

## **8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANNING**

Based on the findings and predictions outlined in Chapter 6, the following section outlines two preliminary impact management plans: an Environmental Management Plan (EMP) and a Social Management Plan (SMP).

The purpose of environmental management and social management planning is to consider and develop proper measures and controls to decrease the potential for environmental degradation during all phases of the Project, and to provide clearly defined action plans and emergency response procedures to account for human and environmental health and safety.

Information collected throughout the implementation of these plans will be used to evaluate predictions made in the environmental assessment of the Project, and allow OHRG to make corrective plans and take corrective actions where necessary.

The organization of this chapter is as follows:

- Section 8.1 describes the **mechanisms for implementation** of the plans including:
  - Osisko's environmental and social objectives.
  - Roles and responsibilities for the program.
  - Planned information management and reporting.
- Section 8.2 describes the **environmental management and monitoring plans** including:
  - The main environmental components.
  - Considerations related to potential effects from the Project.
  - Planned mitigation measures by component.
  - A summary of objectives and planned monitoring activities.
  - A preliminary structure of the developed programs.
  - Initial cost structure for compliance monitoring and reporting.
- Section 8.3 describes the **Social Management Plan** including:
  - A description of local and Aboriginal committees.
  - A description of planned benefit enhancement measures.
  - A preliminary follow up plan.
  - A summary of follow-up consultation.

The plans presented in the following sections should be considered preliminary. Finalization of these plans will occur through consultation with federal and provincial government agencies, Aboriginal groups, the public and other stakeholders. Pertinent legislation, regulations, industry standards, documents and legislative guides were considered in the planning process, and will be followed in the finalization and implementation of the plans. The proposed schedule for finalization of the Environmental and Social Management Plans is provided below:

- Q4 2013 – Submit Final EIS/EA Report
- Q1 2014 – Form Atikokan-OHRG Consultation Committee
- Q2 2014 - Consult on Monitoring Plans
- Q3 2014 – Finalize Construction Monitoring Plans
- Q4 2014 – Receive EIS/EA Approval
- Q1 2015 – Begin Project Construction
- Q1 2016 - Finalize Operations Monitoring Plans
- Q1 2027 – Finalize Closure Monitoring Plan

The above schedule depends on the outcome of the Feasibility Study due to be completed in 2014, at which point it will be decided whether the Project will proceed as scheduled. If the Project is delayed, then the implementation of the follow-up programs will be similarly delayed.

## **8.1 Plan Implementation**

Environmental and social management planning will take place within the context of Osisko's corporate objectives. These objectives have been developed as part of the broader Sustainable Development planning, and are reviewed regularly.

### **8.1.1 Osisko's Environmental and Social Objectives**

Osisko has defined specific environmental and social objectives as part of its annual Sustainable Development reporting. The broad goals and objectives below provide direction to the detailed on-site management plans that will be developed and implemented as part of the Hammond Reef Gold Project.

- Reduce environmental impacts and keep a long-term outlook:
  - Continuous improvement of our environmental management systems.
  - Continuous improvement of our activities to enhance compliance and reduce impacts.
  - Minimize greenhouse gas emissions through reductions and offsets.
  - Minimize fresh water usage and maximize recycling of water.
  - Invest in research and development at our project sites.
  - Invest time and money in responsible and progressive closure planning.

- Support community development by maximizing local and regional benefits:
  - Create jobs and favour local purchases.
  - Facilitate local business development and maximize indirect economic benefits.
  - Improve public infrastructure in our communities.
  - Share the wealth with our communities.

## **8.1.2 Roles and Responsibilities**

In addition to the participation of OHRG in environmental and social management planning for the Project, it is anticipated that government, public, Aboriginal and local communities will participate as outlined below.

### **8.1.2.1 Government Agencies**

Both provincial and federal agencies are anticipated to be included in monitoring plan development and in the provision of ongoing advice for the environmental management plan. It is anticipated that a lead agency will be identified to provide direction which could include:

- Feedback on identified objectives.
- Feedback on design of monitoring studies.
- Review of monitoring reports.
- Verification of the effectiveness of mitigation.
- Recommendation for adaptive management measures.
- Posting of monitoring program notices and results on the Agency's Internet site.

### **8.1.2.2 Aboriginal Communities**

OHRG has initiated and engaged a number of Aboriginal committees that will provide focussed communications between OHRG and the communities, and identify ways that the Project can provide ongoing benefits to identified Aboriginal communities.

OHRG formed First Nations committees with Lac des Mille Lacs First Nation and the member nations of the Fort Frances Chiefs Secretariat, based on the conditions of the signed Resource Sharing Agreement.

OHRG also formed a committee with the Métis Nation of Ontario and member communities based on the conditions in a signed Memorandum of Understanding (MoU). As detailed in Chapter 7, The Métis Consultation Committee has met regularly throughout the Project planning process. Ongoing communications and identification of shared interests is planned to continue with the MNO through the existing Métis Consultation Committee.

Further details regarding the committees are outlined in Section 8.3.

### **8.1.2.3 Town of Atikokan**

A social monitoring committee will be established which will be modelled after the existing Malartic/Osisko Community Committee. The mandate of the Atikokan/OHRG Committee will be to provide a direct link for communications between community members and OHRG. Information about the Project will be shared with the Committee, and Committee members will disseminate this information to the community at large. In turn, community members can approach the Committee with their concerns, and the Committee can share these community concerns with OHRG.

### **8.1.2.4 Osisko Hammond Reef Gold Ltd.**

OHRG will work with the provincial and federal authorities to develop a detailed monitoring and follow-up program. The monitoring program will be implemented by OHRG in consultation with federal and provincial agencies, Aboriginal communities, and other stakeholders, as appropriate.

OHRG's responsibilities include:

- Implementing and funding the follow-up program.
- Training employees and contractors on commitments.
- Analyzing the results.
- Implementing adaptive management measures where required.
- Reporting on the results and outcomes of the program.

## **8.1.3 Reporting and Information Sharing**

### **8.1.3.1 Compliance Monitoring Results**

Compliance monitoring results will be reported annually and discussed with regulators. The results of monitoring, as they relate to the findings of external audits, will be reported to national authorities as applicable. Compliance reporting requirements are identified in Section 8.2.

### **8.1.3.2 Stakeholder and Aboriginal Communications**

Regular public meetings and stakeholder communications will take place to report on various aspects of the Project. OHRG will periodically publish a Community News Brief in local papers to report on topics of interest and provide clear communication at key milestones in the Project. The list of reported issues will be based on community feedback and concerns and could include:

- Operation production and performance, plans and exploration.
- Community involvement, including Aboriginal engagement.
- Environmental and social monitoring results.
- Human Resources information.

The main areas of concern heard from Project stakeholders to date have been protection of environmental integrity, employment opportunities, perspectives of Project development and regional economic impact, and involvement of Aboriginal people in the Project.

## 8.2 Environmental Planning, Monitoring and Compliance

An Environmental Management Plan (EMP) is a living document that must consider predicted impacts to the environment, monitoring data and programs, and means for compliance (present and future) to applicable guidelines and regulations. Planning allows for proactive decision making with regards to mitigation of potential impacts. Once construction and operations commence, monitoring is an integral part of evaluating the effectiveness of the plan and planning process. Monitoring and analysis of monitoring results then allows for adaptive management of the site and adjustment of management plans or mitigation measures to reduce or eliminate potential for impact should the monitoring results differ from predictions. Throughout all of these phases, compliance objectives and requirements must be met as defined by the regulating authorities.

The objective of the EMP is to set out clearly the key components of environmental management for the Project and such that the following concepts are realized throughout the construction, operation, closure and post-closure phases of the Project:

- Negative impacts on the physical and biological environments are mitigated.
- Benefits that will arise from the development of the Project are enhanced.
- Compliance with existing legislation and consistency with provincial guidelines and best practice is achieved.

The Project has been planned and will be implemented with health and safety as the first priority. A brief description of **health and safety planning** was included in Chapter 1 and is further discussed in the context of Environmental Management in Section 8.2.1.

The environmental effects assessment (Chapter 6) predicted potential effects to both the **physical and biological environment** based on the existing environmental conditions described in Chapter 3, and the Project Description as described in Chapter 5, and there is confidence in the predicted results. Management of the physical and biological environment includes consideration of the predicted impacts, implementation and mitigation, monitoring, and means for compliance. OHRG's commitments to protecting the physical and biological environment are part of the Environmental Management Plan as outlined in Sections 8.2.2 and 8.2.3. Closure and post closure are included in the evaluation.

Finally, an assessment of potential effects of **malfunctions and accidents** was included in Chapter 6. OHRG's emergency preparedness and response planning is the final component of the Environmental Management Plan outlined in Section 8.2.4.

It is recognized that some factors that affect the outcomes of the predictive models may change and, therefore, one of the objectives of the Environmental Management Plan is to conduct monitoring programs to verify that the predicted outcomes are being achieved. As a result, on-going monitoring throughout the construction, operations, closure and port-closure phases will be conducted.

