaches are saturated, thus reducing the potential for dust generation.

Dust generation at closure will be managed be encapsulating the tailings with a geomembrane liner and construction of closure cover.

29.22.5.5 Sediment and Erosion Control

Sediment and erosion control will be a focus during construction of the TMF and subsequent embankment raises. The measures identified in the Sediment and Erosion Control Plan will be applied to facility construction and will minimize erosion and prevent sediment releases into the receiving environment.

29.22.5.6 Cyanide Management

Sodium cyanide will be used in the leaching process to obtain gold from the ore. All residue from the leaching process with be routed to a cyanide detoxification circuit, whereby the total cyanide concentration will be reduced to 1.0 mg/L weak acid dissociable cyanide (CN_{WAD}) using the SO_2/Air process, prior to being transferred to the TMF. This is well below the concentration of 50 mg/l CN_{WAD} typically viewed as being protective of birds and wildlife (Implementation Guidance - Standard of Practice 4.4, International Cyanide Management Institute 2015b).

Solution decanted from the tailings in the TSF is exposed to ultraviolet radiation (sunlight) and atmospheric air, resulting in natural degradation (oxidation) of cyanide. Degradation and retention processes also take place in the anaerobic zone of the tailings.

Cyanide in solution (CN_{WAD} and CN_{TOTAL}) will be closely monitored in the tailing slurry stream, tailings storage facility, reclaim water, effluent treatment discharge, and process water streams. An off-site assay laboratory will determine CN_{WAD} levels in the tailings stream, discharge at the tailings storage facility, in the reclaim water, and effluent treatment plant discharge. An off-site laboratory will be used to confirm the results.

29.22.5.7 TMF Closure

TMF closure and rehabilitation will be carried out concurrently during the Operation Phase (where possible) and primarily at the end of economically viable mining. Closure and reclamation activities for the TMF are summarized below and are also presented in the Reclamation and Closure chapter (Volume 2, Chapter 5).

Opportunities for progressive reclamation of the TMF include reclaiming the downstream faces of the TMF embankments with topsoil cover and revegetation once the final Stage 4 embankments are constructed.

Closure and reclamation of the TMF will involve:

- Removal, treatment, and discharge of supernatant pond water from the TMF after the Process Plant is shut down;

- Containing and isolating the tailings by encapsulating with a geomembrane liner to prevent oxidation of the tailings mass; and

- Converting the TMF into a physically stable landform by constructing a revegetated closure cover on top of the encapsulated tailings and establishing a permanent spillway to facilitate shedding of runoff from surface of reclaimed TMF.

The following reclamation activities will be completed during TMF closure:

- Prior to closure, tailings will be selectively deposited around the TMF to establish a final tailings beach that will facilitate construction of the final closure cover;

- Tailings supernatant will be removed and treated to meet effluent discharge limits prior to entering the receiving environment;

- Tailings and reclaim delivery systems and all pipelines, structures, and equipment not required beyond mine closure will be dismantled and removed;

- A permanent spillway will be constructed by excavating a channel on the west side of the TMF between the North and South TMF Embankments;

- A geomembrane liner will be installed over the TMF surface;

- A combined rock and soil cover will be placed over the geomembrane liner in a manner that conveys runoff to the permanent spillway;

- All access roads, ponds, ditches, and borrow areas associated with the TMF that are not required beyond TMF closure will be removed and the areas re-graded; and

- Disturbed areas will be revegetated consistent with the re-vegetation strategy.

The TMF embankment slopes are designed at 2H:1V, which is expected to be permanently stable and therefore will not require further modification at closure other than surface preparation with topsoil and revegetation (may be completed concurrently during operations).

Final reclamation of the TMF will be completed two years after the cessation of mining. The seepage collection system will continue to operate for several additional years past this point until seepage has diminished to negligible quantities and/or is suitable for direct discharge to the environment. The seepage collection systems will be dismantled and removed and the seepage collection ponds regraded and reclaimed once this has been achieved.

29.22.6 Monitoring Program

29.22.6.1 Adaptive Management

Adaptive management may be required if environmental performance monitoring indicates that adverse conditions are prevalent in the ongoing results. Examples include:

- Annual Geotechnical Inspections – If annual geotechnical inspections identify stability concerns with the facility;
- Groundwater Monitoring – If groundwater monitoring suggests that seepage collection measures are inadequate (i.e., seepage flows exceeding design flows);
- Tailings Supernatant / Effluent Monitoring – If monitoring as described in the Site Water Management Plan indicates that cyanide concentrations are above 1.0 mg/L CNWAD or if salinity concentrations exceed what is acceptable for recycling to the Process Plant;
- Downstream Water Quality – If monitoring as part of the Aquatic Effects Management and Response Plan identifies aquatic effects that require further investigation; or
- Routine Visual Monitoring – If regular visual monitoring identifies sediment and erosion control or other issues.

The need for any corrective actions to on-site management of the TMF or installation of additional control measures will be determined on a case-by-case basis, based on monitoring conducted as described above.

29.22.6.2 Monitoring

Requirements to monitor, inspect and report on the performance of the TMF are outlined in the following guidance and legislation:

- Canadian Dam Safety Guidelines (CDA, 2013 and 2014); and
- The Code (BC MEM 2017).

These documents provide overlapping requirements for dam safety inspections and reviews and the development of an Operations, Maintenance, and Surveillance (OMS) Manual as well as an Emergency Preparedness and Response Plan (EPRP) specific to the TMF. The OMS Manual and EPRP will be prepared as part of the *Mines Act* Permit Application (MAPA) and will be revised annually in accordance with Section 6 of the Code (BC MEM 2017) and as each staged TMF expansion is constructed.

Geotechnical instrumentation will be installed in the TMF embankments and foundation during construction, and will be utilized during the Operation, Closure and Reclamation, and Post-Closure Phases of the Project.

Geotechnical instrumentation will be provided during construction, operations, and closure to monitor the TMF and may include:

- Pond level indicator in TMF supernatant pond;
- Water management pond inflow weirs;
- Survey and surface movement monitoring monuments; and
- Flow monitoring for embankment and foundation drains.

The groundwater monitoring wells and select geotechnical instrumentation will be retained post-closure for use as long-term dam safety monitoring devices. Post-closure monitoring will also include annual inspection of the former TMF and ongoing evaluation of water quality, flow rates, and instrumentation records to confirm design objective for closure have been met.

The instrumentation will be used to monitor and assess embankment performance and to identify any conditions different to those assumed during design and analysis. Amendments to the ongoing design and/or remediation work can be implemented to respond to the changed conditions, should the need arise. Key control and monitoring subject areas will include:

- Construction controls, including the use of a construction management program;
- Performance monitoring inspections of the TMF, including instability indicators, stability monitoring, tailings deposition, water management and control, and quality of effluent;
- Monitoring of the flow rates and water quality in the Foundation Drains;
- The adequacy of the water cover as a dust control to minimize onset of ML/ARD; and
- Quality assurance and quality control (QA/QC) measures for ongoing monitoring and inspections.

The future OMS Manual will clearly document the procedures for operating, maintaining, monitoring, and inspecting the TMF along with the roles and responsibilities of relevant staff. Inspections will include:

- Daily inspections by the Mine Supervisor;
- Weekly or after a major storm event or change by the TMF Qualified Person; and
- Annual dam safety inspections will be undertaken by the Engineer of Record (EoR).

Environmental monitoring will consist of regular monitoring of the quality of tailings supernatant, collected seepage, and downstream groundwater as described in the SWMP. The downstream aquatic environment will also be monitored as described in the AEMPR.

The Tailings Monitoring and Follow-up Plan is further discussed in Volume 5, Chapter 30, Section 30.5.3.

29.22.7 Reporting

Table 29.22-1 presents the reporting schedule as prescribed by Sections 10.4.3 and 10.4.4 of the Code (BC MEM 2017). IDM will submit the annual reports listed in Table 29.22-1, as separate reports or together, by March 31 for the previous calendar year. The annual report(s) will be presented in summary form as specified by the Chief Inspector or by the conditions of IDM's *Mines Act* Permit, and will also contain any other information as directed by the Chief Inspector.

Each of the above-mentioned reporting requirements are described further below.

Table 29.22-1: Reporting Requirements Regarding Tailings Management Under the Code

Project Phase	Monitoring, Inspection and Reporting Requirement	Frequency
Pre-Development	Dam Classification Study and Dam Break Inundation Study for Significant or higher consequence TMFs.	Prior to construction (See Appendix 23-A)
Construction	As-Built Reports	Within 90 days of completion of construction
Operation	As-Built Reports (embankment raises)	Within 90 days of completion of construction for each staged embankment expansion
	Annual Manager's Report (include updates to the TMF Register, if applicable)	Annually, by March 31
	Annual TMF and Dam Safety Inspection Report	Annually, by March 31
	Annual Independent Tailings Review Board (ITRB) Report	Annually, by March 31
	OMS Manual Update	Annually, by March 31
	EPRP Update and Testing	Annually, by March 31
	Dam Safety Review including Dam Classification Review and Update	Every 5 years, by March 31
	5-Year Mine Plan Update (include updates to the OMS Manual and EPRP)	Every 5 years, by March 31
Closure	Closure Management Manual	Prior to end of operations
	OMS Manual Update	Annually, by March 31
	EPRP Update and Testing	Annually, by March 31
	Emergency Preparedness and Response Plan	Every 5 years, by March 31
Post-closure	Annual Manager's Report	Annually, by March 31
	Annual TMF and Dam Safety Inspection Report	Annually, by March 31
	Dam Safety Review including Dam Classification Review and Update	Every 5 years, by March 31

29.22.7.1 Construction As-Built Reports

IDM will submit as-built reports within 90 days of completion of construction, in accordance with the Code. This includes initial construction and subsequent construction work.

29.22.7.2 Annual Manager's Report

In accordance with Clause 10.4.4 of the Code, an Annual Manager's Report will be prepared for the TMF, which will include:

- Summary of design and construction works from the year;
- Planned design and construction works for the following year;
- Summary of reclamation and environmental monitoring work performed under Section 10.1.3(e) of the Code;
- Schedule for the following year;
- Update on Life of Mine operation and construction plans and schedule;
- Summary of OMS/EPRP updates;
- Summary of open engineering recommendations, regulatory orders, and permit conditions and status of each recommendation, including schedule to address;
- Summary of dangerous occurrences, including significant TMF or dam safety incidents that that occurred during the year;
- Updated dam inventory;
- Tailings Facility and Dam Safety Inspection Report; and
- Update on risk management activities.

IDM will submit its Annual Manager's Report to the Chief Inspector by March 31 of the following year, in accordance with Section 10.4.4 of the Code.

29.22.7.3 Annual Tailings Facility and Dam Safety Inspection Report

Section 10.5.3 of the Code requires that an Annual Tailings Facility and Dam Safety Inspection Report be prepared that reviews and evaluates the adequacy of performance and operation of the facility. The report will be prepared by the EoR based on the annual inspection conducted by the EoR or a designate who is also registered as a Professional Engineer (P.Eng.) in BC.

The annual inspection report will be submitted with IDM's Annual Manager's Report due on March 31 of the following year, per the Code clause 10.4.4. The BC MEM posts all inspection reports to be available to the public.

Deficiencies, non-conformances, and opportunities for improvement identified during the inspection shall be prioritized with recommended timelines for completion and action plans developed.

29.22.7.4 Register of Tailings Storage Facilities and Dams

IDM will maintain a Register of Tailings Storage Facilities and Dams and will review and update the Register at least annually, in accordance with Clause 10.4.3 of the Code.

29.22.7.5 Annual Report on Activities of the ITRB

Clause 10.4.4(c) of the Code requires that an annual report be prepared summarizing the activities of the Independent Tailings Review Board (ITRB) and which describes the following:

- A summary of the reviews conducted that year, including the number of meetings and attendees;
- Whether the work reviewed that year meets the Board's expectations of reasonably good practice;
- Any conditions that compromise tailings storage facility integrity or occurrences of non-compliance with recommendations from the EoR;
- Signed acknowledgement by the members of the Board, confirming that the report is a true and accurate representation of their reviews;
- A summary of tailings storage facility and dam safety recommendations including a scheduled completion date;
- Performance of high-risk dumps under section 10.5.5 of the Code (if applicable);
- Updates to the tailings storage facilities register as required; and
- Other information as directed by the chief inspector.

The establishment of an ITRB is required under Clause 10.4.2 (1) (c) of the Code.

29.22.8 Roles and Responsibilities

Roles and responsibilities with respect to tailings management are in part prescribed under Section 21 of the *Mines Act* and the Code. Prior to conducting any work on a mine site, a mine owner must designate a Mine Manager under Section 21 of the *Act* who must be present onsite daily and who is ultimately responsible for application of all requirements of

the Code on the site. As such the Mine Manager is ultimately responsible for the safety of the TMF.

The Code also requires the Mine Manager to designate a person to fulfill the role of a TMF Qualified Person, ensure each TMF has an EoR, ensure an Independent Tailings Review Board (ITRB) has been convened and fulfills its mandate, and answers to the Chief Inspector on all issues of compliance with the Code on the Mine Site.

The organizational structure proposed for the implementation of this Plan, consistent with the requirements of the *Mines Act*/Code, is presented in Table 29.22-2.

Table 29.22-2: Roles and Responsibilities for Tailings Management

Position	Responsibilities
CEO/COO	The CEO or COO, as the lead representative of a Mine Owner, is required under the Mines Act/Code to designate a Mine Manager under Section 21 of the *Act*, who must be present onsite daily and who is ultimately responsible for application of all requirements of the Code on the site. The CEO retains overall accountability for tailings management; responsible for putting an appropriate management structure in place, and for providing assurance to the Company and Communities of Interest that tailings are managed appropriately.
VP Environment & Community	Responsible for the development and ongoing updates of this Plan, and for ensuring its implementation. The VP Environment and Community, with help from the Mine Manager, will prepare and maintain the OMS Manual. He/she is also responsible for communication with government and community, including Aboriginal Groups, and for ensuring that the Plan reflects the results of these communications.
Mine Manager	The Mine Manager is designated under Section 21 of the *Mines Act* as the individual ultimately responsible for the mine, including the following aspects: • Accountable for all aspects of the performance and management of tailings and water retaining structures; • Responsible for compliance with regulatory requirements and relevant guidelines; • Responsible to submit all compliance reports to the required regulatory agencies by the due dates; • Defines site roles and responsibilities, authority and accountability; • Allocates required human and financial resources; and • Reports dangerous occurrences including significant TSF or dam safety incidents to the Chief Inspector. The Mine Manager is therefore accountable for the proper implementation and success of this Plan and the OMS Manual at the project site. The Mine Manager will be also responsible for approving monitoring programs and SOPs with support from the Mine supervisor. All compliance reporting with respect to tailings management will be submitted to the Mine Manager.