Where monitoring during the course of implementation of the Environmental Management Plan shows that the mitigation measures proposed are not achieving the desired results, contingency measures would be enacted that would enhance or add to existing mitigation measures such that the resulting impacts would be low or negligible.

Compliance monitoring will form a part of the Environmental Management Plan, and will be determined by specific conditions included in the permits and approvals that are issued by the various agencies. As a result, in the following sections, general monitoring requirements associated with these instruments have been identified. Should unforeseen conditions arise where operations are in non-compliance with the permits or approvals discussion would be entered into with the issuing authority to develop plans to achieve compliance.

### **8.2.1 Health and Safety**

Osisko's corporate Environmental Health and Safety policy is provided in Appendix 1.IV. As per the policy, OHRG is committed to:

- Evaluating each of its activities in terms of the potential impacts and risks for the natural, human and social environments, with the goal of prevention and protection.
- Designing and using its facilities with proven technologies and the most efficient techniques in order to minimize the impact and risk to the environment and to the health and safety of people.
- Putting into place and maintaining emergency action plans to mitigate effects of unforeseen events.

The Health and Safety management system previously in place during the OHRG exploration project will be applied directly to the constructions and operations phases of the Project. The management system was developed with the intent of meeting, as a minimum, the legislative requirements within the Occupational Health and Safety Act and Regulations for Mines and Mining Plants. The Internal Responsibility System (IRS) in place at Hammond Reef includes provisions for the Health and Safety Responsibilities of all levels of management, employees and contractors.

Table 8-1 provides a summary of some examples related to Health and Safety planning, monitoring and compliance. It should be noted that OHRG is committed to complying with all federal and provincial legislation related to workplace and worker health and safety.

Table 8-1: Health and Safety Planning, Monitoring and Compliance

Aspect	Component	Considerations	Implementation, Management or Mitigation	Monitoring Objective and Plan	Regulating Authority / Compliance Requirements
Workplace Safety	General Health and Safety and Security	All workers must have a minimum understanding and acceptance of safe work procedures and policies for their area of employment.	<ul style="list-style-type: none"> <li>■ Training and Monitoring</li> <li>■ Site Orientation Training</li> <li>■ Establishment of a Joint Health and Safety Committee (JHSC)</li> <li>■ WHIMIS Training</li> <li>■ Develop incident reporting and management system</li> <li>■ Develop effective lines of communication</li> <li>■ Develop and implement progressive discipline policy</li> <li>■ Post a copy of the occupational health and safety policy in the workplace, where workers will be most likely to see it</li> <li>■ Provide appropriate training for site supervisors</li> </ul>	<ul style="list-style-type: none"> <li>■ Safe working environment</li> <li>■ Periodic Safety review meetings between management and workers</li> <li>■ Regular JHSC meetings</li> <li>■ Maintain and update training records</li> <li>■ Regular review of incident reporting</li> <li>■ Periodic review and update of health and safety policy</li> </ul>	Occupational Health and Safety Act (OSHA); Examples from OSHA: <ul style="list-style-type: none"> <li>■ instruct, inform and supervise workers to protect their health and safety [clause 25(2)(a)]</li> <li>■ take every precaution reasonable in the circumstances for the protection of a worker [clause 25(2)(h)]</li> </ul>
Workplace Safety	Harassment	All workers are entitled to work in a secure and harassment free environment.	<ul style="list-style-type: none"> <li>■ Develop programs supporting workplace harassment and workplace violence policies and include measures and procedures for workers to report incidents of workplace harassment and workplace violence, and set out how the employer will investigate and deal with incidents or complaints.</li> </ul>	<ul style="list-style-type: none"> <li>■ Verify through incident report tracking</li> <li>■ Annual review of policies and update as required</li> </ul>	OSHA; <ul style="list-style-type: none"> <li>■ prepare policies with respect to workplace violence and workplace harassment and review them at least once a year [subsection 32.0.1(1)]</li> </ul>
Workplace Safety	Worker (Job) Specific Training	Many various specialists, tradespeople all have skill sets that require training to be effective and safe, many of which require certificates or diplomas.	<ul style="list-style-type: none"> <li>■ Confirm credentials of trades people</li> <li>■ Reference Checks</li> <li>■ Specific training or training programs</li> </ul>	<ul style="list-style-type: none"> <li>■ Ongoing maintenance and annual update of training records</li> </ul>	OSHA; <ul style="list-style-type: none"> <li>■ inform a worker, or a person in authority over a worker, about any hazard in the work and train that worker in the handling, storage, use, disposal and transport of any equipment, substances, tools, material, etc. [clause 25(2)(d)]</li> </ul>
Traffic Safety	Vehicular	Human Health and Wildlife	<ul style="list-style-type: none"> <li>■ Worker Education (site vehicle driver course)</li> <li>■ Posting and Enforcing site speed limits</li> </ul>	<ul style="list-style-type: none"> <li>■ Require proof of valid driver's licence</li> <li>■ Maintain records of completion of site specific training</li> </ul>	OSHA (Workplace Hazard)
Traffic Safety	Pedestrian	Human Health and Wildlife	<ul style="list-style-type: none"> <li>■ Worker Education (General orientation)</li> <li>■ Posting and Enforcing site speed limits</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintain and periodically review training records</li> </ul>	OSHA (Workplace Hazard)

Table 8-1: Health and Safety Planning, Monitoring and Compliance (Continued)

Aspect	Component	Considerations	Implementation, Management or Mitigation	Monitoring Objective and Plan	Regulating Authority / Compliance Requirements
Mine Safety	Worker Training	Specific mine training is required for safe mining operations.	Follow training requirements as legislated. Examples include: <ul style="list-style-type: none"> <li>Supervisor training.</li> <li>Surface mining training</li> <li>Mill operator training</li> </ul>	<ul style="list-style-type: none"> <li>Develop and maintain training database and confirm training records of employees</li> <li>Comply with appropriate federal and provincial legislation</li> </ul>	Under OSHA: R.R.O. 1990, Reg. 854, s. 2 (1). O. Reg. 296/11, s. 1.
Mine Safety	Explosives Use	Improper use or storage of explosives could have safety and environmental concerns.	<ul style="list-style-type: none"> <li>Follow safe storage and handling procedures as legislated</li> <li>Provide training on handling and use of explosives</li> <li>Develop an explosives management plan to limit waste explosives</li> <li>Use appropriately maintained and marked vehicles for explosives transport</li> <li>Use appropriate warning signage and blast sirens prior to blasting, and ensure nearby waters are clear of boaters</li> <li>Establish a minimum safe distance from blast zones</li> <li>Develop a blast management plan</li> </ul>	<ul style="list-style-type: none"> <li>Maintain explosives inventory records</li> <li>Maintain training records of employees charged with the use and storage of explosives</li> <li>Routinely inspect explosive storage and preparation facilities</li> <li>Comply with all federal and provincial legislation</li> </ul>	Reg 00/584 Part VI Under OSHA; Explosives Act (Canada) Reg. 272/97 Storage Standards for Industrial Explosives, May 2001 (Department of Natural Resources Canada)
Mine Safety	Fly Rock	Blast Management Plan.	<ul style="list-style-type: none"> <li>Develop a fly rock management plan and use appropriate mitigations to minimize fly rock</li> </ul>	<ul style="list-style-type: none"> <li>Record patterns and observations of fly rock and adjust mitigations if necessary</li> </ul>	OSHA (General worker safety)
Mine Safety	Slope Stability	Improper slope angles or other design considerations may endanger worker safety or mine viability.	<ul style="list-style-type: none"> <li>Follow appropriate mine design plan and blast plan</li> </ul>	<ul style="list-style-type: none"> <li>Map geological structures encountered during operations</li> <li>Periodic review mine operations, design, and slopes by a qualified engineer</li> <li>Reporting and investigation of unusual or unstable conditions or structures</li> </ul>	OSHA (General worker safety) MNDMF (Closure and Post Closure)
Mine Safety	Pit Inflow	Rapid inflow of water may jeopardise mining operations.  At closure flooding of the pit may reduce slope stability.	<ul style="list-style-type: none"> <li>Maintain buffer distance between Upper Marmion Reservoir and Mine as per Mine design</li> </ul>	<ul style="list-style-type: none"> <li>Periodic review of Mine inflow and pumping records</li> <li>Groundwater Level Monitoring</li> <li>Reporting and investigation unusual or excessive mine water inflows or mine structures leading to inflows</li> </ul>	OSHA (General worker safety) MNDMF (Closure and Post Closure)

## **8.2.2 Physical Environment**

Project-environment interactions were evaluated and an assessment of potential effects was carried out based on identified VECs, as outlined in Section 6.1 Physical Effects Assessment. Where potential effects were identified, mitigation measures were applied. Remaining environmental changes were assessed; those identified to be low or moderate were considered for inclusion in the Environmental Management Plan.

Table 8-2 provides information related to management/mitigations as applied for each physical aspect identified; compliance or management monitoring objectives; and potential adaptive management strategies that could be considered depending on monitoring results. Preliminary monitoring considerations for each component of the physical environment including proposed monitoring parameters, locations and methods, and proposed measurement frequency and duration are provided in Tables 8-3 through 8-7.



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Table 8-2: Environmental Management Planning, Monitoring and Compliance – Physical Environment

Project/Environment Interaction	Potential Effects	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Air emissions	<ul style="list-style-type: none"> <li>■ Risk to human and ecological health</li> <li>■ Increase in dust levels</li> <li>■ Change to ambient air quality</li> </ul>	<ul style="list-style-type: none"> <li>■ In-design mitigation including:                             <ul style="list-style-type: none"> <li>▪ Dust management and a dust management plan</li> <li>▪ Design to appropriate air quality standards</li> </ul> </li> <li>■ Develop and implement a greenhouse gas (GHG) emission plan to minimize releases of GHG. The plan will describe:                             <ul style="list-style-type: none"> <li>▪ Potential sources and factors that may influence releases of GHG;</li> <li>▪ Measures to minimize releases of GHG;</li> <li>▪ Monitoring and reporting programs for releases of GHG;</li> <li>▪ Mechanisms to incorporate the results of monitoring programs into further improvements and updates to the plan</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Confirmation of process emissions</li> <li>■ Confirmation of predicted dust and indicator compound levels</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE: Environmental Compliance Approvals</li> <li>■ Ontario Regulation 419/05 under the Environmental Protection Act:                             <ul style="list-style-type: none"> <li>▪ Comply with air standards in Schedule 3 of the regulation</li> <li>▪ Prepare and annually update an Emission Summary and Dispersion Modeling Report used to assess compliance</li> </ul> </li> <li>■ Environment Canada's Code of Practice for Metal Mines</li> <li>■ National Pollutant Release Inventory (NPRI): Report monitoring data</li> <li>■ Canada/US Air Quality Agreement: Notification if required under Article V</li> </ul>	<ul style="list-style-type: none"> <li>■ Register and investigate any air quality complaints</li> <li>■ Review monitoring data and, if required, make appropriate adjustments/modifications to planned mitigation measures such as:                             <ul style="list-style-type: none"> <li>▪ Adjusting fugitive dust management plan, preventative procedures and control measures</li> <li>▪ Modifying in-design fugitive dust control devices (e.g., enclosures, baghouses)</li> <li>▪ Reviewing non-road vehicle emissions and considering alternative vehicle or fuel types, fleet sizes and/or engineered controls (e.g., diesel particulate filters)</li> </ul> </li> </ul>
Noise emissions	<ul style="list-style-type: none"> <li>■ Noise levels may be annoying to nearby receptors.</li> </ul>	<ul style="list-style-type: none"> <li>■ Post signs at potential recreational activity sites to indicate potential for elevated noise levels</li> <li>■ Provide contact information on signage</li> </ul>	<ul style="list-style-type: none"> <li>■ Confirmation that recreational users are not being affected by elevated noise levels</li> </ul>	<ul style="list-style-type: none"> <li>■ Ontario Environmental Protection Act</li> <li>■ MOE publication NPC 300 "Environmental Noise Guideline – Stationary and Transportation Noise Sources – Approval and Planning"</li> </ul>	<ul style="list-style-type: none"> <li>■ Register and investigate any noise complaints</li> <li>■ If received, noise complaints will be followed up on; appropriate stakeholders will be contacted and consulted</li> <li>■ If required, potential noise reduction measures such as mufflers, rubber lining of haul truck boxes and physical barriers may be implemented</li> </ul>
Vibration from blasting	<ul style="list-style-type: none"> <li>■ Blasting in the open pit will cause vibration in surrounding water bodies and may impact fish habitat.</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop blast monitoring and mitigation plan.</li> <li>■ Perform initial monitoring to provide site specific data for refinement of vibration attenuation models</li> <li>■ Adjust blast intensities if required based on initial monitoring results to protect sensitive fish species during critical life stages and eggs during incubation</li> </ul>	<ul style="list-style-type: none"> <li>■ Confirmation that guideline limits are met and allow for adaptive management</li> </ul>	<ul style="list-style-type: none"> <li>■ DFO: Fisheries Act authorizations</li> </ul>	<ul style="list-style-type: none"> <li>■ Review monitoring data and, if vibration exceeds guideline limits, reduce the maximum explosive weight detonated per delay through any one or a combination of the following measures:                             <ul style="list-style-type: none"> <li>▪ Reducing the borehole diameter;</li> <li>▪ Introducing decked charges;</li> <li>▪ Reducing the borehole length.</li> </ul> </li> </ul>

Table 8-2: Environmental Management Planning, Monitoring and Compliance – Physical Environment (Continued)

Project/Environment Interaction	Potential Effects	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Water taking and discharge	<ul style="list-style-type: none"> <li>■ Changes to water levels and flows</li> <li>■ Potential impact to navigable waters</li> </ul>	<ul style="list-style-type: none"> <li>■ Recirculation of water in process plant to reduce withdrawal from Marmion Reservoir</li> <li>■ Management through discussion with other local water users and participation in the Seine River Watershed Management Plan</li> <li>■ Design of facility and flows will be optimized to handle hydrologic conditions and to allow for maintained existing uses of Marmion Reservoir</li> <li>■ Precipitation (weather station) records will be used for design and flow evaluation and adaptive management</li> </ul>	<ul style="list-style-type: none"> <li>■ Confirmation of predictions to allow for adaptive management.</li> <li>■ Ongoing information sharing with other water users</li> <li>■ Periodic review of water levels and weather station data to allow for adaptive water management</li> </ul>	<ul style="list-style-type: none"> <li>■ Seine River Watershed Management Plan</li> <li>■ MMER: requirements</li> <li>■ MOE: Environmental Compliance Approvals</li> <li>■ MNDMF: Closure Plan and amendments (post-closure)</li> <li>■ MISA (Industrial Sewage works Environmental Compliance Approval) applies to worker accommodation camp discharge and TMF operation</li> <li>■ Transport Canada (Navigable Waters Protection Act)</li> </ul>	<ul style="list-style-type: none"> <li>■ Review monitoring data and, if it is clear that the direct project effects are greater than predicted, OHRG will work with the Seine River Management Authority and appropriate regulating authorities to determine appropriate action.</li> <li>■ If required, additional mitigation measures could include:                             <ul style="list-style-type: none"> <li>▪ Withdrawing water only during certain periods of the year and storing it on-site</li> <li>▪ Providing additional fish habitat compensation if flow and/or water level changes in fish bearing waters are greater than predicted</li> </ul> </li> <li>■ If future precipitation events cause flooding in excess of the design capacity of the water management facilities, appropriate structural modifications will be investigated and implemented if necessary</li> </ul>
Pit dewatering	<ul style="list-style-type: none"> <li>■ Changes to lake water levels</li> <li>■ Changes to water quality</li> <li>■ Impact to pit slope stability</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintenance of dewatering flows within site water management system and release through discharge locations</li> <li>■ Monitoring and/or treating to ensure appropriate water quality prior to discharge</li> <li>■ Continual evaluation pit design to ensure slope stability</li> <li>■ Install interception wells, if necessary</li> </ul>	<ul style="list-style-type: none"> <li>■ Confirmation of predictions and design assumptions through monitoring of water levels around the Mine pits</li> <li>■ Adaptive management will be applied should monitoring results differ from predictions</li> </ul>	<ul style="list-style-type: none"> <li>■ MMER: requirements</li> <li>■ MOE: Environmental Compliance Approvals</li> <li>■ MNDMF: Closure Plan and amendments (post-closure)</li> </ul>	<ul style="list-style-type: none"> <li>■ If seepage inflows to the pit are larger than expected, additional pumping infrastructure will be provided and the impact to Marmion Reservoir will be re-assessed. If required, appropriate mitigation measures will be implemented</li> <li>■ Review monitored groundwater levels and, if required, implement adaptive modifications to the pit slope design or groundwater levels through pumping to ensure pit slope stability</li> </ul>

Table 8-2: Environmental Management Planning, Monitoring and Compliance – Physical Environment (Continued)