Position	Responsibilities
TMF Qualified Person	In accordance with Section 10.4.2 of the Code, the TMF Qualified Person is responsible for the following: • Develop and implement the tailings and water management plans for the TMF under their supervision; • Coordinate the design, construction and overall management of the TMF with the EoR, as well as internal and external resources; • Develop succession plan for EoR; • Implement training programs for tailings and water management activities; • Implement the surveillance, inspection, monitoring and maintenance plan outlined in the OMS; • Provide Quantitative Performance Objectives (QPOs) for operational and maintenance activities for inclusion in the OMS; and • Report to the Mine Manager regarding the status and performance of the Tailings Management System. BC MEM (2017) notes that this role may be designated as a portion of an employee's or the Mine Manager's duties. When staffing for the Project, these duties will be assigned to IDM's Mine Manager, who may identify a designate such as the Mine Supervisor for some or all of these duties.
Engineer of Record (EoR)	Section 10.1.5 of the Code requires an EoR to be designated once construction of the TMF is underway. The EoR must be an individual (not a firm) who is a qualified and competent engineer with experience commensurate with the consequence classification and complexity of the facility. The EoR will: • Hold the professional responsibility for the facility design, and is responsible for evaluating the adequacy of the as-built facility relative to the design as well as applicable standards, criteria, and guidelines; • Report on annual Dam Safety Inspections; • Participate in Dam Safety Reviews; • Participate in risk assessments; • Provide QPOs and monitoring frequencies required to ensure the facility is functioning as designed for inclusion in the OMS; and • Participate in the implementation of a succession plan in the event of a change in the EoR.

Position	Responsibilities
Independent Tailings Review Board (ITRB)	Section 10.4.2 of the Code requires the establishment of an ITRB be comprised of independent subject matter experts not currently involved in or responsible for the design, operation or construction of the TMF. The size and make-up of the ITRB will be based on complexity of the tailings system in terms of risk, consequence and disciplines of substance. IDM's IRBT will be established to: • Provide an independent assessment to senior mine management and regulators whether the TMF is designed, constructed and operated appropriately, safely and effectively; • Provide the site team with practical guidance, perspective, experiences and standard/best practices from other operations; • Review and comment on the planning and design process, monitoring programs, data analysis methodology and work performed by site team and/or contract consultants; and • Provide non-binding advice and guidance. The ITRB will not direct the work or perform the role of the Engineer of Record.
Mine Supervisor	The Mine Supervisor will have functional responsibility for the implementation of this Plan under the direction of the Mine Manager. This includes communicating with relevant on-site personnel to ensure compliance with the Plan.
Environmental Superintendent	The Environmental Superintendent will direct personnel on site to fulfill environmental management responsibilities and tasks, and audit contractors for compliance with Plan requirements.
Environmental Monitors	Environmental monitor(s) will be responsible for implementing the monitoring measures for this Plan. This includes completing daily tasks such as sample collection, performance monitoring, and reporting.
Inspectorate	The Code identifies this position, external to IDM, as having the following responsibilities under the Code with respect to tailings management: • Review applications and compliance reporting for completeness and technical reasonableness; and • Conduct inspections of the mine to assess and enforce compliance with the Code. The Inspectorate is designated by the BC MEM and the Chief Inspector of Mines.

Refinement and confirmation of the organizational structure will continue as the permitting process progresses and IDM eventually staffs the Project. Any changes to the above will be consistent with the requirements of the *Mines Act*/Code.

29.22.9 Review of Plan Effectiveness

The Mine Manager or designate will conduct regular evaluations of the monitoring activities as needed. This Plan may be updated if additional methods for monitoring are found to be more appropriate.

The QA/QC for relevant monitoring programs will include the preparation of a SOP for each of the activities within the tailings management system, and auditing operations against this plan and any relevant SOPs.

29.23 Terrain and Soil Management Plan

29.23.1 Introduction

The Terrain and Soil Management Plan (TSMP) is one of many plans that form part of th Project's EMS. The TSMP provides the objectives, legislation, and mitigation measures in minimizing effects to Landforms and Natural Landscapes intermediate components (ICs), in addition to the role and responsibilities and reporting for this plan. This is a conceptual plan and, prior to construction, IDM will revise the TSMP as needed to include additional details as needed relating to Landforms and Natural Landscapes protection measures, inspections, reporting, documentation, and details of continual improvement initiatives.

29.23.2 Scope and Objectives

The TSMP documents IDM's approach and strategies to reasonably achieve the following goals:

- Minimize soil loss;
- Minimize alteration of the soil resource so that ecologically valuable soil characteristics are protected (including fertility, permeability, water holding capacity, biological diversity of the soil microbe, and faunal community);
- Mitigate potential decreases in terrain stability; and
- Manage potential geohazards and associated terrain stability effects.

This plan is supported by several other management plans which influence components of terrain stability and soil productivity, including the:

- VEMP;
- AQDMP;
- SCP;
- ESCP; and
- MHMP.

29.23.2.1 Management Plan Scope

The TSMP is designed to provide environmentally responsible, realistic, and operationally feasible guidance for terrain and soil management. It is intended to address the following potential Project effects:

- Direct loss from site preparation activities including clearing, grubbing, and earth excavations;
- Soil erosion in susceptible areas (i.e., stockpiles, areas with fine-textured soil, cleared areas, and disturbed areas located on slopes);

- Soil contamination (from dust deposition during construction or ML/ARD due to rock exposure) or mobilization of naturally occurring metals in the soil;
- Soil compaction due to vehicle traffic;
- Soil degradation due to improper stockpile management;
- Soil degradation and loss during soil handling when carrying out site reclamation; and
- Loss of terrain stability due to construction and operation of Project infrastructure.

The TSMP addresses the above-mentioned effects through consideration of the surficial geology units and major soil types found within the Project footprint. The TSMP also addresses potential effects to soils from erosion, dust deposition, and ML/ARD through linkages to other management plans. Effects to valued components from sedimentation of watercourses is addressed in the ESRP.

29.23.2.2 Performance Objectives

The broad performance objectives of the TSMP are to:

- Retain and preserve adequate volumes of suitable soil and overburden, as required, for use in reclamation as specified by the Mine Closure and Reclamation Plan;
- Ensure that salvaged soil resources will meet the quantities and qualities required for application in closure;
- Prevent soil erosion during soil handling operations (salvage operations, to and from stockpiles, and during replacement);
- Protect soils from metal substances from Project sources or activities that have the potential to exert an adverse effect on soil quality and its function;
- Through the implementation of terrain and soil BMPs, support the restoration of ecosystem integrity at sites altered by Project activities upon Closure or cessation of such activities; and
- Implement associated management plans that aim to reduce Project-related effects on the soil resource and terrain stability.

29.23.3 Relevant Project Activities

Mine development activities will result in terrain and soil disturbance in portions of the Project footprint. The amount of soil loss and alteration associated with disturbance is largely subject to soil characteristics, edaphic soil conditions under which salvage is undertaken, erosion control, management of salvage activities, and management of stockpiles after salvage.

Project activities that can affect soil quantity, quality, and terrain stability are presented in Chapter 9, Volume 5 (Landforms and Natural Landscapes Effects Assessment of the Application/EIS. Some of these interactions include:

- Road construction (from the junction with Highway 37A to the Upper Portal);
- Clearing, site preparation, and construction for the TMF and Process Plant;
- Road use during all Project phases; and
- Soil stockpiling and storage.

29.23.4 Applicable Legislation and Guidelines

Legislation applicable or relevant to soil and terrain management (soil salvage and handling, soil metal contamination prevention, and erosion and sediment control) include:

- BC *Mines Act* (1996a);
- The Code (BC MEMPR 2008);
- BC *Environmental Management Act* (2003);
- Contaminated Sites Regulation (BC Reg. 375/96);
- FRPA (2002a);
- Forest Service Road Use Regulation (BC Reg. 70/2004); and
- *Fisheries Act* (1985a) - regulates the discharge of harmful substances into fish habitat, including sediment.

The following applicable guidelines and BMPs relevant to the terrain and soils management for the Project will be reviewed and incorporated where practicable include:

- Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments, (BC MOE 2001);
- Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 2007);
- Forest Practices Code of BC, specifically the Soil Conservation Guidebook (2001); and
- Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1992).

Legislation and BMPs regarding erosion are derived from those within the forest industry. Forest harvesting in BC is subject to the *Forest and Range Practices Act* (2002). Stability of soils in riparian ecosystems are protected by the *Forest and Range Practices Act* (FRPA; 2002b) and the *Fisheries Act* (1985b).

Road construction and maintenance within Provincial forests is governed in BC by FRPA (2002a). The Act requires that road construction and maintenance conducted under *Forest*

Act authority adhere to codes provided in the Forest Service Road Use Regulation (BC Reg. 70/2004), which focuses extensively on erosion prevention.

Direction from these BMP sources and guidelines, as well as from requirements stipulated in relevant legislation and regulation, are incorporated into the mitigation measures outlined below. These sources will be key inputs to the development of the TSMP during permitting. Any new or updated BMPs that become available following the submission of the Application/EIS will also be considered.

29.23.5 Environmental Protection Measures

29.23.5.1 Proposed Mitigation Measures

The approach to developing environmental protection measures implements the mitigation hierarchy as per BC MOE (2014b) guidance, in which all feasible measures at one level are considered before moving to the next level. The broad categories of mitigation and management identified for terrain and soils once optimizing alternatives was considered and/or implemented include:

- Design Mitigation;
- BMPs; and
- Restoration.

Decisions made during the process of alternative optimization and mitigation by design are guided by a successful implementation of environmental protection measures and BMPs, and successful restoration is facilitated most effectively by minimizing disturbance.

Environmental protection measures are specific actions and practices that mitigate environmental damage. Appropriate education and training will be provided to all employees and contractors outlining how to minimize effects on terrain and soils and why it matters. This information will be prepared and made available to all employees on site in the form of fact sheets and/or handbooks.

Planning and management strategies employed during mine development and operation will minimize surficial disturbance and progressive restoration will be undertaken as soon as possible. However, soil under the Project footprint will be disturbed, so the primary method of reducing effects to soil will be through soil salvage, erosion control, and avoidance of contamination.

29.23.5.2 Soil Salvage

Salvaged soils and suitable overburden will be used during restoration activities and reclamation to facilitate the restoration of functioning ecosystems. To achieve this goal, these materials (soils and suitable overburden) will be salvaged, handled, transported, and stored in a manner that does not result in excessive losses of suitability and future productivity.

Soil salvage measures to be employed are as follows:

- The operation will be adequately supervised and will follow a predetermined soil salvage plan;
- Soil salvage will include mineral and organic materials identified in the soil salvage plan. In practice, this means humus form (if present) materials will be salvaged and stored with the salvaged mineral soil, while excess vegetation (e.g., large tree limbs, root-balls, logs, etc.) will not be placed in the soil stockpile but may be retained for spreading as part of the final reclamation;
- Prolonged exposure of bare soil to the elements will be avoided; whenever possible, soil salvage will immediately follow vegetation clearing;
- Soil salvage will not be conducted when soils are too wet or too dry, as working in these conditions can degrade soil quality;
- When practical, 'bouldery' mineral coarse fragments larger than 25 cm diameter will be separated during salvaging. This will enable equipment operators to effectively shape the soil stockpile. It will also improve the quality of the soil for use in future reclamation efforts;
- Stockpiles will be designed to be geotechnically stable;
- Stockpiles will be located on stable foundations, on level ground where possible, and outside of active floodplains and riparian areas;
- Stockpile design will incorporate setbacks to ensure materials are not inadvertently displaced outside approved areas;
- Soil and suitable overburden will be segregated in separate stockpiles;
- Stockpiles will be constructed to avoid the promotion of changes in oxidation/reduction reactions that may promote the availability of metals, particularly arsenic which is naturally elevated in the area;
- Stockpiles will be constructed as soil salvage activities progress. As portions of the stockpile become completed, the slopes will be contoured to ensure stockpile stability, minimize erosion and to help vegetation establishment;
- Traffic in stockpile areas will be limited to stacking and shaping the stockpiles to minimize compaction;
- Stockpiles will be surrounded by runoff diversion and collection ditch catchments and shaped in a way that will promote slow, efficient drainage of the slopes;
- Completed portions of stockpiles (both slope and top) will be re-vegetated to minimize soil erosion, maintain soil quality, and control weeds; and

- Stockpiles will be accessible and will be marked in the field with permanent signs. Information on stockpile quantity and quality will be recorded.

29.23.5.3 Soil Contamination

The primary strategies for managing soil contamination are to: 1) identify potential sources of metals; and 2) employ techniques to control their potential for release to the environment and potential to impact soils. These measures include:

- Avoidance and minimization of activities that may increase potential for mobilization of naturally occurring metals;

- Identification of ML/ARD sources both naturally occurring (as related to potential quarries, overburden pits, and road cuts) and process-related (storage and disposal of ML/ARD wastes and products);

- Salvage of soil from the footprint of area(s) of proposed ML/ARD ore and rock storage/stockpiles or handling areas;

- Sampling of salvaged soil to determine natural metal concentrations. If natural metal levels exceed the limits set in the Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 2007) or exceed the Soil Criteria for Toxicity to Soil Invertebrates and Plants outlined in the Contaminated Sites Regulation (375/1966), then the contaminated soil will be stored separately and measures consistent with the MHMP will be taken to inhibit metal release to the environment;

- Dust control (Process Plant and ore handling/stockpile areas and along roads); and

- Drainage and sediment control (collection and treatment of contact water prior to discharge).

Several of the above noted measures are parts of other environmental management plans (AQDMP, SWMP, and MHMP). Together these measures reduce the potential for metal contamination of the local soils resource.

Potential contamination of soils with metals resulting from dust deposition will be monitored throughout the Project's life. Mitigation and remediation initiatives will be undertaken if contamination exceeds regulated levels.

29.23.5.4 Terrain Stability

Geotechnical knowledge, adequate design, quality construction, and monitoring will be emphasized throughout all phases of the Project. If a situation arises where the risk of geotechnical failure becomes apparent, proactive preventive measures will be taken to address the problem and ensure geotechnical stability is reinstated.

Potential effects on terrain stability can be mitigated by identifying areas where there is a moderate to high likelihood of slope failure following Project development, conducting terrain stability field assessments of those areas by a QEP, and adapting designs to address

stability issues. Detailed geotechnical plans will be required in order to avoid adverse effects on terrain. Follow-up monitoring is required in these areas in order to determine the effectiveness of mitigation. Mitigation will be used to reduce the risk of associated Project development in areas of terrain that are unstable and potentially unstable to an acceptable level. These strategies will reduce the risk by reducing the:

- Probability of the geohazard occurring;
- Geohazard magnitude (e.g., volume, peak discharge);
- Geohazard intensity (e.g., run-out distance, velocity, impact forces);
- Spatial probability of effect (i.e., likelihood that the geohazard will reach or impact the element at risk);
- Temporal probability of effect (e.g., likelihood of workers being present in the zone subject to the hazard); and
- Vulnerability (i.e., the degree of loss to a given element at risk within the area affected by the snow avalanche or landslide hazard).

Slope stabilization techniques, including terracing and bioengineering structures such as wattle fences and brush layers, will be used in areas with highly erodible soils and those areas with long and/or steep slopes. Erosion-control measures will include seeding of exposed soils with an erosion-control seed mix or hydro-seeding with a mix of seed, mulch, and a tackifier as soon as possible after soil surface disturbance. Where required, such as along water-diversion channels, soil-erosion control measures to be adopted may include construction of channel-bank protection and the installation of erosion-control blankets. Silt fences will be used to contain sediments eroding off-site and to prevent them from entering waterways. To protect erodible channel banks, rock material, willow bundles, or gabions will be used, as required. Details are provided in the ESCP.