Project/Environment Interaction	Potential Effects	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Excavation and stockpiling	<ul style="list-style-type: none"> <li>Potential for metal leaching and acid drainage from stockpiles</li> </ul>	<ul style="list-style-type: none"> <li>Waste Rock and Tailings will be stored appropriately</li> <li>Runoff and seepage from WRMF and TMF will be captured and treated if necessary</li> <li>A geochemical management plan will be developed to periodically confirm the geochemical characteristics during operational placement of materials</li> </ul>	<ul style="list-style-type: none"> <li>Confirmation of predictions</li> <li>Periodic evaluation for signs of oxidation or acid mine drainage influence</li> <li>Confirmation of material properties' to confirm mine design, allow for adaptive management, and for consideration in the Certified Closure Plan</li> </ul>	<ul style="list-style-type: none"> <li>Mining Act of Ontario – Regulation 240/00</li> <li>MMER</li> </ul>	<ul style="list-style-type: none"> <li>If stockpile runoff is found to be acidic or contain unacceptable metals concentrations, additional evaluation of water quality will be completed and further mitigation strategies will be developed if necessary. Potential mitigation strategies may include:                             <ul style="list-style-type: none"> <li>Enhanced water treatment</li> <li>Modification to runoff/seepage collection systems</li> </ul> </li> <li>Modify the closure plan to ensure long-term protection of aquatic and terrestrial life if deemed necessary through geochemical testing and experience gained through mine operation</li> </ul>
Water Discharge	<ul style="list-style-type: none"> <li>Changes to water quality.</li> <li>Water discharges from the Project are predicted to meet baseline conditions, guideline values or site specific water quality objectives</li> </ul>	<ul style="list-style-type: none"> <li>Capture of runoff and seepage in collection ditches and sumps to the extent practicable</li> <li>Recirculation of water in process plant to the extent practicable</li> <li>Capture water within the reclaim pond and PPCP to settle solids</li> <li>Implement management controls if necessary to reduce nutrient loading (ammonia, nitrate, and phosphorous)</li> <li>Include a treatment facility for suspended solids which would be operated if necessary</li> <li>Develop contingency plan that considers treatment of metals (Project Site discharge) or phosphorus (worker accommodation camp discharge)</li> <li>At closure and post-closure, re-establish direct drainage from Project Site areas to lakes and reservoirs only once applicable guidelines or site specific water quality objectives are met</li> </ul>	<ul style="list-style-type: none"> <li>Confirmation of predictions for general parameters including nutrients, cyanide and metals</li> <li>Management of on-site water quality through monitoring of internal stations</li> <li>Ensure regulatory compliance at off-site stations included discharge points during operations and post-closure</li> </ul>	<ul style="list-style-type: none"> <li>MOE: Environmental Compliance Approvals</li> <li>MOE: Permit to Take Water (<i>Ontario Water Resources Act</i>)</li> <li>DFO: Fisheries Act authorizations</li> <li>MMER regulatory requirements</li> <li>MNDMF: Closure Plan and amendments (post-closure)</li> <li>MISA (Industrial Sewage works Environmental Compliance Approval) applies to worker accommodation camp discharge and TMF operation</li> </ul>	<ul style="list-style-type: none"> <li>Review monitoring data and, if required, develop and implement an appropriate mitigation or water management strategy to meet appropriate water quality objectives. Potential mitigation/management strategies may include:                             <ul style="list-style-type: none"> <li>Enhanced water treatment</li> <li>Enhanced settling through adjustment of pond sizes and/or flocculation</li> <li>Enhanced containment measures</li> </ul> </li> </ul>

Table 8-2: Environmental Management Planning, Monitoring and Compliance – Physical Environment (Continued)

Project/Environment Interaction	Potential Effects	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Spills	<ul style="list-style-type: none"> <li>Changes to water and soil quality</li> </ul>	<ul style="list-style-type: none"> <li>Develop standard spill response procedures and protocols</li> <li>Develop and communicate roles and responsibilities for spill response including environment department and management teams</li> <li>Worker training on spill response protocols during general site orientation and for responders</li> <li>Maintenance of a spill and spill response database</li> </ul>	<ul style="list-style-type: none"> <li>Timely reporting of spills to management teams and appropriate government agencies in accordance with all applicable laws and regulations</li> <li>Rapid and appropriate response to clean-up spills</li> <li>Continual improvement through maintenance of spill and spill response database</li> </ul>	<ul style="list-style-type: none"> <li>MOE – Spills or unexpected releases will be reported to MOE following applicable guidelines and regulations</li> </ul>	<ul style="list-style-type: none"> <li>Develop and implement a root cause and effect spill prevention approach which could involve implementation of a preventative maintenance plan</li> <li>Enhance containment measures for potentially harmful materials if required</li> <li>In the event of a catastrophic spill, contaminated soils may be excavated, disposed of in an approved disposal area and replaced with uncontaminated soil</li> </ul>
Earthworks	<ul style="list-style-type: none"> <li>Loss of soil and alteration of terrain may have implications with respect to wildlife use and the use of the area as a timber resource</li> <li>Erosion may influence slope stability and water quality</li> </ul>	<ul style="list-style-type: none"> <li>Timber harvesting agreements will mitigate loss of timber resources</li> <li>Soils will be stockpiled, protected against erosion and used in progressive restoration of habitat to the extent practicable</li> <li>Maintenance of roadways and embankments will be undertaken to protect against erosion</li> <li>Monitor embankment stability, pit slopes, and site erosion during construction, operation and into closure until long-term stability is demonstrated</li> </ul>	<ul style="list-style-type: none"> <li>Assurance of embankment stability, pit slopes, and site erosion through periodic review</li> </ul>	<ul style="list-style-type: none"> <li>Mining Act of Ontario</li> <li>Canadian Dam Association Guidelines for slope stability</li> <li>MOE requirements for protection of ecological habitat</li> </ul>	<ul style="list-style-type: none"> <li>On-going erosion and sediment control measures will be reviewed and revised as necessary if soil erosion is significantly undermining slope stability or water quality</li> <li>If required, implement enhanced erosion and sediment control measures such as:                             <ul style="list-style-type: none"> <li>Placement of rock armouring on slopes</li> <li>Use of silt curtains</li> </ul> </li> <li>Work with local communities to identify alternate resource and wildlife areas</li> </ul>

### **8.2.2.1 *Air Quality and Vibration***

The air quality and vibration monitoring and follow-up program is designed to be appropriate to the scale of the Project and the effects identified through the environmental assessment process. The program is intended to confirm the methods used to estimate the Project emissions and the effectiveness of in-design mitigation measures, and in doing so, assess if alternative mitigation strategies are required to minimize emissions from the Project and their impacts. Four specific activities are recommended to verify the predicted effects of the Project on the atmospheric environment:

- Verification of silt loadings on the roads
- Source testing to confirm process emissions
- Ambient air monitoring for indicator compounds that are greater than 51% of the MOE POI Limits and not included in the source testing program
- Vibration monitoring

Monitoring programs considerations for the atmospheric environment during the operations phase are presented in Table 8-3.



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**Table 8-3: Proposed Monitoring Program Considerations – Air Quality and Vibration**

Potential Effect	Indicator / Parameter	Location(s)	Method	Frequency	Duration
Increased risk to human and ecological health	<ul style="list-style-type: none"> <li>Concentrations of TSP/PM<sub>10</sub>/PM<sub>2.5</sub> and selected indicator compounds (NO<sub>x</sub>, CO, SO<sub>2</sub>, HCl, NH<sub>3</sub>, NaOH)</li> </ul>	<ul style="list-style-type: none"> <li>Stacks that discharge significant emissions of indicator compounds</li> </ul>	<ul style="list-style-type: none"> <li>Source testing in accordance with applicable source testing codes</li> </ul>	<ul style="list-style-type: none"> <li>One time (i.e., single occurrence) testing campaign for each significant emissions source</li> </ul>	<ul style="list-style-type: none"> <li>Discrete testing during permitting phase</li> </ul>
Increased dust levels	<ul style="list-style-type: none"> <li>Silt loadings on roads</li> </ul>	<ul style="list-style-type: none"> <li>Access and haul roads</li> </ul>	<ul style="list-style-type: none"> <li>Periodic sampling road silt loadings to improve accuracy of emission estimations</li> </ul>	<ul style="list-style-type: none"> <li>Annually during summer months</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing beginning at the start of operations until a consistent silt loading is established</li> </ul>
Changes to ambient air quality	<ul style="list-style-type: none"> <li>TSP</li> </ul>	<ul style="list-style-type: none"> <li>Location to be selected based on locations of mine activities</li> </ul>	<ul style="list-style-type: none"> <li>Installation of air quality monitoring station</li> </ul>	<ul style="list-style-type: none"> <li>Samples to be collected on the 6-day National Air Pollutant Surveillance (NAPS) Cycle</li> </ul>	<ul style="list-style-type: none"> <li>Construction phase until closure</li> </ul>
Increased vibration levels	<ul style="list-style-type: none"> <li>Ground and air vibration level monitoring from blasting operations</li> </ul>	<ul style="list-style-type: none"> <li>Six sites during each blast; Set up at distances varying from about 300 m to 2000 m from the blast</li> </ul>	<ul style="list-style-type: none"> <li>Establish a series of seismographs at varying distances from blasts and keep a detailed record of the loading parameters</li> </ul>	<ul style="list-style-type: none"> <li>Minimum of 12 blasts</li> </ul>	<ul style="list-style-type: none"> <li>To be determined based on data recorded during initial blasts and ECA requirements</li> </ul>
	<ul style="list-style-type: none"> <li>Blast ground vibrations</li> </ul>	<ul style="list-style-type: none"> <li>Nearest active fish spawning bed</li> </ul>	<ul style="list-style-type: none"> <li>Instrumentation to record ground vibration intensities.</li> <li>Data would be compared to known blast times to assess peak ground vibration intensities produced</li> </ul>	<ul style="list-style-type: none"> <li>To be determined based on environmental compliance approval (ECA) requirements</li> </ul>	<ul style="list-style-type: none"> <li>To be determined based on data recorded during initial blasts and ECA requirements</li> </ul>
	<ul style="list-style-type: none"> <li>Blast-induced water overpressure level</li> </ul>	<ul style="list-style-type: none"> <li>Nearest fish habitat</li> </ul>	<ul style="list-style-type: none"> <li>Instrumentation to record water overpressure intensities, including a hydrophone and data acquisition unit</li> </ul>	<ul style="list-style-type: none"> <li>Periodic monitoring as the blasts approach the nearest fishery. Based on data recorded during initial blasts, a decision will be made on subsequent monitoring requirements</li> </ul>	<ul style="list-style-type: none"> <li>To be determined based on data recorded during initial blasts and ECA requirements</li> </ul>

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### **8.2.2.2 Hydrology**

OHRG will prepare a comprehensive water monitoring program that will include groundwater quality, surface water quality, levels and flows along with meteorology and flow metering of all pumped water. With respect to the Hydrology monitoring program, the objectives will be to:

- Verify the accuracy of the predicted changes in flows and lake water levels in site, local and regional scale watercourses and water bodies.
- Confirm the assumptions underlying the predicted changes (e.g., water takings, effluent discharges, runoff rates).
- Support the implementation of adaptive management measures to address previously unanticipated changes.
- Satisfy compliance monitoring requirements included in Environmental Compliance Approvals and Permits to Take Water issued by the Ontario Ministry of the Environment pursuant to the Ontario Water Resources Act and in Fisheries Act Authorizations issued by Fisheries and Oceans Canada and authorizations issued pursuant to the Navigable Waters Act (if applicable).
- Field studies will consist of flow and water level monitoring in site, local and regional scale watercourses and water bodies identified as potentially being affected by Project activities and at key points in the Project's water management system to confirm and update estimates of water takings, effluent discharges and water recycling. Field monitoring activities for Hydrology will be coordinated with monitoring activities for other disciplines where appropriate, to reduce costs and increase efficiency.

A preliminary list of proposed monitoring stations for consideration is provided in Table 8-4. These will be modified as permitting requirements are determined. The final Program may be modified as monitoring results are analysed and may result in elimination of some locations and/or addition of other locations. Existing flow and lake water level monitoring stations that are currently operating will continue to be operated throughout the period prior to the construction phase and thereafter throughout the four phases of the Project (construction, operations, closure and post-closure). Monitoring at new stations will be initiated prior the start of the construction phase, to establish existing conditions, and will continue through the operations phase until closure.

In addition to carrying out field studies, the following secondary data in electronic format will be sourced on an annual basis throughout the four phases of the Project:

- On-site precipitation, temperature and evaporation data collected at the Project meteorological station (Atmospheric Environment TSD).
- Precipitation and temperature data collected at Environment Canada's Atikokan (AUT) meteorological station.
- Flow and water level data for Lac des Mille Lacs, the Lower Marmion Reservoir and the Upper Marmion Reservoir collected by H2O Power Limited Partnership and Valerie Falls Limited Partnership (Brookfield Renewable Energy Group) as part of compliance monitoring under the Seine River Water Management Plan (Boileau 2004).



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**Table 8-4: Proposed Monitoring Program Considerations – Site Flows and Hydrology**

Potential Effect	Indicator / Parameter	Location(s)	Method	Frequency	Duration	
Changes to flows and lake water levels	Water withdrawal rates	Fresh water intakes	■ Install flow metering devices for measurement of all pumped water	■ Record data daily	Construction phase through the operations phase	
	Effluent discharge rates	Treated sewage and mine wastewater effluent discharge outlets	■ Install flow metering devices for measurement of all pumped water	■ Record data daily	Construction phase through the operations phase	
	Mine dewatering flows	Variable based on areas being dewatered	■ Install flow metering devices for measurement of all pumped water	■ Record data daily	Construction phase through the operations phase	
	In-pit runoff and seepage collection volumes	Mine pit pumping station(s)	■ Install flow metering devices for measurement of all pumped water	■ Record data daily	Construction phase through the operations phase	
	Project site out-of-pit runoff and seepage collection volumes	Site water collection pumping stations	■ Install flow metering devices for measurement of all pumped water	■ Record data daily	Construction phase through the operations phase	
	TMF seepage collection volumes	TMF seepage collection pumping stations	■ Install flow metering devices for measurement of all pumped water	■ Record data weekly	Construction phase through the operations phase	
	Recycle water use and TMF precipitation and runoff collection volumes	TMF reclaim pond pumping station	■ Install flow metering devices for measurement of all pumped water	■ Record data weekly		
	TMF reclaim pond water level	TMF reclaim pond	■ Install instrumentation for continuous water level recording; manual readings by staff gauge if continuous recording not possible	■ Continuous; Daily if continuous recording not possible	Construction phase through the operations phase	
	Daily mean flow	Sawbill Creek above Sawbill Bay	Lumby Creek above Lizard Lake	■ Install instrumentation for continuous flow recording	■ Continuous; Weekly if continuous recording not possible	Continued baseline monitoring through the construction and operations phases until closure or as required based on review of monitoring data
				■ Install instrumentation for continuous flow recording	■ Continuous; Weekly if continuous recording not possible	
				■ Install instrumentation for continuous flow recording	■ Continuous; Weekly if continuous recording not possible	
	Daily mean flow and daily mean lake water level	Lizard Lake West Tributary at Unnamed Lake 5	■ Install instrumentation for continuous flow and water level recording	■ Continuous; Weekly if continuous recording not possible		
		Lumby Creek below Lizard Lake	■ Install instrumentation for continuous flow and water level recording	■ Continuous; Weekly if continuous recording not possible		
Instantaneous flows	Sawbill Bay East Tributary	■ Manual flow measurement	■ Periodic			
	Lumby Creek Tributary at Lizard Lake	■ Manual flow measurement	■ Periodic			
Pit water level (post-closure)	Open pit(s)	■ Manual measurement of water level elevation	■ Annually	Post-closure until overflow or until pit infill rate is confirmed		

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### **8.2.2.3 Hydrogeology**

The hydrogeology component of the water monitoring program is designed to allow for long-term monitoring of the effects of Project activities on groundwater levels and groundwater quality within the LSA throughout all stages of the Project. The recommended program will comprise the measurement of groundwater levels (or water pressures) at a number of locations within the Project Site. Data logging pressure transducers will be used to obtain a continuous record of groundwater level fluctuations at select monitoring locations that will be supported by quarterly manual depth to water measurements. Groundwater level/pressure monitors will be located within and adjacent to the open pits and integrated with the program to monitor pit slopes during excavation.

As a minimum, four groundwater level monitoring nests will be established adjacent to the shoreline of Upper Marmion Reservoir for the operations phase to monitor groundwater levels around the open pits, including two at the southwest end of the west pit. It is expected that these nests will be completed with screens set to depths of 10 m and 30 m below the elevation of Upper Marmion Reservoir (415 masl). Within each open pit, sump water levels will be regularly monitored along with groundwater pressures on pit slopes. The location, design of and monitoring frequency at locations to be established will be developed as part of pit slope stability monitoring program.

With the exception of the area of open pit mining, groundwater monitoring locations will be selected primarily based on water quality considerations; and will likely include monitoring at the following general areas:

- Perimeter monitoring at the WRMF, PPCP, effluent treatment plant, low-grade ore stockpile, overburden stockpile and the TMF.
- Perimeter monitoring at the worker accommodation camp.
- Adjacent to areas of chemical/fuel storage and maintenance facilities.

It is expected that approximately 20 monitoring well nests will be established at the Project Site (including existing well nests where these can be retained) as part of a comprehensive water monitoring program to monitor groundwater quality at these facilities. Groundwater level measurements will also be obtained on a regular basis at any observation well installed for the purpose of monitoring groundwater quality. Similarly, up to five groundwater monitoring wells (including existing wells where these can be retained) are expected to be established in the immediate proximity of surface water level and flow monitoring stations (where access allows for monitoring well installation) to monitor the relationship between groundwater and surface water.

The Groundwater monitoring program will be modified as specific permitting requirements are determined. The program will be conducted on an adaptive management basis and may be modified as monitoring results are analysed, which may result in elimination of some locations and/or addition of other locations.

The proposed groundwater level and quality monitoring programs are summarized in Table 8-5. The groundwater monitoring programs would be initiated in the construction phase and would continue through the operations phase until closure.