Sections of the roads will be exposed to avalanche hazards. The exposed areas will be inspected by the Occupational Health and Safety and Emergency Response planning committees to determine the associated risks. Standard operating procedures for road maintenance and avalanche management will be developed to reduce and manage the associated risks.

29.23.6 Monitoring and Follow-up

Monitoring will evaluate and document: 1) if the TSMP is implemented as intended, and 2) if adverse effects to terrain and soils resulting from interactions between the Project and the environment are successfully avoided or minimized.

Specifically, monitoring will help determine environmental compliance and whether the stated performance objectives are being achieved. Such monitoring will inform the need for corrective action or adaptive management.

Environmental personnel will be on site during Construction to ensure that the TSMP is being implemented and objectives are being met. If mitigation measures as outlined in the TSMP are being implemented but one or more performance objectives are not achieved, then adaptive management will be undertaken to evaluate the effectiveness of the mitigation measures.

The terrain and soil monitoring program will form part of the overall Project environmental monitoring program. Terrain and soil monitoring variables that will be considered for assessment are as follows:

- Area of land disturbance as compared to planned disturbance;
- Rates of erosion and sedimentation;
- Use of measures employed to optimize soil salvage and minimize soil contamination and terrain instability and identification of successful initiatives and opportunities for improvement; and
- Success of measures employed to optimize soil salvage and minimize soil contamination, i.e., volume of soil stockpiles, appropriate timing of stockpile seeding, occurrence of standing water on soil stockpiles, vegetation success, areal extent of soil replacement, and soil chemical characteristics.

Soil metal contamination monitoring will be implemented early during Project construction to detect potential metal deposition/mobility patterns. The program will involve a number of fixed sites located at various distances from the potential sources of emissions. Location of sampling points will be determined in the permitting phase.

Terrain conditions will also be monitored for potential instability issues, including those resulting from the construction of Project infrastructure. The overlying area will be investigated for the potential of downhill movements of rubble and snow. If a situation arises where the risk of geotechnical failure becomes apparent, proactive preventive measures will be taken to address the problem and ensure geotechnical stability is reinstated. Any sediment and erosion control issues will be addressed in accordance with the ESCP.

Specific monitoring procedures, including work planning and scheduling details, will be outlined in the detailed plan during permitting and prior to commencement of Construction.

29.23.7 Reporting

Reporting will be conducted on an annual basis as required for reclamation and environmental monitoring of soil salvage and replacement as conducted during mine development (including construction), operation, and closure as required by the *Mines Act* (1996a) and the Code (MEM 2017).

Inspection reports will include:

- A description of completed mitigation activities;

- Monitoring results including identification of any incidents or issues of non-compliance;
- A log of photographs (e.g., erosion, soil and suitable overburden salvage, stockpiling and replacement, areas of soil contamination, terrain stability issues, etc.);
- Recommendations, such as adaptive management or preventive measures; and
- A list any required corrective actions.

Internal reports will be generated corresponding with the frequency of monitoring and inspections.

Designated trained personnel will oversee the terrain and soil monitoring program, maintain inspection reports, and provide guidance with the support of a qualified soil/geotechnical specialist, when required. Implementation and associated reporting of terrain and soil monitoring will be the responsibility of the site Environmental Manager.

29.23.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the TSMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

The Environmental Superintendent (or designated qualified staff) will disseminate the performance objectives and actions with all Project personnel that have the potential to directly or indirectly influence terrain and soil management on site during the Construction, Operation, Closure and Reclamation, and Post-Closure Phase activities. Communication of this information and endorsement by qualified individuals will be recorded and tracked as a key performance indicator.

Employees participating in terrain and soil management will be identified by IDM and will receive training and education, if required. All employees will be made aware of the general issues and concerns surrounding terrain and soil management activities and monitoring plans.

29.24 Vegetation and Ecosystems Management Plan

29.24.1 Introduction

The Vegetation and Ecosystems Management Plan (VEMP) is one of many plans that form the Project's EMS. The VEMP provides the objectives, legislation, and mitigation measures in minimizing effects to Vegetation and Ecosystems valued components (VCs) in addition to the role and responsibilities and reporting for this plan. This is a conceptual plan and, prior to construction, IDM will revise the VEMP as needed to include additional details relating to Vegetation and Ecosystems protection measures, inspections, reporting, documentation, and details of continual improvement initiatives.

29.24.2 Scope and Objectives

The purpose of the VEMP is to provide environmentally responsible, realistic, and operationally feasible guidance for management related to Vegetation and Ecosystems during the Construction, Operation, Closure and Reclamation, and Post-Closure Phases of the Project. The VEMP provides guidance for the Vegetation and Ecosystems VCs identified through consultation with NLG, regulators, and the public:

- Ecologically viable soil;
- Alpine and parkland ecosystems;
- Old growth and mature forested ecosystems;
- Floodplain and wetland ecosystems;
- BC Conservation Data Centre (CDC) listed ecosystems; and
- Rare plants, lichens, and associated habitats.

Management of Project-related effects on Vegetation and Ecosystems were determined in accordance with the key mitigation approaches outlined in the Effects Assessment Methodology (Volume 3, Chapter 6) and the Procedures for Mitigating Impacts on Environmental Values (BC MOE 2012).

Mitigation and management will be coordinated with management of relevant environmental, economic, heritage, health, and/ or social ICs and VCs. The VEMP is coordinated with the following applicable chapters and management plans to avoid and minimize effects to Vegetation and Ecosystems:

- Closure and Reclamation (Volume 2, Chapter 5);
- AQDMP;
- AEMRP;
- ESCP;
- TSMP; and
- Wildlife Management Plan.

29.24.3 Applicable Legislation and Guidelines

Vegetation and ecosystems will be managed according to applicable legislation, regulations, and policies:

- BC *Mines Act* (1996a);
- The Code (MEM 2017);
- BC *Environmental Management Act* (2003a);
- *Weed Control Act* (1996m);
- Weed Control Regulation (BC Reg. 66/85);
- *Integrated Pest Management Act* (2003b);
- *Seeds Act* (1985f);
- FRPA (2002a);
- Invasive Plants Regulation (BC Reg. 18/2004);
- *Wildlife Act* (1996e);
- Riparian Areas Protection Act (1997b) and Riparian Areas Regulation (BC Reg 41/2016);

- *Water Sustainability Act* (2014);
- *Migratory Birds Convention Act* (1994);
- *Fisheries Act* (1985a);
- *Species at Risk Act* (2002b); and
- Federal Policy on Wetland Conservation (Environment Canada 1991).

The following applicable guidelines and BMPs relevant to the management of Vegetation and Ecosystem will be reviewed and incorporated where practicable:

- Develop with Care Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014c);
- Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia (BC MOE 2009);
- An Invasive Alien Species Strategy for Canada (GOC 2004);
- Invasive Species Strategy for British Columbia (Invasive Species Council of BC 2012);
- Best Management Practices Riparian Management for Small Streams (BCTS 2017);
- Standards and Best Practices for Instream Works (BC MWLAP 2004a);
- Windthrow Handbook for British Columbia Forests (Stathers et. al. 1994);
- Best Practices for Managing Invasive Plants Along Roadsides: A Pocket Guide for British Columbia's Maintenance Contractors (BC MOTI 2010);
- Invasive Species Council of BC (2017) website (i.e., T.I.P.S. brochures);
- Invasive Plants Identification Field Guide (Province of BC 2008);
- Guide to Weeds in British Columbia (BC Ministry of Agriculture, Food and Fisheries 2002);
- Northwest Invasive Plant Council Strategic Plan (NWIPC; 2015);
- Northwest Invasive Plant Council (NWIPC) 2017 Target Invasive Plant List (NWIPC 2017);
- Forest Practices Code Riparian Management Area Guidebook (BC MOF 1995);
- The Handbook for Pesticide Applicators and Dispensers (BC MWLAP 2005);
- Procedures for Mitigating Impact on Environmental Values (BC MOE 2014b);
- Towards an Environmental Mitigation and Offsetting Policy for British Columbia: A Discussion Paper (BC MOE 2010); and BC CDC (2017).

29.24.4 Relevant Project Activities

29.24.4.1 Construction

Construction activities will interact with Vegetation and Ecosystem VCs through surface disturbance that will include clearing vegetation and removing topsoil, stockpiling overburden and topsoil, and through traffic associated with the transport of people, goods, and materials. Specifically, Project activities will interact with Vegetation and Ecosystem VCs in the Construction, Operation, and Closure and Reclamation Phases through development of the following:

- Re-activation and use of the Access Road from Highway 37A to Bromley Humps;
- Construction of the TMF and the Process Plant at Bromley Humps and ancillary buildings and facilities;
- Construction and use of the Haul Road from the Process Plant at Bromley Humps to the underground mine;
- Clearing associated with the creation of the right-of-way for the Powerline from Highway 37A to the underground mine; and
- Installation of the Powerline poles along the length of the line.

29.24.4.2 Operation

Operation Phase activities will interact with Vegetation and Ecosystem VCs through the ongoing use and maintenance of Project infrastructure and through water withdrawal and stockpiling associated with mining including the following:

- Ongoing use and maintenance of the Project roads;
- Ongoing vegetation maintenance under the Powerline;
- Waste rock, ore, and soil stockpiling;
- Withdrawal of water for industrial water requirements, Process Plant, TMF, dust suppression, road building, and other activities; and
- Discharge of water from the underground facilities.

29.24.4.3 Closure and Reclamation

Closure and Reclamation activities will interact with Vegetation and Ecosystem VCs through:

- The decommissioning of the Process Plant, TMF, and ancillary buildings and facilities;
- Land reclamation and removal of water intake and discharge infrastructure; and
- Soil handling and revegetation of proposed reclaimed areas.

29.24.5 Environmental Protection Measures

The following are the performance objectives of the VEMP:

- Avoid and minimize loss and alteration of ecosystem function, abundance, and extent through Project design;
- Minimize loss and alteration of ecosystem function, abundance, and extent through adherence to applicable legislation, BMPs, and Project-specific mitigation measures in conjunction with management of other relevant environmental, economic, heritage, health, and/or social ICs and VCs; and
- Restore ecosystem function, abundance, and extent to a degree possible through progressive reclamation and upon mine closure.

29.24.5.1 Approach to Environmental Protection Measures

The approach to developing environmental protection measures implements the mitigation hierarchy as per BC MOE (2014b) guidance, in which all feasible measures at one level are considered before moving to the next level. The broad categories of mitigation and management identified for Vegetation and Ecosystems once optimizing alternatives was considered and/or implemented include:

- Design Mitigation;
- BMPs; and
- Restoration.

29.24.5.2 Design Mitigation

Design mitigation included:

- Minimizing cut-and-fill in areas with metal leaching/acid rock drainage (ML/ARD) potential;
- Routing portions of the Access Road to avoid wetlands; and
- Developing objectives of closure plans for reclaimed areas to establish site conditions that allow for realistic and operationally feasible ecological trajectories, and that take into consideration ecosystem function and wildlife habitat end land use objectives.

29.24.5.3 BMPs and Project Mitigation Measures

Through additional Project design, legislative requirements, industry standards, and/or BMPs, the Project mitigation measures for Vegetation and Ecosystems include the following:

- Only geochemically suitable material from rock quarries and borrow sources will be used to construct permanent structures (i.e. tailings dam). For roads, pads and rock cuts, the following will be conducted to the extent possible:

  - Minimize cut and fill in areas with ML/ARD potential;
  - Free passage of water through fill materials (i.e. free span bridges or culverts) and not through rock drains; and
  - For pads, drainage will be collected using water diversions.

- The design of the Access Road and Haul Road has been optimized to minimize the distance travelled, which will reduce noise, dust, and emissions associated with construction and operation;
- The clearing of vegetation and soil will be minimized to the extent possible, and avoided where practicable, for unique features identified by QEPs, including wetlands, exposed bedrock, cliffs etc., which often provide high value habitat to wildlife and may support sensitive vegetation communities and growth forms;
- Conduct pre-construction invasive plant surveys within the Project footprint to determine the presence/absence of invasive plants;
- Remove existing invasive plant populations to prevent the spread to adjacent areas;
- Establish an early detection, inventory, control, and monitoring and follow-up program in accordance with Provincial guidance (i.e., BC MFLNRO 2017) and expert recommendations;
- The area of landscape disturbance will be minimized and ecosystem-based revegetation and progressive reclamation will occur promptly to minimize erosion potential, introduction of invasive plants, and to facilitate initiation of successional ecological processes;
- Where possible, soil will be:
  - Stripped and stockpiled for future reclamation; and
  - Preserved by minimizing the number of times soil is moved;
  - Reducing the vehicle traffic over the soil surface; and
  - Avoiding handling soils when they are too dry or too wet;
- Where possible, organic soils will be salvaged and stored separately from mineral soils;
- Monitoring of reclaimed areas will be conducted periodically to ensure they are revegetated;
- Revegetation will be undertaken with seeds (and/or plants) suitable for the local area and ecosystems and during the appropriate growing season and conditions to: 1) ensure maximum survival rate; 2) avoid establishment of invasive species; and 3) facilitate the establishment of ecological functions and their associated attributes (e.g. species diversity and productivity);
- All vehicles and machinery travel will be restricted to designated road surfaces;

- The design of the Access Road optimizes the utilization of the existing forestry road to avoid and minimize new disturbance;

- Soil handling procedures will be developed specific to sensitive ecosystems (alpine and parkland, wetlands, floodplains, and BC CDC listed ecosystems). High quality soils will be identified and stockpiled when required in accordance with the TSMP;

- Objectives of closure plans for reclaimed areas will be developed to establish site conditions that allow for realistic and operationally feasible ecological trajectories and that take into consideration ecosystem function and wildlife habitat objectives;

- Removal of alpine and parkland, old and mature forest, wetland, floodplain, and BC CDC listed ecosystems will be avoided and minimized through Project design;

- Forests will be managed according to FRPA (2002a) silviculture requirements and BMPs;

- Construction activities will be conducted in accordance with the guidelines outlined in the Wildlife Management Plan to ensure minimal risk to old and mature forest wildlife habitat, such adhering to sensitive periods, specific guidelines, and applicable legislation for wildlife species of concern that use old and mature forest;

- Appropriate setback and buffer distances from surface water bodies and riparian features will be implemented and maintained;

- Rare plant protection and management measures will include the following:

    - Apply adaptive Project design changes that avoid harm to rare plant and lichen populations, where practicable;

    - Avoid surface disturbance in areas with known rare plant and lichen populations;

    - Avoid use of all herbicide sprays within 200 m of rare plant and lichen populations, and limit such use to direct application rather than broadcast sprays;

    - Create exclusion zones around rare plant and lichen habitats to minimize effects related to surface clearing, fugitive dust, and invasive plant introduction;

    - Erect temporary fencing or other barriers around the nearby rare plant and lichen populations to avoid further disturbance to the site where avoidance is not feasible and development is permitted within buffer areas around plant populations;

    - Minimize deposition of fugitive dust on rare plant and lichen populations through adherence to the AQDMP; and

    - Ensure that a EQP, capable of identifying rare plants and lichens is on site (at the clearing location) during vegetation-clearing activities in known rare plant habitat.