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**Table 8-5: Proposed Monitoring Program Considerations – Hydrogeology**

Potential Effect	Parameter	Location(s)	Method	Frequency	Duration
Changes to Groundwater Levels	Groundwater Level (Elevation)	In the vicinity of and at select locations downgradient from the Mine, Stockpiles, Waste Rock Management Facility (WRMF) and Water Management Systems	■ Manual depth to water measurements for at all locations and continuous monitoring using data logging pressure transducer at select locations	■ Quarterly for manual depth to water measurements. Continuous for locations with data logging pressure transducers	■ Construction phase through the operations phase until closure or as required based on review of monitoring data
		Select locations between the open pit(s) and Upper Marmion Reservoir	■ Manual depth to water measurements for at all locations and continuous monitoring using data logging pressure transducer at select locations	■ Quarterly for manual depth to water measurements. Continuous for locations with data logging pressure transducers	■ Construction phase through the operations phase until closure or as required based on review of monitoring data
		Select locations downgradient from the TMF near the shoreline of Lizard Lake and Upper Marmion Reservoir (Sawbill Bay)	■ Manual depth to water measurements	■ Bi-annual	■ Construction phase through the operations phase until closure or as required based on review of monitoring data
		Select locations downgradient from the worker accommodation camp's septic system near the shoreline of Upper Marmion Reservoir (Sawbill Bay)	■ Manual depth to water measurements	■ Bi-annual	■ Construction phase through the operations phase until closure or as required based on review of monitoring data
		Select locations near surface water (hydrology) monitoring stations	■ Manual depth to water measurements	■ Quarterly	■ Construction phase through the operations phase until closure or as required based on review of monitoring data
Changes to Groundwater Quality	Water Quality Parameters (as identified later in Section 8.2.2 or as required by applicable Acts, Regulations and/or permits)	In the vicinity of and at select locations downgradient from the Mine, Stockpiles, Waste Rock Management Facility (WRMF) and Water Management Systems	■ Discrete (grab) sampling and laboratory analysis	■ Bi-annual	■ Construction phase through the operations phase until closure
		Select location(s) between the open pit(s) and Upper Marmion Reservoir	■ Discrete (grab) sampling and laboratory analysis	■ Bi-annual	■ Construction phase through the operations phase until closure
		Select location(s) downgradient from the TMF near the shoreline of Lizard Lake and Upper Marmion Reservoir (Sawbill Bay)	■ Discrete (grab) sampling and laboratory analysis	■ Bi-annual	■ Construction phase through the operations phase until closure
		Select location(s) downgradient from the worker accommodation camp's septic system near the shoreline of Upper Marmion Reservoir (Sawbill Bay) and the chemical/fuel storage and maintenance facilities	■ Discrete (grab) sampling and laboratory analysis	■ Bi-annual	■ Construction phase through the operations phase until closure

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#### **8.2.2.4 Water Quality**

The water quality monitoring program initiated during the baseline studies will be continued through the construction, operations and closure phases. The purpose of the program is to verify predictions made during the impact assessment, evaluate regulatory compliance with the permitting requirements and provide a basis for effective water quality management on-site. The number of locations monitored will be reduced from the baseline studies to focus on Lizard Lake, Sawbill Bay and Lynxhead Bay, and the watercourses draining from the Project Site (i.e., the MSA). A more focused list of parameters will be monitored quarterly, including metals and ions that the baseline studies and modeling have indicated may increase during construction and operations. This will include TSS, sulphate, chloride and a suite of metals (ICP scan) as well as arsenic, selenium and mercury. The sampling program (locations sampled, parameters included and frequency of sampling) may be modified depending on other monitoring requirements that may be identified under any approvals or permits and will be coordinated with hydrogeology and hydrology sampling efforts and locations where possible to ensure there is minimal duplication.

A detailed Water Quality monitoring plan will be developed once the monitoring requirements under other Acts and Regulations that may apply to the Project have been determined. The program will be conducted on an adaptive management basis and may be modified as monitoring results are analysed, which may result in elimination of some locations/parameters and/or addition of other locations. Proposed water quality monitoring considerations are provided in Table 8-6. This will be supplemented by monitoring requirements as required under the various permits.

##### **8.2.2.4.1 Sampling Parameters**

Water quality samples will be submitted for the following laboratory analyses:

- **Physical parameters:** pH, alkalinity, conductivity, dissolved oxygen, total dissolved solids and total suspended solids, total organic carbon (TOC) and dissolved organic carbon (DOC)
- **Major ions:** calcium, magnesium, potassium, sodium, sulphate, chloride, and fluoride
- **Nutrients:** nitrate, nitrite, ammonia, total phosphorus and phosphate
- **Organics:** oil and grease, phenols
- **Metals:** total and dissolved (including mercury)
- **Cyanide:** total and free

All chemical analyses will be carried out with detection limits suitable for comparison to the relevant surface water quality criteria or guidelines (Provincial Water Quality Objectives (PWQO) and Canadian Water Quality Guidelines (CWQG)).



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**Table 8-6: Proposed Monitoring Program Considerations – Water Quality**

Potential Effect	Parameter	Location(s)	Method	Frequency	Duration
Changes to Surface Water Quality	Water Quality Parameters (as identified in this Section or as required by applicable Acts, Regulations and/or permits)	Stream inlet at north end of Sawbill Bay; Upstream of worker accommodation camp discharge	■ Discrete (grab) sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		Channel south east of Lynxhead Bay; Upstream of mine effluent discharge	■ Discrete (grab) sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		Raft Lake Dam; Last monitoring station before discharge from Marmion Reservoir	■ Discrete (grab) sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		Reference station in Unnamed Lake at northern most point of RSA (upstream of Site and TMF)	■ Discrete (grab) sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		Sawbill Bay (mixing basin of worker accommodation camp discharge)	■ Water column profile sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		Lizard Lake (potential mixing basin of deep groundwater flow from TMF area)	■ Water column profile sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		Hawk Bay (upstream Upper Seine)	■ Water column profile sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		Turtle Bay			
		Lynxhead Bay	■ Water column profile sampling and laboratory analysis	■ Quarterly	■ Continued baseline monitoring and monitoring from construction phase through the operations phase until closure
		North Sawbill Bay; worker accommodation camp discharge location	■ Discrete (grab) sampling and laboratory analysis	■ Quarterly	■ Baseline monitoring beginning in 2013 and monitoring from construction phase through the operations phase until closure
		South Sawbill Bay; Mine effluent discharge site	■ Water column profile sampling and laboratory analysis	■ Quarterly	
		Open pit(s)	■ Discrete (grab) sampling and laboratory analysis	■ Annually prior to discharge and monthly after discharge	■ From first year of closure (as able based on safety considerations) until a stable chemical condition is reached and prior to discharge ■ After discharge until five years of acceptable results have been obtained

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### **8.2.2.5 Geochemistry**

A geochemistry monitoring plan will be developed and implemented by OHRG to confirm the characteristics of the materials mined, placed or otherwise used in construction. Preliminary geochemistry monitoring considerations are provided in Table 8-7.

The plan will include confirmation samples at a rate that considers the mine schedule, existing geochemical data, and follows appropriate guidance documents such as MEND (2009) or INAP (2012) as is required under O.Reg 240/00 under the Mining Act of Ontario. Samples will be analyzed using appropriate test methods for assessment of ARD/metal leaching potential, to confirm that the samples fall within the range identified, tested and described in the Geochemistry, Geology and Soils TSD. The results of analysis of geochemical characterization samples will be evaluated as part of on-going management of the Project Site. Since the development of a geochemical sampling program is contingent upon development of a detailed mine plan, the details of the program will be developed when a mine plan has been completed in the detailed design phase of the Project.



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**Table 8-7: Proposed Monitoring Program Considerations – Geochemistry**

Potential Effect	Parameters	Location(s)	Method	Frequency	Duration
Change in water quality relative to predictions	<ul style="list-style-type: none"> <li>■ Solid phase and leachate</li> <li>■ Sulphide minerals</li> <li>■ Paste pH</li> <li>■ Acid-base accounting results</li> <li>■ Net acid generation test results</li> <li>■ Visual change in site materials (colour, drainage)</li> </ul>	<ul style="list-style-type: none"> <li>■ TMF</li> <li>■ WRMF</li> <li>■ Site Materials</li> <li>■ Pit Walls</li> </ul>	<ul style="list-style-type: none"> <li>■ Test materials mined to confirm the acid drainage and leachate potential used in the modelling assessment</li> <li>■ Review site water quality monitoring data collected under water quality monitoring program</li> </ul>	<ul style="list-style-type: none"> <li>■ Annual site inspection and confirmation sampling</li> <li>■ Annual monitoring data review</li> </ul>	<ul style="list-style-type: none"> <li>■ Discrete testing, and annual review over life of mine and closure, reducing in frequency in post closure (likely every five years)</li> </ul>

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### **8.2.3 Biological Environment**

Environmental management planning for potential effects to the biological environment will be focussed on activities and components that were assessed in Chapter 6 as having a low or moderate effect. The effects of the Project on the biological environment were assessed giving consideration to the following environmental components:

- Terrestrial ecology
  - Wetland Vegetation
  - Forest Vegetation
  - Wildlife Groups
  - Wildlife Individuals
- Aquatic ecology
  - Aquatic Habitat
  - Fish and Benthic Communities
  - Fish Species
  - Fish Tissue

Project-environment interactions were evaluated and an assessment of potential effects was carried out based on identified VECs, as outlined in Section 6.2, Biological Effects Assessment. Where potential effects were identified, mitigation measures were applied. Remaining environmental changes were assessed; those identified to be low or moderate were considered for inclusion in the Environmental Management Plan.

Table 8-8 provides information related to management/mitigations as applied for the biological environment; compliance or management monitoring objectives; and potential adaptive management strategies that will be implemented or could be considered depending on monitoring results. Preliminary monitoring considerations for each component of the biological environment including proposed monitoring parameters, locations and methods, and proposed measurement frequency and duration are provided in Tables 8-9 and 8-10.



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**Table 8-8: Environmental Management Planning, Monitoring and Compliance - Biological Environment**

Potential Effect(s)	Potentially Affected VEC(s)	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Loss/alteration of vegetation Altered drainage patterns Changes to upland forest and wetland habitat Changes to wildlife and plant communities	<ul style="list-style-type: none"> <li>■ Wetlands</li> <li>■ Forest Cover</li> </ul>	<ul style="list-style-type: none"> <li>■ Vegetated riparian buffers will remain around watercourses at access road crossings to the extent possible</li> <li>■ Where feasible, native plant species will be used for reclamation</li> <li>■ An Invasive Plant Management Plan will be developed including:                             <ul style="list-style-type: none"> <li>■ Establishment of demarked areas to minimize encroachment into natural</li> <li>■ Regular cleaning of construction equipment, particularly before moving into sensitive vegetation areas</li> <li>■ Isolation of areas undergoing natural regeneration until native vegetation is established</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Ensure successful colonization of native plants in regenerating areas</li> </ul>	<ul style="list-style-type: none"> <li>■ Environmental Protection Act of Ontario</li> </ul>	<ul style="list-style-type: none"> <li>■ If invasive species are found to be preventing regeneration of native vegetation, adaptive measures such as plant removal may be implemented</li> </ul>
Changes to water levels	<ul style="list-style-type: none"> <li>■ Wetlands</li> <li>■ Species at Risk</li> <li>■ Furbearers</li> <li>■ Moose</li> <li>■ Wild Rice</li> </ul>	<ul style="list-style-type: none"> <li>■ Recirculation of water in process plant to reduce withdrawal from Marmion Reservoir</li> <li>■ Implement management controls</li> </ul>	<ul style="list-style-type: none"> <li>■ Ensure effectiveness of mitigation measures</li> <li>■ Confirm predictions on effects to terrestrial VECs</li> </ul>	<ul style="list-style-type: none"> <li>■ Environmental Protection Act of Ontario</li> </ul>	<ul style="list-style-type: none"> <li>■ Enhance re-circulation through increased water storage</li> <li>■ Temporarily interrupt operations if necessary</li> <li>■ Re-evaluate effects on terrestrial VECs and, if required, investigate additional mitigation measures</li> </ul>
Increased risk to ecological health Increased dust levels Changes to ambient air quality	<ul style="list-style-type: none"> <li>■ Species at Risk</li> <li>■ Furbearers</li> <li>■ Moose</li> </ul>	<ul style="list-style-type: none"> <li>■ In-design mitigation including:                             <ul style="list-style-type: none"> <li>■ Dust management plans; and</li> <li>■ Design of facilities to appropriate air quality standards</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Ensure effectiveness of mitigation measures</li> <li>■ Confirm predictions on effects to terrestrial VECs</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE: Environmental Compliance Approvals</li> <li>■ Ontario Regulation 419/05</li> <li>■ Emission Summary and Dispersion Modeling Report</li> <li>■ National Pollutant Release Inventory reporting</li> </ul>	<ul style="list-style-type: none"> <li>■ Enhance air treatment/dust suppression efforts</li> <li>■ Temporarily interrupt operations if necessary</li> <li>■ Re-evaluate effects on terrestrial VECs and, if required, investigate additional mitigation measures</li> </ul>

Table 8-8: Environmental Management Planning, Monitoring and Compliance - Biological Environment (Continued)

Potential Effect(s)	Potentially Affected VEC(s)	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Displacement of wildlife due to loss of habitat and change in habitat suitability due to noise and human activity	<ul style="list-style-type: none"> <li>■ Species at Risk</li> <li>■ Furbearers</li> <li>■ Upland breeding birds</li> <li>■ Moose</li> </ul>	<ul style="list-style-type: none"> <li>■ Avoid vegetation clearing within the breeding bird window (approximately May 15th-July 31st), where possible. If activities must occur within the window, pre-clearing surveys will be completed by a qualified ecologist to identify and demark active nests and set up appropriate buffer areas.</li> <li>■ Develop an appropriate “hunting, harvesting, trapping or fishing” policies for workers while they are staying at the worker accommodation camp</li> <li>■ Design transmission lines to minimize collisions and electrocution of birds to the extent practicable</li> <li>■ Selectively clear transmission line pathway without grading or stripping of topsoil</li> <li>■ Provide compensation for lost habitat if required (e.g., bats)</li> </ul>	<ul style="list-style-type: none"> <li>■ Minimize presence of large mammals (e.g., moose) in the danger zone or during blasting periods.</li> <li>■ Identify and protect active nests present in areas targeted for clearing during the breeding bird.</li> <li>■ Confirm effectiveness of habitat compensation measures if required (e.g., bats)</li> </ul>	<ul style="list-style-type: none"> <li>■ Environmental Protection Act of Ontario</li> <li>■ Ontario Ministry of Natural Resources</li> <li>■ Migratory Birds Conservation Act (MBCA)</li> <li>■ Endangered Species Act</li> </ul>	<ul style="list-style-type: none"> <li>■ If monitoring data suggests displacement is greater than predicted or stakeholder concerns are raised, targeted studies may be initiated to assess the potential causes of displacement, the adequacy of the active monitoring program and to investigate and identify potential mitigation measures</li> </ul>
Loss/injury of wildlife through nuisance interactions and/or accidents (i.e., vehicle collisions)	<ul style="list-style-type: none"> <li>■ Species at Risk</li> <li>■ Furbearers</li> <li>■ Upland breeding birds</li> <li>■ Moose</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop and implement an industrial and domestic waste management plan including:                             <ul style="list-style-type: none"> <li>▪ Appropriate management of food wastes</li> <li>▪ Use of appropriate waste receptacles to limit attraction of wildlife</li> <li>▪ Worker education on proper waste management techniques and the risks associated with feeding wildlife and careless disposal of food waste</li> </ul> </li> <li>■ Worker awareness training of hazards to wildlife, including species at risk</li> <li>■ Speed limits will be posted and enforced on the access road and mine site road</li> <li>■ Animals that become a nuisance will be trapped and moved to remote locations for release</li> </ul>	<ul style="list-style-type: none"> <li>■ Ongoing review of the waste management program and improvement through adaptive management</li> <li>■ Evaluation of the effectiveness of the wildlife management strategy through recording of losses of wildlife individuals from vehicle collisions</li> </ul>	<ul style="list-style-type: none"> <li>■ Environmental Protection Act of Ontario</li> <li>■ Ontario Ministry of Natural Resources</li> <li>■ Migratory Birds Conservation Act (MBCA)</li> </ul>	<ul style="list-style-type: none"> <li>■ If required, revise the industrial and domestic waste management plan to include additional measures such as the installation of temporary wildlife barriers (fences), more frequent incineration of food wastes and strict enforcement of food waste policies</li> <li>■ If required, appropriate signage may be posted to warn drivers of areas where frequent vehicle-wildlife interaction occur</li> <li>■ If required, install snow fencing or hoarding to re-direct snapping turtles from roads or culverts</li> </ul>

Table 8-8: Environmental Management Planning, Monitoring and Compliance - Biological Environment (Continued)