- Adverse effects will be minimized to terrestrial ecosystems that depend on hydrological connectivity and flow through management by ensuring free passage of water through fill materials (i.e. using free span bridges or culverts);

- Roots and groundcover will be retained where possible to maintain slope stability and prevent surface erosion, as outlined in the AEMRP;

- Erosion potential will be reduced by conducting sensitive work during periods of low runoff to the extent possible;

- Riparian areas will be managed per the legislated reserve and/or management zone setbacks and work practices established under FRPA (2002a), where feasible; and

- Pre-construction surveys will be conducted to delineate relevant boundaries of the BC CDC listed ecosystems, and the location of BC CDC listed ecosystems will be communicated to ground crews. “No work” zones and/or buffers will be delineated accordingly, where feasible.

29.24.6 Monitoring Program

Monitoring will identify:

- Which mitigation approaches are effective; and
- Inadequacies in specific methods or management.

Monitoring the success or failure of the methods will assist in identification of opportunities for responsive management to emerging negative trends. Specific monitoring procedures, including work plans and schedules, will be outlined in permitting and prior to commencement of construction.

Adaptive management principles and strategies will be implemented if the original predictions of effects and mitigation effectiveness are not as anticipated. Adaptive management will require consideration of monitoring results, management reviews, incident investigations, shared traditional or local knowledge, new or improved scientific methods, regulatory changes, or other Project-related changes. Mitigation and monitoring strategies for Vegetation and Ecosystems will be updated to maintain consistency with management plans and BMPs that may become available during the life of the Project. Key stakeholders, Aboriginal Groups, and government agencies will be involved, as applicable, in developing effective strategies and additional mitigation.

Environmental personnel will be on site to ensure that the VEMP is being implemented and objectives are being met. If mitigation measures are being implemented but performance objectives are not achieved, then adaptive management will be triggered for appropriate corrective action.

IDM will disseminate the performance objectives and actions to Project employees and contractors (workers) that have the potential to directly or indirectly influence vegetation and/or ecosystems on site during Project activities in the Construction, Operation, and

Closure and Reclamation Phases. Communication of this information and sign-off by individuals will be recorded and tracked as a key performance indicator.

Workers participating in vegetation and ecosystem management initiatives will be identified by IDM and will receive appropriate training and education, if required. All employees will be made aware of the general issues and concerns surrounding vegetation and environmental management activities and monitoring plans.

29.24.7 Reporting

Reporting will be conducted as per future permits, approvals, and authorizations relevant to vegetation and ecosystem management and will be delivered to the Mine Manager and/or delegates. Annual *Mines Act* (1996a) reporting of the environmental monitoring will be conducted and will include the following example information:

- Records of inventory, treatment, monitoring, and restoration activities;
- QA/QC protocols (e.g., data validation) implemented;
- Evaluation of the effectiveness of the environmental protection measure employed in achieving the stated objective(s) where appropriate; and
- Education and training for workers completed.

An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved

29.24.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the VEMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan. Enhanced training in existing provincial and federal legislation, ecology, available data entry tools, and reporting programs related to ecosystem-based management and restoration will be provided as appropriate to the responsible environmental personnel.

29.25 Waste Management Plan

29.25.1 Introduction

The Waste Management Plan (WMP) describes ways that IDM intends to reduce and manage waste for the life of the Project. The WMP provides direction on the prompt, effective, and organized management strategies that will be implemented for non-hazardous and hazardous wastes, recyclables, and treated sewage.

29.25.2 Scope and Objectives

The objective of the WMP is to protect human health and to minimize potential adverse effects to the environment from waste produced at the Project site during Construction, Operation, Closure and Reclamation, and Post-Closure Phases of the Project. A material is defined as a waste once it cannot be used for its original purpose. The plan outlines the legislation, policies, and procedures that IDM would follow for recycling, storage, handling, and disposal of:

- Non-hazardous and hazardous industrial waste; and
- Non-hazardous domestic wastes.

The WMP documents the Proponent's approach to waste management and outlines strategies that will be used to process the various waste streams to ensure environmental protection. In order for the WMP and associated procedures to work to their full extent, everyone on the Project site must be made aware of the plan and their corresponding responsibilities. All Project personnel, including contractors, need to be active participants.

The targets for the WMP are to ensure that:

- All employees and contractors ('workers') on site have training in Project waste management strategies, achieved through site orientation training (Section 29.25.5.4).

- Every work area has a designated waste collection or disposal area; and

- Every waste collection or disposal area has designated and secure areas or containers for disposal of specific waste types.

Other Project management plans that link with and will be coordinated with the WMP include:

- ERP;
- FMP;
- HMMP;
- Material Handling & ML/ARD Management Plan;
- TMP;
- SWMP;
- SCP; and
- Explosives Management Plan.

An integrated approach will be adopted in the application of the various components of environmental management and reporting for the Project.

29.25.3 Applicable Legislation and Guidelines

Development and implementation of the WMP will be guided by several provincial and federal acts, regulations, and BMPs to cover proper waste handling, storing, treating,

disposal, and transportation. There are several legislative statute requirements, industry standards, and codes of practice applicable to waste management, including:

- Canada *Transportation Act* (1996l);
- Canadian *Environmental Protection Act* (1999);
- *Environmental Management Act (*2003a);
  - Hazardous Waste Regulation (RSBC. C. 63/88);
- *Fisheries Act* (1985a);
- *Hazardous Products Act* (1985d);
  - Controlled Products Regulations (SOR/88-66);
  - Hazardous Products Regulations (SOR/2015-17);
- Hazardous Waste Legislation Guide (BC MOE 2016c);
- *Land Act* (1996n);
- *Public Health Act* (2008);
- *Mines Act* (1996a);
  - The Code (BC MEM 2017);
- *Transport of Dangerous Goods Act (*1996i);
  - Transport of Dangerous Goods Regulation (RSBC. C. 203/85);
- *Water Sustainability Act* (2014);
- *Wildlife Act* (1996e); and
- WHMIS (WorkSafeBC 2015).

29.25.4 Relevant Project Activities

Industrial and domestic waste will be generated from the Project throughout the life of the Project:

- **Construction Phase**: Waste will be produced through construction of roads, camps, mine and mine facilities, the Process Plant, and TMF, and will include both hazardous and non-hazardous wastes;

- **Operation Phase**: Waste will be produced through ore extraction and tailings processing, as well as domestic waste generated from people on site; and

- **Closure and Reclamation Phase and Post-Closure Phase**: Waste will be produced in the Closure and Reclamation and Post-Closure Phases. Waste materials associated with dismantling and removal of buildings, tanks, and other surface structures, will be produced. The Reclamation and Closure Phase will involve a high volume of reuse, recycling, and recovery.

The following types of waste may be produced at the Project site:

- Domestic:
  - Refuse / garbage;
  - Glass and aluminum cans;
  - Plastics;
  - Paper; and
  - Compostable refuse (e.g., food scraps).
- Industrial:
  - Dry batteries;
  - Building materials;
  - Cement;
  - Scrap metal and wood;
  - Tires;
  - Vehicles;
  - Wiring;
  - Light bulbs;
  - Glass; and
  - Rebar.
- Hazardous:
  - Batteries;
  - Biohazard waste;
  - Laboratory chemicals;
  - Hydraulic oil, motor oil, and associated materials (e.g., filters);
  - Sharps (e.g., razors, first-aid needles);
  - Absorbent pads;
  - Acids;
  - Solvents; and
  - Empty petroleum and reagent drums, carboys, and pails; and
- Sewage.

An inventory of the estimated types and quantities of waste will be generated prior to permitting as required.

29.25.5 Action Plans to Reduce and Manage Waste

29.25.5.1 Reduce, Reuse, Recycle, and Recover

The following hierarchy forms the framework for the WMP and will be implemented throughout the Project life: reduce, reuse, recycle, and recover. Once these four Rs are implemented, remaining waste will be responsibly handled, stored, treated, and disposed of.

29.25.5.1.1 Reduce

The key to waste management is to reducing consumption of materials to reduce the amount of waste produced. Careful consideration of material consumption will be part of the WMP process in every Project phase and evaluated regularly. Waste reduction measures include the following:

- Substituting materials with recyclable and reusable materials where possible to replace non-recyclable and non-reusable materials;
- Avoiding the use of hazardous materials where possible and substituting with non-hazardous materials where practicable;
- Purchasing materials in bulk containers and minimal packaging where possible to avoid volume of containers and packages;
- Using non-disposal items and materials over disposable products;
- Inventory and material ordering practices implemented to maximize use of materials before product expiration; and
- Training personnel on waste minimization and reuse.

29.25.5.1.2 Reuse

Reuse of materials will be a high priority and implemented where practicable, including the following examples:

- Waste oils, glycols, and solvents that can be reused for secondary jobs;
- Scrap metal and wood can be repurposed; and
- Chemical containers returned to the supplier to be refilled.

29.25.5.1.3 Recycle

The Project will implement a recycling program to recycle as much of the waste produced as possible that cannot be avoided or reused. The products will be organized and streamlined in process to minimize the improper recycling or disposal of products. Example materials to be recycled include:

- Plastics;

- Scrap metals;
- Wood;
- Paper and cardboard;
- Salvageable parts from vehicles;
- Oil and used oil filters;
- Lead-acid and alkaline batteries;
- Auto parts that are not reusable;
- Paints that cannot be reused; and
- Organics.

29.25.5.1.4 Recover

Extracting materials or energy as a by-product for other uses is the last step in the overarching waste management hierarchy. Possible materials and energy to recover for the Project will be identified prior to construction and will be assessed and evaluated throughout the life of the Project.

29.25.5.2 Waste Management Infrastructure

The waste management infrastructure for the Project will be established at the onset of construction activities and will be located at the Bromley Humps, consisting of a Waste Storage Area and a Hazardous Waste Storage Area. All construction waste will be backhauled from site to an approved disposal facility.

29.25.5.3 Waste Collection, Storage, and Disposal

29.25.5.3.1 Collection and Storage

Waste will be collected in designated waste collection areas, separated, and sorted into appropriate recycling, reuse, and recovery sites. To reasonably avoid and minimize the misplacement of waste materials, these designated areas will be clearly marked and monitored, and workers will be adequately trained on what is prohibited and permitted. Clear plastic bags will be used in collections where appropriate (no dark garbage bags).

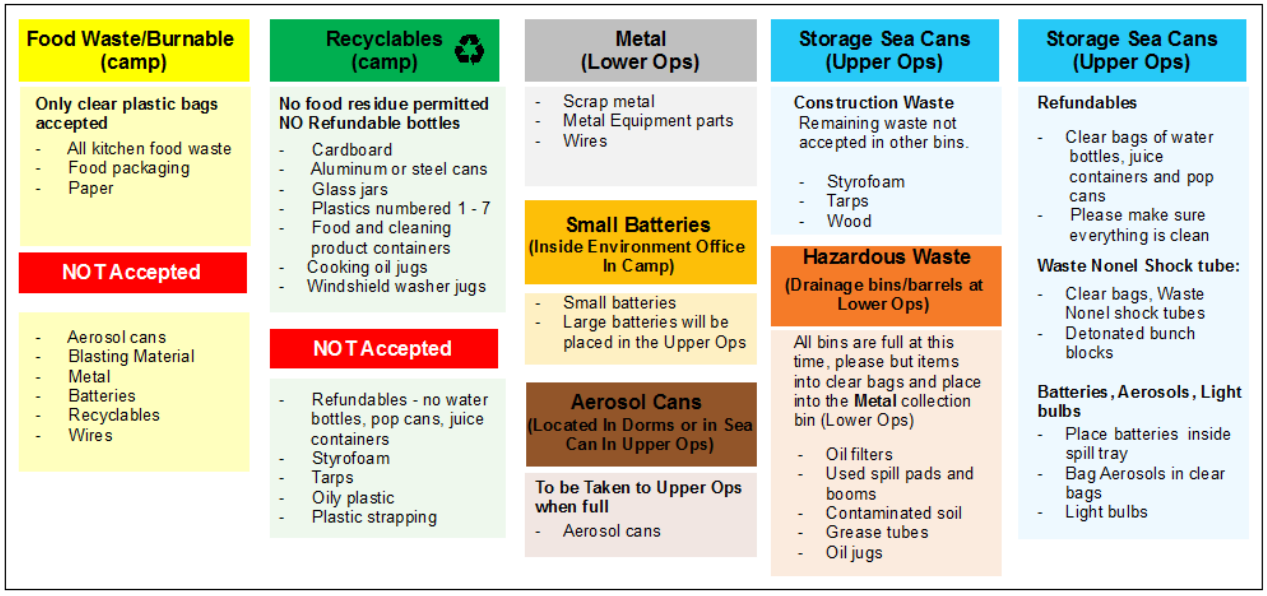
Figure 29.25-1 provides an example of how the waste will be organized at the collection and storage sites.

These collection areas will be considered temporary waste storage areas until it is processed further or transferred off site to the appropriate approved recycling or disposal facilities or landfill. Separating all waste at the source and ensuring proper handling, storage, and disposal will mitigate attracting wildlife. Waste collection areas will be covered and fenced as appropriate as a way to reasonably avoid attracting wildlife, including pests, and to protect against the weather. These collection areas will safely store waste over a relatively short and pre-determined time, typically between one and three months.

Hazardous waste will be packaged, labelled, and stored at the Bromley Hump location, which will be clearly marked with appropriate signs. These sites will be optimally located and contained in areas that reasonably avoid or minimize risk to adverse environmental and

human health effects. Hazardous waste will be stored in a bermed containment area and will only be permitted to reach maximum volumes until they are shipped off site. These sites will be adequately designed to contain spills. The HMMP and SCP provide more information on the hazardous materials management and spill contingency management, respectively.

Figure 29.25-1: Example of Waste Organization



The following waste management practices will include, but will not be limited to, the following:

- Fire prevention systems adequately designed for the materials being stored;
- Spill kits to safely clean and mitigate spills will be available;
- Containers will be maintained in good condition and appropriate for the waste material; and
- Containers will be labelled with material type and dated.

29.25.5.3.2 Sewage and Grey Water Treatment

Sewage and grey water from the facilities will be removed by a contractor for offsite disposal. No sewage or septic works are therefore required on site. Water will be used in the washing facilities for heavy equipment and trucks. An oily water treatment system will be utilized at the washing facilities and reused where practicable. The excess water will be released to the environment under permitted authorization and depending on water quality and operational needs. Alternatively, and where necessary, excess water will be pumped to the TMF.

29.25.5.3.3 Disposal

Waste products other than mineral tailings will be sorted at the Process Plant prior to offsite removal. Solid waste (scrap steel, wood, etc.) will be collected in bins. Empty chemical totes, lubricant drums, etc. will be collected and compacted. All industrial waste will be back-hauled offsite for recycling or disposal in an appropriate manner. Sewage and grey water from the mine dry and maintenance facilities will be hauled to an appropriate facility near Stewart, for disposal.

Waste transport offsite will be conducted in safe and appropriately equipped and labelled trucks and only to approved disposal and recycling facilities. All hazardous waste will be handled, stored, and transported in accordance with the HMMP and the Transportation of Dangerous Goods regulations (RSBC. C. 203/85).

29.25.5.4 Training

All workers will undergo appropriate training on environmental and waste management, including the importance and practical implementation of the four Rs in waste management (i.e., reduce, reuse, recycle, and recover), waste management practices to minimize wildlife attraction, and how and where to recycle materials at the Project site. Each worker will be expected and responsible of disposing waste according to the waste management plan.

Specific workers employed to manage the waste collection facilities and sewage treatment plant will be further trained in more detail and in accordance with the applicable regulations and guidelines. This includes training in the safe work and sorting procedures and proper procedures in the identification and action plan of any potential waste improperly sorted. Workers who are involved in the receiving, storing, or transportation of potentially hazardous materials will undergo WHMIS training and Transportation of Dangerous Goods training. Information about training for workers handling hazardous materials is provided in the HMMP.

29.25.6 Monitoring Program

Monitoring of waste management procedures include the assessment and review of the implementation of the four Rs using measurable parameters. A comprehensive checklist will be developed for assessment at regular intervals and will include checking that measures were implemented for the four Rs in waste management, such as volume waste recycled, reused, and recovered, materials being used by their expiry dates, and the largest containers being used for ordering materials as practicable for the needs of the Project.

Monitoring will also include the following:

- Quantity and type of materials directed to each of the waste management facilities;
- Weight and location of waste disposed of in the offsite landfill;
- Collection of runoff samples and analysis of quality downstream of the temporary waste storage facilities (e.g., surface runoff or shallow groundwater seepage);

- Testing of treated sewage effluent quality from the sewage treatment plant; and
- Planned and random visual inspections, including maintenance of waste storage containers and facilities.

29.25.7 Reporting Requirements

Reporting will be conducted as per future permits, approvals, and authorizations relevant to waste management and will be delivered to the Mine Manager and/or delegates. An auditing program will be developed and implemented prior to the start of construction for applicable compliance checks and QA/QC. Results of the audits will be included in the reporting system, including a record of the dates the audits took place, what was checked/reviewed, corrective actions carried out, and personnel involved.

29.25.8 Roles and Responsibilities

The Environmental Superintendent will be responsible for the implementation of the WMP. The Environmental Superintendent will inform and report to the Mine Manager. All employees, contractors, and contractor employees are responsible for complying with the intent of this plan.

29.25.9 Review of Plan Effectiveness

Certain components of the WMP may need to be modified based on site experience or changes in legislation or best practices. All aspects of the plan shall be audited or reviewed for effectiveness and to identify components needing correction, adjustment, or upgrading. Formal evaluations of this plan will be documented, with deficiencies noted and corresponding progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

29.26 Wildlife Management Plan

29.26.1 Introduction

This Wildlife Management Plan outlines the approach that IDM will take to minimize potential effects on wildlife and wildlife habitat as a result of interactions with Project components or activities. The Wildlife Management Plan involves the implementation of widely recognized BMPs and development of procedural mitigation measures. BMPs and mitigation measures will be implemented during Project planning, Construction, Operation, Closure and Reclamation, and Post-Closure Phases to minimize anticipated effects while accommodating operational, health, and safety requirements.

Many mitigation measures have already been implemented during the planning stages of the Project. These include Project design, such as site and route selection, selection of best available technologies to-date for Project infrastructure and mining equipment, and a

commitment to progressive reclamation. Mitigation is guided by the provincial mitigation hierarchy (i.e., avoid, minimize, restore, and offset) (BC MOE 2014a and 2014b) whereby feasibly practicable measures are considered and applied prior to moving to the next level.

The monitoring program is intended to assess the effectiveness of the mitigation and to detect unanticipated effects. Information from monitoring will guide adaptive management protocols, such that in the event that original predictions of effects and mitigation effectiveness are not as expected, adaptive management principles and strategies will be implemented.

Adaptive management will require consideration of monitoring results, management reviews, incident investigations, shared traditional or local knowledge, new or improved scientific methods, regulatory changes, or other Project-related changes. Mitigation and monitoring strategies for wildlife will be updated to maintain consistency with action plans, management plans, and BMPs that may become available during the life of the Project. Key stakeholders, Aboriginal Groups, and government agencies will be involved as necessary in developing effective strategies and additional mitigation. Therefore, the Wildlife Management Plan is considered to be a "living document" and will be revised as necessary to incorporate these updates or changes throughout the life of the Project. Monitoring programs will be further detailed in subsequent Wildlife Management Plan revisions to capture discussions with stakeholders, Aboriginal Groups, government agencies during review of the Application/EIS.

29.26.2 Scope and Objectives

This Wildlife Management Plan outlines the approach that IDM will take to minimize potential effects on wildlife and wildlife habitat as a result of interactions with Project components or activities. The objectives of the Wildlife Management Plan are to:

- Minimize the effects of the Project during Construction, Operation, Closure and Reclamation, and Post-Closure Phases;
- Outline the development of monitoring programs to evaluate certain environmental assessment (EA) predictions and assess effectiveness of mitigation measures; and
- Support an adaptive management approach to mitigation of potential effects resulting from the Project.

The strategies and actions identified in the Wildlife Management Plan should be considered in association with the following Project-specific environmental management plans:

- Adaptive Management Plan — supports implementation of adaptive management in association to wildlife monitoring results;
- Access Management Plan — outlines road management, access controls, and monitoring of use, including speed limits that will reduce the potential for wildlife collisions;

- Air Quality and Dust Management Plan — provides information on fugitive dust dispersal as well as management and mitigation measures that will limit dust dispersal to minimize the effects to wildlife and wildlife habitats within and adjacent to the Project footprint;

- Explosives Management Plan — provides measures that will be used to reduce effects of surface blasting on behavior and habitat of goats and other wildlife species;

- Fuel Management Plan — provides guidance on the storage and use of fuel on-site to prevent leaks and spills that could have adverse effects on wildlife and wildlife habitat;

- Hazardous Materials Management Plan — provides guidance on the storage and use of hazardous substances on-site to prevent leaks and spills that could have adverse effects on wildlife and wildlife habitat;

- Noise Abatement Plan — provides guidance related to reducing noise, which will mitigate sensory disturbance to wildlife in the Project area;

- Site Water Management Plan — provides measures that will be used to prevent process solution and contact water from affecting habitats retained within the Project footprint including a redundant system of liners, drainage layers, leak detection, and monitoring systems;

- Spill Contingency Plan — provides background planning and operational procedures for spill response to minimize exposure of wildlife to deleterious substances;

- Tailings Management Plan — provides guidance related to minimize exposure of wildlife to deleterious substances and preventing wildlife from entering the TMF;

- Vegetation and Ecosystems Management Plan — provides mitigation of potential effects to vegetation and vegetation monitoring protocols which indirectly relate to the protection of wildlife habitat; and

- Waste Management Plan — provides details on handling Project waste, which, if mishandled can attract problem wildlife to the site.

29.26.3 Applicable Legislation and Guidelines

29.26.3.1 Federal Context

The Pacific/Yukon Region of Environment and Climate Change Canada (ECCC) is responsible for coordinating federal environmental policies and programs related to wildlife. ECCC administers or shares responsibility for multiple Acts addressing legislation directly or indirectly related to wildlife. Federal legislation related to wildlife is summarized in Table 29.26-1. Numerous federal documents provide guidance related to wildlife, conservation, and recovery strategies for specific species. Examples of federal documents are provided in Table 29.26-2.

Table 29.26-1: Summary of Applicable Federal Legislation for Wildlife

Name	Year	Description
Canada Wildlife Act	1985g	The *CWA* protects and conserves wildlife through the creation and management of wildlife areas (known as National Wildlife Areas) (ECCC 2016a). Wildlife areas are intended to preserve critical habitats for migratory birds and other wildlife species, particularly those listed under SARA. The Wildlife Area Regulations prohibits activities that could be harmful to wildlife and their habitats unless an activity is authorized under a permit.
Migratory Birds Convention Act (MBCA)	1994	The *MBCA* protects and conserves migratory birds (as individuals and populations), their eggs, and their nests in Canada through the implementation of the Migratory Birds Regulations and the Migratory Birds Sanctuary Regulations (ECCC 2016c). According to the *MBCA*, removal of migratory birds, their eggs, or nests from a site is only permissible if the migratory birds are causing or may cause damage to property and equipment (subject to permitting). Deposit of harmful substances to birds in areas or waters frequently visited by migratory birds is prohibited.
Species at Risk Act (SARA)	2002	The *SARA* provides for the legal protection of plant and wildlife species to conserve their biological diversity and prevent extirpation or extinction (ECCC 2016d). Under *SARA*, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) identifies and assesses plant and wildlife species considered at risk, which may then qualify for legal protection and recovery under *SARA*. Once listed under *SARA*, species plans are legal requirements to secure the necessary actions for species recovery and management.

Table 29.26-2: Examples of Applicable Federal Strategies, Guidelines, Plans, and Best Management Practices for Wildlife

Name	Year	Type	Description
Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada	2004	Guidelines	Outlines general responsibilities to consider for wildlife species at risk in Canada, best practice guidelines, and implications of the *SARA* for environmental assessment (EC 2004).
Recovery Strategy for the Common Nighthawk (*Chordeiles minor*) in Canada	2016	Recovery Strategy	This recovery strategy outlines the best available scientific information regarding what is required to achieve recovery of this species. The recovery strategy also identifies recovery goals, objectives, and recommended actions to achieve recovery (EC 2016a).
Bird Conservation Strategy for Bird Conservation Region 5: Northern Pacific Rainforest	2013	Conservation Strategy	This document provides information on priority bird species present in that region, as well as their population objectives, their habitats, their threats, and recommended conservation objectives and actions (EC 2013).
Recovery Strategy for the Marbled Murrelet (*Brachyramphus marmoratus*) in Canada	2014	Recovery Strategy	This recovery strategy outlines the best available scientific information regarding what is required to achieve recovery of this species. The recovery strategy also identifies recovery goals, objectives, and recommended actions to achieve recovery (EC 2014c).
Recovery Strategy for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Canada	2015	Recovery Strategy	This recovery strategy outlines the best available scientific information regarding what is required to achieve recovery of these species. The recovery strategy also identifies recovery goals, objectives, and recommended actions to achieve recovery (EC 2015).
Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada.	2016	Recovery Strategy	This recovery strategy outlines the best available scientific information regarding what is required to achieve recovery of this species. The recovery strategy also identifies recovery goals, objectives, and recommended actions to achieve recovery (EC 2016b).
Management Plan for the Western Toad (*Anaxyrus boreas*) in Canada	2016	Management Plan	This management plan identifies conservation actions and land use measures that are necessary to ensure western toad do not become threatened or endangered in Canada. The management plan summaries the best available scientific information regarding the biology of western toad and any known threats to the species. The management plan also identifies goals, objectives, and recommended actions to achieve conservation (ECCC 2016b).

29.26.3.2 Provincial Context

At the provincial level, the Skeena Region (Region 6) of the BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO) is responsible for managing wildlife and wildlife habitat within the region surrounding the Project. Provincial legislation related to mitigating Project-related effects to wildlife and wildlife habitat is summarized in Table 29.26-3.

In addition to the provincial legislation described below, there are multiple provincial strategies, plans, guidelines, and BMPs that relate to wildlife and wildlife habitat. Table 29.26-4 lists documents that were considered when developing appropriate mitigation measures to implement for the management of wildlife.

Table 29.26-3: Summary of Applicable Provincial Legislation for Wildlife

Name	Year	Description
Wildlife Act	1996e	The *Wildlife Act* defines wildlife as all native (and some non-native) amphibians, birds, mammals, and reptiles that live in British Columbia (BC MFLNRO 2017). The *Wildlife Act* provides for the protection, conservation, and management of wildlife populations and wildlife habitats within British Columbia. Under Section 34 of the Act, it is an offence to possess, take, injure, molest, or destroy a bird, its egg(s), or a nest that is occupied by a bird or its egg(s). The nests of select species[5] are protected year-round. Wildlife species can be legally designated as endangered, threatened, or special concern under the Act, which enables penalties for killing or harming wildlife, or the establishment of Critical Wildlife Habitats in Wildlife Management Areas.
Forest and Range Practices Act (FRPA)	2002a	The FRPA outlines standards and requirements for how forest and range practices and natural resource activities should be conducted on Crown land in BC in a manner that ensures protection of natural resources, including wildlife. Mechanisms under the FRPA include Ungulate Winter Ranges (UWRs) and Wildlife Habitat Areas (WHAs). An UWR is an area of habitat that is critical to meeting an ungulate species' winter habitat requirements (BC MOE 2017b). A WHA is an area of habitat that is critical to meeting the habitat requirements of an Identified Wildlife species (BC MOE 2017c). Identified Wildlife includes species legally designated as endangered, threatened, or special concern under the *Wildlife Act* (BC MOE 2017a) and species considered important to a region of BC. Within a WHA, activities are managed to minimize any adverse effects to Identified Wildlife (BC MOE 2017a). The Project area overlaps an approved WHA for Grizzly Bear (Data BC 2017b), and three approved UWRs for Mountain Goat or Moose (Data BC 2017a).

[5] Eagle, Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*), Osprey (*Pandion haliaetus*), heron, or Burrowing Owl (*Athene cunicularia*).

Name	Year	Description
Environmental Management Act (EMA)	2003a	The EMA regulates pollution, hazardous waste, contaminated site remediation, and the discharge of municipal and industrial waste to the environment while ensuring the protection of human health and the environment (Province of BC 2017). The EMA is applicable to the Project as the Proponent will be responsible for managing Project-related pollution, hazardous waste, contaminated sites, and the discharge of industrial waste to the environment while ensuring the protection of the environment (including wildlife) and human health.

Table 29.26-4: Summary of Applicable Provincial Strategies, Guidelines, Plans, and Best Management Practices for Wildlife

Name	Year	Type	Description
Identified Wildlife Management Strategy – Accounts and Measures for Managing Identified Wildlife	2004	Management Strategy	The Accounts and Measures for Managing Identified Wildlife summarize the status, life history, distribution, and habitat requirements of Identified Wildlife; they also outline specific guidelines for habitat conservation and management (BC MWLAP 2004b).
Identified Wildlife Management Strategy – Procedures for Managing Identified Wildlife	2004	Management Strategy	The Procedures for Managing Identified Wildlife describe the procedures for establishing, modifying, and rescinding a Wildlife Habitat Area (WHA), and for implementing strategic and landscape level planning recommendations (BC MWLAP 2004c).
Recovery Strategy for the Northern Goshawk, *laingi* subspecies (*Accipiter gentilis laingi*) in British Columbia	2008	Recovery Strategy	This recovery strategy outlines the best available scientific information regarding what is required to achieve recovery of the Northern Goshawk *laingi* subspecies. The recovery strategy also identifies recovery goals, objectives, and recommended actions to achieve recovery (NGRT 2008).
Management Plan for the Mountain Goat (*Oreamnos americanus*) in British Columbia	2010	Management Plan	This management plan identifies conservation actions and land use measures that are necessary to ensure Mountain Goat do not become threatened or endangered in BC. The management plan summaries the best available scientific information regarding the biology of Mountain Goat and any known threats to the species. The management plan also identifies goals, objectives, and recommended actions to achieve conservation (MGMT 2010).
Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia	2013	Guidelines	The purpose of these guidelines is to help maintain raptor populations and their habitats during urban and rural land development in BC (BC MOE 2013a). The document is a companion document to Develop With Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014c).
Management Plan for the Northern Goshawk, *laingi* subspecies (*Accipiter gentilis laingi*) in British Columbia	2013	Management Plan	The management plan is intended to support the ongoing conservation and recovery efforts for the Northern Goshawk *laingi* subspecies as detailed in the 2008 BC Recovery Strategy, while still making allowances for continued resource development opportunities (BC MFLNRO 2013).

Name	Year	Type	Description
Recovery Plan for the Western Screech-Owl, *kennicottii* subspecies (*Megascops kennicottii kennicottii*) in British Columbia	2013	Recovery Plan	This recovery plan outlines the best available scientific information regarding what is required to achieve recovery of the Western Screech-Owl *kennicottii* subspecies. The recovery plan also identifies recovery goals, objectives, and strategic actions to achieve recovery (BC MOE 2013b).
A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia – Interim Guidance	2014	Guidelines	These guidelines provide direction for considering and mitigating threats to wildlife and wildlife habitat in the North Area (i.e., Peace, Omineca, and Skeena regions) during industrial activities (BC MFLNRO 2014).
Develop With Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia: Section 4 Environmentally Valuable Resources	2014	Guidelines	The purpose of these guidelines is to province-wide direction for maintaining environmentally valuable resource during urban and rural land development in BC. Environmentally valuable resources include species, features, or locations that enhance the biodiversity of an area; these may include common or rare species or habitats (BC MOE 2014c).
Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia	2014	Guidelines	The purpose of these guidelines is to help maintain amphibian and reptile populations and their habitats during urban and rural land development in BC (BC MOE 2014d). The document is a companion document to Develop With Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014a).
Management Plan for the Western Toad (*Anaxyrus boreas*) in British Columbia	2014	Management Plan	This management plan identifies conservation actions and land use measures that are necessary to ensure Western Toad do not become threatened or endangered in BC. The management plan summaries the best available scientific information regarding the biology of Western Toad and any known threats to the species. The management plan also identifies goals, objectives, and recommended actions to achieve conservation (PWTWG 2014).
Provincial Framework for Moose Management in British Columbia	2015	Framework	The purpose of this framework is to provide guidance on moose management in BC. In particular, the framework focuses on the preparation of regional moose action plans and the establishment of a scientific foundation for moose harvest management decisions (BC MFLNRO 2015).
Science-Based Guidelines for Managing Northern Goshawk Breeding Areas in Coastal British Columbia	2015	Guidelines	These guidelines provide direction for Northern Goshawk habitat management in coastal BC (McClaren et al. 2015).

Name	Year	Type	Description
Best Management Practices for Amphibian and Reptile Salvages in British Columbia	2016	Best Management Practices	The purpose of these BMPs are to provide guidance on how to plan and implement amphibian and reptile salvages while minimizing adverse effects to the translocated and recipient amphibian and/or reptile populations (BC MFLNRO 2016).
Best Management Practices for Bats in British Columbia	2016	Best Management Practices	The purpose of these BMPs are to provide information on the potential effects of different natural resource development activities on bats and their habitats, and guidance on how to minimize these potential effects (BC MOE 2016d).
A Strategy to Help Restore Moose Populations in British Columbia	2016	Strategy	This strategy provides recommendations to restore seriously depleted moose populations and increase moose populations in general across BC (Gorley 2016).

29.26.3.3 Regional Land Use Plans

The Project LSA and most of the Regional Study Area (RSA) overlap portions of the Nass South Sustainable Resource Management Plan (SRMP; BC MFLNRO 2012). The southern portion of the Project RSA also overlaps the North Coast Land and Resource Management Plan (LRMP; BC MSRM 2005). The Nass South SRMP and North Coast LRMP describe resource management objectives for wildlife and wildlife habitat, including mountain goat, grizzly bear, moose, furbearers, Marbled Murrelet, Northern Goshawk, and other general wildlife. The goals and objectives in these land use plans that are related to wildlife VCs in this assessment are summarized in Table 29.26-5.

Table 29.26-5: Wildlife Management Goals and Objectives Established by Land Use Plans

Wildlife Resource	Goals	Objectives
Nass South SRMP		
Mountain Goat	Manage winter range to help ensure a healthy population	Minimize adverse disturbance to goats within mountain goat winter range
	Avoid disturbance and displacement during vulnerable periods	Minimize adverse disturbance to mountain goat winter range from helicopter logging
	Minimize pressure on the population from legal and illegal harvest through human access management	Minimize the number of roads within 500 m of mountain goat winter range and 1000 m of canyon dwelling goat winter range
Grizzly Bear	Provide adequate habitat to ensure a healthy population	Preserve the highest value grizzly bear habitat Maintain the quality and effectiveness of grizzly bear foraging habitat Minimize human-bear conflicts Minimize long-term displacement of grizzly bears from industrial access development
Moose	Manage winter range to help ensure a healthy population	Maintain, enhance or restore winter habitats
	Minimize pressure on the population from legal and illegal harvest through human access management	Minimize mortality and disturbance within and adjacent to winter ranges through access management
Furbearers	Maintain high value habitat for identified species to help ensure a healthy population	Minimize impact to known high value fisher and wolverine habitat
Northern Goshawk	Maintain a viable population within the plan area	Maintain nesting and post-fledging habitat at known goshawk nest areas, to support continued use and reproduction in those areas Maintain foraging habitat around known known goshawk nest and post-fledging areas

Wildlife Resource	Goals	Objectives
General	Protect special habitats for general wildlife	Maintain effectiveness of riparian habitats adjacent to wetlands
North Coast LRMP		
Mountain Goat	Manage and sustain mountain goat winter range and optimum populations at a low risk by maintaining habitat quality, quantity and distribution throughout their natural range	Maintain functional and structural attributes of goat winter ranges wherever they occur in the landscape Maintain habitat suitability of winter range by minimizing disturbance and mortality risk to mountain goats Minimize road-induced displacement and mortality risk within or adjacent to ungulate winter range (UWR)
Grizzly Bear	Maintain the abundance, distribution and genetic diversity of populations in each Grizzly Bear Population Unit	Maintain the diversity and abundance of Grizzly bears in the North Coast LRMP area
	Minimize the risk of bear displacement and mortality as a result of human activities, including roaded and air access	Minimize mortality risk to bears related to motorized road access at the watershed scale To minimize road-induced displacement and mortality risk of bears within or adjacent to critical habitats
	Maintain the quality and quantity of bear habitat across multiple scales	Maintain landscape level forage supply by Biogeoclimatic Ecosystem Classification (BEC) variant on a continual basis (spatially and temporally) Maintain adequate forage within managed forest stands by maintaining productive understories Maintain the integrity of land linkage amongst critical grizzly bear habitats, including functional visual (security) and resting (bedding) cover
	Manage human activities, including bear viewing, so that bear habituation does not exceed low to moderate levels	Minimize impacts to bears from water- and air-based commercial and non-commercial wildlife viewing Minimize impacts to bears from land-based commercial and non-commercial wildlife viewing Minimize displacement and habituation of bears due to commercial recreation activities including land-based bear viewing Prevent bear mortality resulting from negative bear-human interactions e.g. bears conditioned to human attractants (garbage, pet food, offal, etc.)
	Grizzly bear management areas	Create additional area closed to hunting grizzly bear
	Minimize the potential for bear-human interaction	Minimize potential for bear-human interaction by promoting the use of “bear awareness”
	Area-specific management	Maintain benchmark populations of grizzly bears within the Skeena-Nass Grizzly Bear Management Area

Wildlife Resource	Goals	Objectives
Moose	Maintain healthy and viable populations of moose at a low risk throughout their potential range	Minimize the potential for moose mortality in road areas in identified winter range Maintain the quality of snow interception and browse produced within identified moose winter range
Marbled Murrelet	Maintain adequate nesting habitat to ensure viable populations of Marbled Murrelet across their present range within the plan area Down-list Marbled Murrelet from Threatened to Special Concern under the federal *Species at Risk Act*	Maintain the quantity and quality of Marbled Murrelet nesting habitat across the plan area Maintain quantity and quality of optimal nesting habitat in core areas
Northern Goshawk	Maintain adequate nesting and foraging habitat to ensure a viable population of northern goshawks across their present range within the plan area	Maintain all known goshawk nest areas and post-fledging areas with sufficient mature and old growth forest to allow continued occupancy and successful reproduction Maintain sufficient foraging habitat adjacent to nest areas to allow continued occupation of the breeding territory Undertake research and inventory to (a) identify the distribution, and habitat needs, of goshawks including identification of nest areas and post-fledging areas, and (b) characterize the taxonomy of the subspecies found in the plan area
Coarse Filter Biodiversity	Maintain the natural biodiversity of the North Coast LRMP area, including the full range of functional ecosystems, over time and at all scales	Identify and reserve key wildlife migration/movement corridors Designate and protect known critical wildlife habitat features vital to a variety of species

29.26.4 Wildlife Valued Components

Potential interactions between the Project and wildlife valued components (VCs) were identified within the Application/EIS. The interactions were assessed to result in potential effects of the Project's activities on wildlife habitat availability, habitat distribution, and risk of mortality. For example, construction of mine facilities, the Access Road, and Haul Road were identified as potentially affecting wildlife through habitat alteration, sensory disturbance, disruption to movement, and mortality risk.

Wildlife and wildlife habitat identified as VCs are the targeted species in the Wildlife Management Plan (Table 29.26-6). Wildlife and wildlife habitat are important because of their value to Aboriginal Groups and other people who may in part rely on certain species as

a subsistence and economic resource and for their value as a part of healthy ecosystems. Additionally, some species have been identified as at-risk either federally or provincially.

Table 29.26-6: Wildlife Valued Components

Valued Component		BC[1]	COSEWIC[2]	SARA[3]
Mountain Goat	*Oreamnos americanus*	Blue	-	-
Grizzly Bear	*Ursus arctos*	Blue	Special Concern	-
Moose	*Alces americanus*	-	-	-
Fubearers, including: • American marten • wolverine *luscus* subspecies	 *Martes Americana* *Gulo gulo luscus*	 - Blue	 - Special Concern	 - -
Hoary marmot	*Marmota caligata*	-	-	-
Bats, including: • Keen's myotis • little brown myotis • northern myotis	 *Myotis keenii* *Myotis lucifugus* *Myotis septentrionalis*	 Blue - Blue	 Data Deficient Endangered Endangered	 Schedule 3 – Special Concern Schedule 1 – Endangered Schedule 1 – Endangered
Migratory Breeding Birds • habitat guilds • MacGillivray's warbler	 *Not applicable* *Geothlypis tolmiei*	 - -	 - -	 - -
Migratory Birds Species at Risk • black swift • common nighthawk • marbled murrelet • olive-sided flycatcher	 *Cypseloides niger* *Chordeiles minor* *Brachyramphus marmoratus* *Contopus cooperi*	 Blue - Blue Blue	 Endangered Threatened Threatened Threatened	 - Schedule 1 – Threatened Schedule 1 – Threatened Schedule 1 – Threatened
Raptors • northern goshawk *laingi* • western screech-owl *kennicottii*	 *Accipiter gentilis laingi* *Megascops kennicottii kennicottii*	 Red Blue	 Threatened Threatened	 Schedule 1 – Threatened Schedule 1 – Special Concern
Non-migratory Game Birds • sooty grouse • white-tailed ptarmigan	 *Dendragapus fuliginosus* *Lagopus leucura*	 - -	 - -	 - -

Valued Component		BC[1]	COSEWIC[2]	SARA[3]
Amphibians • western toad	*Anaxyrus boreas*	Blue	Special Concern	Schedule 1 – Special Concern

[1] Provincially listed species at risk in British Columbia (Red = Endangered; Blue = Threatened).

[2] Federal species designated by COSEWIC in Canada for listing on Schedule 1 of the SARA.

[3] Federally listed species at risk in Canada (Schedule 1 = official list of wildlife species at risk; Schedule 3 = wildlife species waiting to be reassessed for possible inclusion under Schedule 1)

29.26.5 General Wildlife Protection Measures

29.26.5.1 Project Design

The current development plan for the Project was the outcome of an alternatives assessment process whereby IDM considered several criteria to determine an optimal development plan given technical, economic, environmental, and social parameters. Input received from the public, Aboriginal Groups, government agencies, and other stakeholders during the consultation process was considered in the alternatives assessment.

The following project infrastructure design considerations have been included to minimize potential effects on wildlife and wildlife habitat:

- Minimized and contained Project footprint within one watershed (i.e., Bitter Creek);
- Situated Project infrastructure to avoid sensitive habitats (e.g., riparian areas, wetlands, steep slopes, mature/old forest) and important wildlife habitat features (e.g., natal/denning sites, nests, mineral licks, wildlife trees) whenever practicable, which will minimize habitat alteration and sensory disturbance;
- Design of the Access Road was optimized to use the existing forestry road to avoid and minimize new disturbance and distance travelled, which will reduce noise, dust, and emissions associated with construction and operation;
- Power line design and location will include consideration of guidelines for bat and bird protection to minimize strikes and electrocutions (APLIC 2006). Measures will be taken where practicable and reasonable to discourage birds, particularly raptors, from nesting on power poles;
- Tailings disposal methods have been designed to reduce beach / dust sources and generation. The operational supernatant pond volume in the TMF will be managed to reduce the potential for dust generation. Refer to the TMP for further details;
- Infrastructure (including the Access Road) was designed in a manner that minimizes the footprint of disturbance and to avoid, where practicable, identified wildlife sensitive areas. Whenever possible Project roads and road embankments will be constructed in a

manner to minimize the potential to act as physical barriers or filters to wildlife movement;

- Buildings will be designed and maintained to exclude wildlife (e.g., covering vents with mesh and skirting buildings to prevent wildlife from entering);

- Directed / focused lighting will be used where possible rather than broad area lighting to minimize sensory disturbance to wildlife. Timer systems will be considered, where appropriate, to limit light disturbance and reduce power consumption. Light in non-essential areas will only be used when necessary without compromising worker safety. Types of illumination should be light-emitting diode (LED) if possible since they produce little heat and have more focused light spectrums that are less appealing to insects and thus do not attract bats; and

- Petroleum products will be stored in holding tanks or closed facilities that exclude wildlife.

29.26.5.2 Progressive Reclamation

IDM will undertake progressive reclamation activities throughout the life of the Project as per the Reclamation and Closure Plan. Project components will be decommissioned and removed at the end of their useful life and waste rock temporarily stored at the surface will be placed underground as backfill. TMF closure and rehabilitation activities will also be carried out progressively during the Operation Phase whenever possible. An early and progressive approach to reclamation can result in habitat suitability returning to pre-disturbance conditions and reduces the duration of habitat alteration, sensory disturbance, and disruption to movement.

29.26.5.3 Wildlife Protection Policies

The following wildlife protection policies will apply to all aspects and phases of the Project:

- Where practical, and not a risk to human safety, a Stop Work policy will be implemented when wildlife in the area may be endangered (i.e., risk of physical injury or death) by the work being conducted;

- Fishing and hunting by Project employees, contractors, and consultants will be prohibited; IDM will discuss the appropriate implementation of this policy with Aboriginal Groups and stakeholders;

- A policy of no feeding and no intentional attraction of wildlife will be developed, disseminated to all Project and contractor employees during employee orientation and enforced;

- A policy of no littering will be developed and continue throughout the life of the Project, will be disseminated to all Project and contractor employees and consultants during employee orientation, and will be enforced;

- Harassing, approaching, or otherwise interfering with wildlife will be prohibited, such as chasing wildlife with a motorized vehicle;

29.26.5.4 Wildlife Sightings and Wildlife Incident Reporting

A wildlife sighting and incident reporting log or database will be maintained by the Environment Department. These records will provide valuable information for adaptive management of wildlife throughout all phases of the Project. The following wildlife sightings and incidents will be reported to the Environment Department and recorded:

- Mountain goats in areas of surface blasting will be reported and recorded;
- Direct interactions of focal wildlife with infrastructure (e.g., roads and Mine Site) will be recorded and reported;
- Incidental observations of wildlife will be recorded and reported for personnel safety;
- Mortality events of wildlife will be reported and recorded. Should a carcass be found on the roadside, it will be reported and removed promptly to discourage scavenging wildlife along Project roads. The BC Conservation Officer Service will be notified and consulted regarding proper disposal of any dead animals;
- Vehicle collisions with wildlife along the Project-controlled Access Road and Haul Road will be reported and recorded;
- All bear interactions and incidents will be reported and recorded;

Reports of focal wildlife sightings should also describe the wildlife encounter. For example, whether the encounter occurred during site access, during completion of Project activities such as blasting, or was related to waste management procedures or Project infrastructure. Wildlife sighting reporting will also include, where available, such details as date, time, and location of the encounter; wildlife species involved; number of individuals (where relevant); and the behavioural response of wildlife.

29.26.5.5 Nuisance Wildlife

In the event that nuisance wildlife are encountered, the following measures will be implemented.

- Appropriately trained personnel will monitor and evaluate human-wildlife conflicts to determine whether an animal should be considered a problem animal and the appropriate course of action to take;
- In the event of a wildlife encounter, deterrents will be employed first (e.g., bear spray, air horn); firearms will only be used as a last resort when all other deterrents have failed; and
- If an animal is killed in defense of life or property, the BC Conservation Officer Service will be notified and consulted regarding proper disposal of the dead animal.

29.26.5.6 Wildlife Education Program

A Wildlife Education Program will be developed to communicate awareness of IDM's commitment to the protection of wildlife and wildlife habitat. The program will be incorporated into the Site orientation and training process and provided to all employees, contractors, and site visitors through all phases of the Project. Records will be kept to document completion of the program by all site personnel and visitors.

The objectives of the program will be to ensure awareness of wildlife-related issues and appropriate mitigation measures to reduce human-wildlife conflicts and to support the wildlife observation reporting requirements. Wildlife orientation may be adjusted based on the role of employees, and in general may include the following topics:

- Overview of the wildlife in the area;
- Review of the No Feeding and No Intentional Attraction of Wildlife policy;
- Review of the Waste Management Plan and the No Littering policy;
- Review of the prohibition of fishing and hunting by site personnel and visitors;
- General wildlife mitigation measures;
- Access Road restrictions and operating protocols (e.g., wildlife right-of-way, speed limits, check-ins, road-wildlife reporting programs);
- Personal firearms prohibition from the Project site; exceptions may be individuals authorized to have registered Company firearms for predator protection;
- Wildlife safety procedures such as Bear Aware to minimize risk to humans and wildlife;
- Procedures for dealing with problem wildlife;
- Wildlife reporting procedures; and
- Waste management protocols and procedures.

29.26.6 Site Activity Based Protection Measures

29.26.6.1 Vegetation Clearing and Site Preparation

A compact Project footprint was designed to minimize disturbance to wildlife and wildlife habitats. Where Project design allows, Project infrastructure and laydown areas will be constructed outside of identified environmentally sensitive areas (e.g., wetlands) and will avoid important wildlife habitat features (e.g., denning area, raptor stick nests, etc.). Important wildlife habitat areas or features identified during baseline assessments will be flagged by a QEP/EM with an appropriate buffer consistent with A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia (BC MFLNRO 2014) or specified in approved Ungulate Winter Range General Wildlife Measures

(Table 29.26-7). Buffers will be marked on design drawings and physically demarcated with appropriate visual markers and signage (e.g., flagging ribbon, orange snow fencing, etc.). Outside of sensitive periods, wildlife habitat features will be kept structurally intact wherever practical.

Vegetation clearing will be conducted outside of critical and cautionary periods for wildlife VCs whenever possible. The following mitigation measures will be implemented to minimize habitat disturbance to wildlife:

- Prior to site preparation or construction works, Project footprint boundaries and known wildlife habitat features or sensitive areas will be clearly marked on site plans and in the field by a QEP and will include appropriate no-disturbance buffers;

- Project activities will be restricted to the defined Project footprint. Construction Phase and Operation Phase activities, including vehicle use, will be restricted to areas that are surveyed, approved, marked, and flagged. Due care will be taken by all personnel to avoid excessive and unnecessary disturbance to existing riparian and aquatic areas, vegetation, and wildlife habitat within the Project footprint. The creation of new access to alpine areas within known goat ranges will be avoided;

- The clearing of vegetation and soil will be minimized to the extent possible, and avoided where practicable for unique features identified by QEPs, including wetlands, exposed bedrock, cliffs etc., which often provide high value habitat to wildlife and may support sensitive vegetation communities and growth forms;

- No-disturbance buffers will be established around identified wildlife habitat features (e.g., mineral licks, dens, and bat roosts) during sensitive periods, as per the setback distances identified by the Wildlife Management Plan or by a QEP;

- Vegetation clearing and ground disturbance will be avoided during the migratory bird nesting period (May 1 to July 31) whenever possible. If vegetation clearing and ground disturbance cannot be avoided during the nesting season, a QEP will conduct pre-clearing nest surveys to reduce the risk of incidental take. If a nest is identified during these pre-clearing surveys or incidentally during other field activities, an appropriate no-disturbance setback will be established around the nest to minimize sensory disturbance and will remain in place until the nestlings have successfully fledged[6];

- Pre-clearing surveys for bat maternal roosts, hibernacula, and stick nests will be conducted in suitable habitats prior to vegetation clearing and ground disturbance activities during sensitive periods. Any identified bat maternal roosts, hibernacula, or stick nests will be left structurally intact and an appropriate no-disturbance buffer will be established by a QEP around the habitat feature, or a site-specific mitigation plan will be developed the a QEP;

[6] The nests of certain species are protected year round under the provincial *Wildlife Act*. These include Eagle, Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*), Osprey (*Pandion haliaetus*), heron, or Burrowing Owl (*Athene cunicularia*).

- Pre-clearing surveys for active grizzly bear den sites will be conducted in identified high-quality habitat prior to any planned fall, winter or early spring vegetation clearing or ground disturbance or any other activity that could potentially disturbed or destroy an active den. Any identified active den site will be left undisturbed and a no-disturbance buffer will be established around the active den until the den is vacated in spring; and

- Pre-clearing surveys for hoary marmot colonies will be conducted in identified high-quality habitat if those activities are scheduled to occur within the birthing and rearing periods from May to June. Suitable habitat occurs near the Mine Site and Haul Road, in high elevation areas (> 1,200 masl) with south-facing slopes. Any identified active den site will be left undisturbed and a no-disturbance buffer will be established around the den site until the den is vacated. A QEP may provide a site-specific mitigation plan to address active den sites.

Table 29.26-7: Critical and Cautionary Periods for Vegetation Clearing and No-Disturbance Buffers for Wildlife

VC	Critical and Cautionary Periods[1]	No-disturbance Buffer
Mountain Goat	Critical[2]: January 15–July 15 (birthing period) Caution[3]: November 1-January 14 (Winter rut)	500 m no-disturbance buffer around all important mountain goat habitats (winter range, kidding and early rearing, mineral lick use areas, escape terrain and connecting trails). Maintain visual screening (i.e., forested cover) (BC MFLNRO 2014).
Grizzly Bear	Critical: October through to spring (winter denning) Caution: Remainder of year	If occupied den found, minimum 60 m setback, no motorized equipment or industrial activity (BC MFLNRO 2014).
Moose	Critical: May 15–July 15 (calving period) Caution: November 16–May 14 (winter rut and later winter period)	Wherever possible, apply 200 m setback from wetland edges and riparian habitats for temporary roads and associated facilities (BC MFLNRO 2014).
Furbearers (including marten, wolverine)	Wolverine: Critical: February 1–June 29; Caution: June 30–August 1 Marten: Critical: None; Caution: March 1–September 30	Avoid activities within 60 m of active marten den. Avoid activities within 500 m of wolverine denning habitats during the critical period (BC MFLNRO 2014).
Hoary Marmot	Not mentioned in the guidelines	Avoid activities within 20 m of hoary marmot colony (BC MFLNRO 2014).
Bats (including little brown myotis, northern myotis and Keen's myotis)	Critical: May 15–September 30 (Maternity roost sites) and October 1–May 31 (Hibernaculum sites) Caution: None	Avoid blasting, removal of rock or talus, construction of roads or facilities within 300 m of important features (e.g. colonial maternity of hibernation sites). Avoid vegetation removal within 20 m (minimum) buffer adjacent to lake, wetland, stream that occur within 500 m of valuable bat habitat (BC MFLNRO 2014).
Migratory Breeding Birds	Critical: May 1–July 31 (nesting season)	Species specific buffers will be selected using guidance from General Nesting Periods of Migratory Birds in Canada by a professional biologist with avian expertise (e.g., 10–50 m or more for most nests of songbirds and other small birds; 10–25 m up to 50 m or more for swallow colonies; 10–30 m up to 50 m or more for most waterfowl nests) (ECCC 2017).

VC	Critical and Cautionary Periods[1]	No-disturbance Buffer
Migratory Birds – Species at Risk	Marbled Murrelet: Critical: April 1–September 14 Songbirds: Critical: May 1–July 31 (nesting season)	Species specific buffers will be selected using guidance from General Nesting Periods of Migratory Birds in Canada by a professional biologist with avian expertise (e.g., 10–50 m or more for most nests of songbirds and other small birds; 10–25 m up to 50 m or more for swallow colonies; 10–30 m up to 50 m or more for most waterfowl nests) (ECCC 2017).
Raptors	Species specific Critical Periods between January 26–September 6.	Species specific buffers will be selected using guidance from Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia by a professional biologist with avian expertise (e.g., a minimum buffer of 200–500 m from nesting raptors (dependent on species ability to co-exist with anthropogenic activities) with an additional breeding season quiet buffer of 100 m or more depending on the species (BC MOE 2013a).
Non-migratory Game Birds	Critical: May 1–July 31 (nesting season)	Species specific buffers will be selected using guidance from General Nesting Periods of Migratory Birds in Canada by a professional biologist with avian expertise (e.g., 10–50 m or more for most nests of songbirds and other small birds; 10–25 m up to 50 m or more for swallow colonies; 10–30 m up to 50 m or more for most waterfowl nests) (ECCC 2017).
Western Toad	Critical: Restrict development near lakes and ponds (winter); Restrict activities at known breeding locations (spring). Caution: At known and potential breeding lakes and ponds because of juvenile dispersal (summer).	Minimum of 30 m buffer from outer highest seasonal wetted perimeter of small wetlands (BC MFLNRO 2014).

[1] Source: A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia (BC MFLNRO 2014).

[2] Critical: Development activities are not appropriate during this timeframe. If working in this window is unavoidable, proponent must contact an appropriate QEP to discuss alternatives, along with potential mitigation and monitoring plans. A referral to work in this window must be accompanied by rationale, mitigation and monitoring plan.

[3] Operators should avoid development activities during these timeframes. If working in this window in unavoidable, proponent must contact an appropriate QEP to discuss alternatives, along with potential mitigation and monitoring plans. A referral to work in this window must be accompanied by rationale, mitigation and monitoring plan.

29.26.6.2 Road Construction, Maintenance, and Use

Operations along the Access Road and Haul Road will be managed to limit the potential effects to wildlife, including disturbance to wildlife along roads, barrier or filter effects to movement, and mortality resulting from vehicles collisions or other indirect effects of road use. The Access Road will be a radio-assisted, single-lane, gravel road with regular pullouts and will be approximately five metres wide. The following mitigation measures will be implemented to manage Project-related vehicle traffic and minimize sensory disturbance and direct mortality risk due to wildlife-vehicle collisions. Refer to the Access Management Plan for further details.

29.26.6.2.1 Road Construction BMPs

- New sections of road will be designed to avoid important wildlife habitat features and sensitive habitats, where possible;
- Where possible, roads will be designed with clear lines of sight to increase the ability of drivers to see wildlife or other hazards;
- Whenever practicable Project roads and road embankments will be constructed in a manner to minimize the potential to act as physical barriers or filters to wildlife movements;
- Creation of pools attractive to amphibians along roads and within facility areas will be avoided wherever practicable;
- Less-attractive vegetation will be planted in Project roadside areas. Seeding will use non-forage vegetation species for roadside sediment and erosion control;
- Measures will be implemented to minimize potential Project effects in identified high-quality wildlife habitats and movement corridors, including signage along Project roads in high-value wildlife areas or known wildlife travel corridors to warn vehicle operators of the potential to encounter wildlife;
- Maximum speed limit of 50 kilometres per hour (km/h) will be established to minimize risk of wildlife collisions. Reduced speed limits of 30 km/h may be applied as necessary through wildlife sensitive areas during critical and cautionary periods; and
- If migration routes for western toad are identified that cross the Access Road or Haul Road, active crossing will be monitored and adaptive measures put in place to minimize potential amphibian mortality.

29.26.6.2.2 Road Maintenance BMPs

- Water or other dust suppressant will be used for site roads as needed and when ambient air temperatures permit. The use of wildlife-attracting dust suppressants will be avoided if possible. Refer to the Air Quality and Dust Management Plan for further details;

- Snow bank height along Project roads will be managed and will include periodic breaks to minimize the potential for Project roads to act as physical barriers or filters to wildlife movement. Creating escape pathways (i.e. gaps) in snowbanks will allow wildlife (e.g. moose) to exit road areas;

- Vegetation along Project road sides will be mowed / brushed as necessary to ensure visibility of animals and reduce the risk of wildlife-vehicle collisions; and

- Alternative measures will be used for deicing Project roads (e.g., gravel) or dust suppression (e.g., water) whenever possible, as salt is known to attract foraging wildlife. The use of salt in traction grit for winter road management will be avoided.

29.26.6.2.3 Road Use BMPs

- Crew changes will take place via shuttle on a daily basis to minimize vehicle traffic;

- Haul trucks will travel in scheduled convoys whenever possible;

- Use of high volume haul trucks for ore and waste transport will minimize the number of trips required between the source and the destination along the primary Access Road;

- Vehicles will be driven at designated speeds on site roads;

- Drivers will be informed that wildlife has the right of way along the Project Access Road and Haul Road as part of the Wildlife Education Program;

- Wildlife sightings at or near the Project will be documented (location and time) and reported to environmental staff;

- All wildlife collisions will be reported to the Environmental Department immediately. The driver is to record and report location and time of the collision as well as species involved; and

- All roads will be closed to the public including private vehicles such as snowmobiles or all-terrain vehicles and all foot traffic. Road use will be restricted only to people required for Project construction, operation, maintenance, closure, and reclamation.

29.26.6.3 Blasting

- Above-ground blasting will be limited to the Construction Phase;

- Above-ground blasting will be halted when sensitive receptors are observed in the general blast area;

- Whenever possible during construction, above-ground blasting will be scheduled outside of the November 1 to July 15 critical and cautionary periods for mountain goat when blasting within suitable goat habitat. If this is not feasible, mountain goat presence in effective habitat will be identified by an EM/QEP prior to blasting by ground-based surveys between November 1 and July 15;

- If a raptor nest is successfully occupied on project infrastructure, or natural habitats, adjacent to an above-ground blasting site, blasting patterns will be altered to limit the effects on raptors or blasting will be delayed in that area until after the nesting period. Raptor presence will be assessed in the Zone of Influence (ZOI) by an EM/QEP prior to blasting during the nesting period (March 15 to September 15). ZOI will be a minimum of 300 m and may be larger depending on the species present. ZOI distances will be determined by the EM/QEP;

- If above-ground blasting is required within a no-disturbance buffer around a sensitive wildlife receptor, a site-specific mitigation plan will be developed in consultation with a QEP and appropriate authorities; and

- During underground blasting in the Operation Phase, impulse events will be limited to certain times of the day. Instantaneous charge per delay will be minimized to suit blast.

29.26.6.4 Aircraft Operation Management

The Project includes very little requirement for helicopter use. Mitigation to minimize potential effects on wildlife include:

- Development of pre-determined flight paths to provide horizontal as well as vertical buffer distances between flight paths and known sensitive habitats. For mountain goat habitats, these include 400 m vertical and 2,000 m horizontal separation (MGMT 2010). If provincial standard buffers cannot be feasibly implemented a site-specific mitigation plan will be developed by a QEP; and

- Pilots will be briefed on the negative effects of overflights on wildlife species and the need to maintain a minimum altitude of 400 m when possible wherever wildlife species are observed (greater altitude distances may be required for more sensitive wildlife species).

29.26.6.5 Site Access Management

All roads will be closed to the public including private vehicles (snowmobile, all-terrain vehicles, etc.) and all foot traffic. Road use will be restricted only to persons required for Project construction, operation, maintenance, closure, and reclamation. Further considerations for access by Aboriginal persons and stakeholders are discussed in the Access Management Plan.

29.26.6.6 Waste and Water Management

Site staff will be housed in the community of Stewart, thereby minimizing waste (e.g., petroleum and sewage waste) at the Project site. To minimize wildlife attractants the following BMPs will be incorporated into the Waste Management Plan:

- A waste and wildlife attractant management protocol will be developed and implemented as part of the Wildlife Management Plan to ensure wildlife do not have access to temporary on-site waste storage areas, contaminated areas, and attractants;

- General waste will be separated from other waste streams (e.g., hazardous wastes, recycling) at the source and will be handled, stored, transported, and disposed of as per the Waste Management Plan;

- Bear proof receptacles will be used for all waste and wildlife attractants, to prevent bears from accessing facility wastes, contaminated areas, and attractants;

- Additional wildlife exclusion measures may be implemented if waste storage areas are frequently accessed by bears or wolverine or other wildlife; and

- Staff are to report wildlife observations and incidents of wildlife getting into trash receptacles to the Environment Department.

29.26.7 Species Specific Protection Measures

29.26.7.1 Mountain Goat

Mountain goat specific BMPs will include:

- If mountain goats approach within 500 m of an active work site, the Environmental Superintendent will be notified and will assess the behavior of the animal(s) for signs of stress or disturbance. Additional mitigation measures will be employed depending on the response of the animal(s) and may include limiting activities until the animal(s) have moved beyond the site;

- Avoid creating new access to alpine areas within known goat ranges;

- Limit helicopter flights in areas frequented by goats; and

- Minimize road use and disturbance during critical and cautionary use periods for existing roads near licks.

29.26.7.2 Grizzly Bear

Project-related effects to grizzly bears and large carnivores will be mitigated through the application of the Project design and general wildlife protection measures. In particular, management of Project waste and other potential attractants is critical to minimizing potential effects to bears and other carnivores, as such, waste management protocols will be included as part of the employee orientation for all employees and contractors. Waste management protocols for the Project will be strictly enforced.

Grizzly bear and carnivore dens are considered important wildlife features, particularly for those species that regularly re-use den sites. Typically, bears re-use dens only occasionally, although they often re-use denning areas. Wolves are known to re-use dens and denning areas for generations. Wolverine natal dens may get used during subsequent years, or may occur in similar areas. Consequently, construction activities will include efforts to leave any identified dens structurally intact wherever possible. The Proponent will establish a no-disturbance buffer around active dens identified during the denning period. If an occupied

bear winter den is found, an appropriate no-disturbance buffer (e.g., minimum 60 m) will be implemented to reasonably avoid disturbing the bear.

29.26.7.3 Bats

The Project effects assessment evaluated potential Project-related effects to little brown myotis, particularly regarding effects to active bat roosts. To minimize potential effects:

- Pre-clearing surveys for bat roosts will be conducted by a QEP prior to the commencement of construction activities within 100 m of the Project footprint in areas with a high potential to support bat roosts (i.e., habitats below 1,000 masl in elevation with suitable rock faces/cliffs or old forest with large trees (average diameter at breast height [dbh] >25 cm));

- Any identified bat roosts will be left structurally intact and a no-disturbance buffer will be established around active roosts;

- If necessary, potential loss of observed bat roosting habitat will be offset by the installation of bat boxes or artificial roost trees as per guidelines in Best Management Practices for Bats in British Columbia (BC MOE 2016) and in suitable locations as determined by a QEP;

- Blasting within 1,000 m of important bat features should ensure sound pressure is less than 150 decibels, shock wave is less than 1.5 p.s.i and the peak particle velocity is less than 15 mm/second (BC MOE 2016). No blasting should occur within 300 m of valuable bat habitat features; and

- Mine portals and underground workings will be designed to minimize the potential for bats to gain access. Measures will also be taken to reduce the risk of bats gaining access to underground infrastructure, such as tight mesh and use of artificial light and motion. If bats gain access and use the substructure for maternal roosts or hibernacula, adaptive measures will be incorporated for their protection and continued access, and BC MFLNRO will be contacted and made aware of the use.

29.26.7.4 Birds and Bird Nests

The Project area contains a wide variety of habitats that provide breeding habitat for multiple bird species including raptors, waterbirds, waterfowl, shorebirds, and upland birds, including several species at risk. To protect birds nesting within the Project area, several mitigation measures have been developed in addition to the Project design and general mitigation measures identified above:

- During construction, vegetation clearing will be conducted outside of the migratory bird nesting period (May 1 to July 31). If clearing outside of the bird nesting period is not possible, bird nest surveys will be conducted prior to clearing and any active nests identified will be protected within a no-disturbance buffer. Survey methods will follow BMPs, and including the following:

  - Surveys will be conducted by qualified individuals who are experienced in performing pre-clearing surveys and have knowledge of regional bird species;
  - Surveys will extend beyond the Project footprint to the distance of the appropriate no-disturbance setbacks based on the habitat;
  - Survey information including date, time, survey effort, and details on any nests located (e.g., location, species, nest status, photos etc.) will be documented on standardized forms;
  - A no-disturbance setback around active nests will be established until chicks have fledged or the nest is determined to have been predated or abandoned;
  - Once the survey is completed, clearing activities will be completed within a seven-day window (in areas where no nests have been found); and
  - Survey results will be communicated with the on-site Construction Supervisor.

- A species-specific buffer will be employed around identified nest sites that are detected during pre-clearing nest surveys or on infrastructure. Species-specific buffers will be selected using guidance from General Nesting Periods of Migratory Birds in Canada (ECCC 2017). These nests will be monitored until the young have fledged or the nest is abandoned. The minimum buffer distance of 30 to 50 m will be utilized whenever practicable as determined by a QEP, assuming Project operability.

29.26.8 Monitoring Program

29.26.8.1 Monitoring Objectives

Wildlife monitoring for the Project must be relevant to monitoring Project effects, particularly where the effects assessment predictions were based on limited data, there was uncertainty in the predictions, or where there is the potential for a significant effect. Monitoring also assists in identifying any unanticipated Project-related effects so that mitigation actions can be implemented to reduce further harm.

A wildlife effects monitoring program will be developed based on the following objectives:

- Monitor wildlife use of the Project area;
- Monitor and verify potential effects related to the Project;
- Monitor and evaluate the effectiveness of mitigation measures;
- Identify unanticipated Project-related effects;
- Discern Project-related changes from natural variability; and
- Inform adaptive management measures.

The monitoring program is separated into two components: facility monitoring and species-specific monitoring. Facilities monitoring focuses on monitoring and assessing the effectiveness of the wildlife management controls within site. Species-specific monitoring is

intended to monitor VC species and determine if the Project related effects are as predicted in the Application/EIS.

The Wildlife Effects Monitoring and Follow-up Program is further discussed below and in Volume 5, Chapter 30, Section 30.5.4.

29.26.8.2 Facility Monitoring

Project infrastructure and activities associated with site facilities pose potential risks to wildlife and obstacles to wildlife movement. Monitoring of components will be implemented to determine whether effects are occurring as predicted in the Application/EIS and if mitigation and management measures are adequate. These include monitoring of the Mine Site footprint, traffic monitoring, Project activity monitoring, tracking wildlife observations, tracking Project-related mortality, and monitoring related to waste management. Table 29.26-8 provides a general summary of the facility-specific monitoring programs that will be developed.

Table 29.26-8: Summary of General Project Monitoring Related to Wildlife

Monitoring Component	Frequency	Description
Mine Site footprint / Habitat loss monitoring	Annual	Monitor and annually review the amount of wildlife habitat lost to the Mine Site footprint. Comparisons will be made between the planned footprint in the Project description and the actual footprint mapped using a GPS. This will quantify direct habitat loss in the Project footprint.
Building Assessment	Monthly	Check Project infrastructure for use by nest predators (e.g., foxes, ravens etc.), nesting structures, or as a haven for potential problem wildlife or use by bats as a roosting site.
Waste Management	Monthly	Conduct regular surveillance of Project facilities and waste disposal sites to ensure that wildlife are not frequenting these areas. Additionally, perform audits periodically to assess the effectiveness of waste management practices.
Wildlife Observations	Continuous	Track all wildlife observations reported by Project personnel and contractors; data collected will include date, time, and location of the encounter; wildlife species involved; number of individuals (where relevant); and the behavioural response of wildlife.
Project-related wildlife mortality	Continuous	Document and track all near misses, collisions, and other observed wildlife mortalities within the Project area. Investigate any Project-related ungulate or large carnivore mortality to determine if further action is needed.

The Wildlife Management Plan will be revised/updated as necessary based on the monitoring results. Monitoring will include, but is not limited to:

- Use of Project infrastructure by wildlife for security habitat (refuge, shelter), daily activities (roosting, perching), or nesting purposes;
- Effectiveness of bat exclusion measures;
- Use of any alternate habitats provided (e.g., use of bat boxes);
- Raptor nesting success will be monitored;
- The TMF will be monitored for use by migratory birds and bats; and
- The Waste Storage Area will be monitored for wildlife that may be attracted.

Monitoring will be conducted by the Environment Department. The on-site staff will be familiar with the Project's effects assessment and Project conditions related to wildlife, commitments made to mitigate effects on wildlife, and the adaptive management process used to manage responses to mitigation actions.

29.26.8.3 Species-specific Monitoring

Monitoring of species occurrence will occur at the local level by Project personnel tracking incidental observations of wildlife (i.e., wildlife sighting and incident reporting). Where development of species specific monitoring programs is required, monitoring programs will be developed in consultation with various stakeholders, Aboriginal Groups, and regulatory agencies prior to commencing the Construction Phase.

29.26.9 Reporting Requirements

The Proponent will report annually on the findings of the facility based and species-specific wildlife monitoring. Annual reporting will include, but not be limited to:

- Summarize wildlife mitigation measures implemented;
- Describe any investigations of Project-related wildlife mortality, the results of the investigations, and any corrective actions taken; and
- Summarize any consultation with regulators, Project-related working groups, Aboriginal Groups, or stakeholders regarding on-site wildlife issues.

Every three years, or as appropriate based on data collection, the Proponent will review the results of the annual monitoring and develop a detailed report that includes a retrospective analysis and assessment of trends in monitoring results. Statistical analyses of the monitoring results will be performed where appropriate.

29.26.10 Roles and Responsibilities

The Mine Manager is ultimately responsible for the successful implementation of the Wildlife Management Plan. This includes on-site environmental monitoring and compliance related to all Project phases. Department managers and supervisors have a responsibility to ensure that staff, contractors, consultants, and visitors in their respective areas of responsibility have been trained in IDM wildlife mitigation expectations and procedures and implement the Wildlife Management Plan. In addition, manager and supervisor responsibilities will include:

- Conducting wildlife awareness training;
- Ensuring that all personnel adhere to recommended mitigation measures; and
- Ensuring all personnel adhere to all established No Activity Buffers.

The Environment Superintendent is responsible for:

- Providing guidance relating to permit conditions, commitments, regulations, acts, and interpretation of legislation;
- Supervising Environment Department staff that are implementing the Wildlife Management Plan;
- Communicating requirements to other Managers;
- Incorporating requirements in Departmental planning;
- Preparing required reports (internal and external); and
- Completing required reviews and updates to the Wildlife Management Plan, as per the document control requirements.

The Environmental Monitor (EM) and/or QEP will be responsible for tracking and reporting on environmental permit obligations and commitments for the Project. The EM and/or QEP will be responsible for:

- Reporting incidents to the Environment Manager, including non-compliances with certificates or permits requirements, commitments, legislation and regulations, and environmental management plans;
- Liaising with the Environment Manager to ensure that permit requirements, commitments, regulations, and acts are understood at the field level and that they are managed appropriately;
- Advising workers to ensure mitigation measures are understood and are implemented appropriately; and
- Supporting on-site training through implementation of the Wildlife Education Program.

Environment Department staff will be responsible for ensuring compliance with the detailed requirements outlined in this plan. During the Construction and Operation Phases, the Environment Department will advise the contractors or site departments responsible for particular areas and monitoring the effectiveness of the Wildlife Management Plan. The Environment Department will work with external parties including the Proponent's technical advisors, relevant authorities, Aboriginal Groups, and stakeholders on communicating the findings of the Wildlife Management Plan and making appropriate adjustments to the Plan.

All on site personnel, including staff, contractors, suppliers, and visitors, will be required to implement measures of the Wildlife Management Plan as it pertains to their activities on site. General responsibilities include:

- Completing site orientation including wildlife awareness training;
- Reporting all incidental wildlife observations; and
- Adhering to all established No Activity Buffers.

All helicopter pilots will be responsible for:

- Avoiding sensory disturbances to wildlife;
- Maintaining a minimum altitude of 400 metres (m) when possible wherever wildlife species are observed; and
- Enforcing flying limits at all times except in emergency circumstances and during take-off and landing.

29.26.11 Review of Plan Effectiveness

The Wildlife Management Plan is a "living" document and will be revised as new information relevant to the protection of wildlife in the Project area becomes available and to ensure that mitigation measures adapt to results of monitoring. Plan updates will include consideration of monitoring results, management reviews, incident investigations, shared traditional or local knowledge, new or improved scientific methods, regulatory changes, or other Project-related changes. Mitigation and monitoring strategies for wildlife will be updated to maintain consistency with action plans, management plans, and BMPs that may become available during the life of the Project. Adaptive management measures will also be employed to manage for any unanticipated effects from the Project.

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