Potential Effect(s)	Potentially Affected VEC(s)	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Loss water bodies and water courses within mine footprint.	<ul style="list-style-type: none"> <li>Baitfish</li> <li>Northern Pike</li> </ul>	<ul style="list-style-type: none"> <li>Minimize the direct loss of fish by developing and implementing a fish relocation plan with input from stakeholders and Aboriginal communities</li> <li>Develop and implement a No Net Loss / Habitat Offset Plan (NNLP) with MNR/DFO that provides habitat compensation under Section 35 of the <i>Fisheries Act</i> and the MMER Schedule 2 waterbody listing</li> </ul>	<ul style="list-style-type: none"> <li>Assess the effectiveness of habitat offset projects in replacing lost habitat</li> </ul>	<ul style="list-style-type: none"> <li>DFO: Fisheries Act</li> <li>MMER</li> </ul>	<ul style="list-style-type: none"> <li>If habitat offset projects prove to be ineffective or do not meet the objectives of the NNLP, alternative offset projects will be considered and discussed with the appropriate regulatory authorities</li> </ul>
Changes in receiving water levels due to loss of watershed area and water taking	<ul style="list-style-type: none"> <li>Lower Reaches</li> <li>Lizard Lake</li> <li>Upper Marmion Reservoir</li> </ul>	<ul style="list-style-type: none"> <li>Recirculation of water in process plant to reduce withdrawal from Marmion Reservoir</li> <li>Management through discussion with other local water users and participation in the Seine River Watershed Management Plan</li> </ul>	<ul style="list-style-type: none"> <li>Assess aquatic health of water bodies impacted by water level changes</li> <li>Confirm assumptions related to habitat loss</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Protection Act of Ontario; MOE</li> <li>Fisheries Act; DFO</li> </ul>	<ul style="list-style-type: none"> <li>If effects on water levels are greater than predicted, the effects on aquatic habitat will be re-evaluated and the need for additional habitat offset projects will be considered and discussed with the appropriate regulatory authorities</li> </ul>
Change to water quality in Sawbill Bay due to discharge Loss lake bottom habitat due to intake and discharge structures Loss of fish due to high intake velocities	<ul style="list-style-type: none"> <li>Baitfish</li> <li>Northern Pike</li> <li>Walleye</li> <li>Smallmouth Bass</li> <li>Upper Marmion Reservoir</li> </ul>	<ul style="list-style-type: none"> <li>Discharge and intake structures will be set at an appropriate height above the lake bottom to minimize impacts on aquatic life</li> <li>Effluent diffusers will be constructed to enhance mixing and dilution at the discharge locations</li> <li>An aquatic effects monitoring plan will be developed in consultation with aboriginal groups, the public and regulatory agencies during the permitting process</li> <li>Intake structures will include fish screens and will be designed according to established velocity criteria to minimize entrainment of fish and other organisms</li> </ul>	<ul style="list-style-type: none"> <li>Confirm operation of intake structures within operational velocity criteria</li> <li>Assess aquatic health of water bodies in areas near the discharge structures</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Protection Act of Ontario; MOE</li> <li>Fisheries Act; DFO</li> </ul>	<ul style="list-style-type: none"> <li>If intake velocities exceed guideline criteria, appropriate measures will be implemented to reduce velocities such as:                             <ul style="list-style-type: none"> <li>Modifying the intake to provide a larger intake screen area; or</li> <li>Reducing the operational withdrawal rate through appropriate water management activities</li> </ul> </li> <li>If monitoring of effluent discharge shows trends that may eventually result in significant adverse effect on aquatic life, the mitigation strategy will be re-evaluated additional mitigation measures may be implemented.</li> </ul>
Loss of aquatic habitat due to road construction	<ul style="list-style-type: none"> <li>Baitfish</li> <li>Northern Pike</li> <li>Smallmouth Bass</li> </ul>	<ul style="list-style-type: none"> <li>Road and culvert/bridge construction will avoid fish spawning windows and adhere to strict erosion and sediment control plans</li> <li>Compensate for habitat lost at stream crossings</li> </ul>	<ul style="list-style-type: none"> <li>Minimize road impingement on habitat and sediment release during construction</li> <li>Assess aquatic health of channel upstream and downstream of road crossings</li> <li>Assess the effectiveness of habitat offset project in replacing lost habitat</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Protection Act of Ontario; MOE</li> <li>Fisheries Act; DFO</li> <li>MNR: Environmental Guidelines for Access Roads and Water Crossings</li> </ul>	<ul style="list-style-type: none"> <li>Erosion and sediment control measures will be reviewed and revised as necessary during construction</li> <li>If required, water conveyance structures (e.g., culverts) will be modified/repared to ensure proper flow conveyance and fish passage</li> <li>If habitat offset projects prove to be ineffective or do not meet the objectives of the NNLP, alternative offset projects will be considered and discussed with the appropriate regulatory authorities</li> </ul>

Table 8-8: Environmental Management Planning, Monitoring and Compliance - Biological Environment (Continued)

Potential Effect(s)	Potentially Affected VEC(s)	Mitigation Measures	Monitoring Objectives	Regulating Authority / Compliance Requirements	Contingency / Non-Compliance Strategy
Impact to sensitive fish spawning and nursery habitat due to blasting operations	<ul style="list-style-type: none"> <li>■ Baitfish</li> <li>■ Northern Pike</li> <li>■ Walleye</li> <li>■ Smallmouth Bass</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop blast monitoring and mitigation plan</li> <li>■ Adjust blast intensities if required based on initial monitoring results to protect sensitive fish species during critical life stages</li> </ul>	<ul style="list-style-type: none"> <li>■ Confirmation of predictions related to impacts on fish habitat and to allow for adaptive management</li> </ul>	<ul style="list-style-type: none"> <li>■ Fisheries Act (DFO)</li> </ul>	<ul style="list-style-type: none"> <li>■ Review monitoring data and, if vibration exceeds guideline limits, reduce the maximum explosive weight detonated per delay through any one or a combination of the following measures:                             <ul style="list-style-type: none"> <li>▪ Reducing the borehole diameter</li> <li>▪ Introducing decked charges</li> <li>▪ Reducing the borehole length</li> </ul> </li> </ul>

### **8.2.3.1 Terrestrial Environment**

OHRG will prepare a comprehensive Terrestrial Ecology monitoring program based on the residual effects predicted in the Terrestrial Ecology assessment. The objectives of the Terrestrial Ecology monitoring program will be to:

- Verify the accuracy and predictions of the EIS/EA Report;
- Confirm the effectiveness of mitigation measures, and in doing so, determine if new mitigation strategies are required;
- Ensure successful colonization of native plants in regenerating areas;
- Ensure effectiveness of mitigation measures;
- Protect active nests;
- Protect bird populations;
- Improve the waste management program;
- Evaluate the effectiveness of the wildlife management plan; and
- Evaluate the effectiveness of bat habitat compensation measures.

Monitoring program considerations for Terrestrial Ecology including proposed methods, frequency and duration are provided in Table 8-9.

### **8.2.3.2 Aquatic Environment**

An Aquatic Environment monitoring program will be designed and implemented to confirm water quality, flow and water level alteration predictions generated during surface water modelling. If the monitoring program establishes that Project-related effects on the aquatic environment are greater than predicted, fish habitat suitability and utilization studies will be triggered on aquatic features (APIs) and/or specific VECs.

The environmental monitoring program will include an Environment Effects Monitoring (EEM) program to during operations through to closure, details of which will follow EC/MOE requirements. The EEM will be developed when the Project becomes subject to the Regulations.

Preliminary monitoring considerations for the Aquatic environment are provided in Table 8-10. The majority of the monitoring activities will be completed as part of the monitoring of habitat offset projects included in the No Net Loss Plan and/or the Environmental Effects Monitoring Plan. These are described in more detail in the Aquatic TSD.



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**Table 8-9: Proposed Monitoring Program Considerations – Terrestrial Ecology**

Potential Effect	Indicator / Parameter	Location(s)	Method(s)	Frequency	Duration
Loss and/or Alteration of Vegetation	Composition/diversity/health of plant communities in LSA	Disturbed areas within the mine site and access routes that are left to naturally regenerate	<ul style="list-style-type: none"> <li>Visual assessment of areas undergoing natural regeneration by an ecologist</li> </ul>	<ul style="list-style-type: none"> <li>Periodically at each site; approximately every 2-3 years</li> </ul>	<ul style="list-style-type: none"> <li>Beginning 2-3 years after an area is left to re-vegetate and on-going until native vegetation communities become established and are considered to be thriving</li> </ul>
Displacement of wildlife  Change in habitat availability and suitability	Presence/persistence of species in the LSA	Monitoring locations to be selected based on ongoing mine activity	<ul style="list-style-type: none"> <li>Breeding bird point counts using same methods as outlined in the Terrestrial Ecology TSD</li> </ul>	<ul style="list-style-type: none"> <li>Annually</li> </ul>	<ul style="list-style-type: none"> <li>Construction phase, operations phase and closure or as required by relevant permits</li> </ul>
		Location(s) of installed bat habitat compensation measures (if required)	<ul style="list-style-type: none"> <li>Bat acoustic monitoring using stationary devices and visual assessments</li> </ul>		
		Areas adjacent to the mine site and within the LSA	<ul style="list-style-type: none"> <li>Review of secondary source of data from MNR (hunting and trapping records)</li> </ul>	<ul style="list-style-type: none"> <li>Review of records as available and as updated</li> </ul>	
			<ul style="list-style-type: none"> <li>Recording visual observations of SAR and other wildlife in a Wildlife Log</li> </ul>	<ul style="list-style-type: none"> <li>On-going</li> </ul>	
Risk of wildlife Injury/Mortality			<ul style="list-style-type: none"> <li>Mandatory reporting of road mortality and other mortality by mine staff</li> </ul>		

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**Table 8-10: Proposed Monitoring Program Considerations – Aquatic Environment**

Potential Effect	Parameter	Location(s)	Method	Frequency	Duration
Changes to Water Levels	<ul style="list-style-type: none"> <li>■ Water levels</li> <li>■ Distribution/success of aquatic vegetation; Instream/littoral cover features; Fish use (age composition, abundance, diversity)</li> </ul>	<ul style="list-style-type: none"> <li>■ Upper Marmion Reservoir</li> <li>■ Lizard Lake</li> <li>■ API-8</li> </ul>	<ul style="list-style-type: none"> <li>■ Water level recording data loggers; manual readings by staff gauge if continuous recording not possible</li> <li>■ Vegetation mapping, electrofishing/ seine netting</li> </ul>	<ul style="list-style-type: none"> <li>■ Continuous (dataloggers); daily or weekly readings gauge if continuous recording not possible</li> <li>■ Bi-annual (biological assessments)</li> </ul>	<ul style="list-style-type: none"> <li>■ Operations phase through to closure</li> </ul>
Mortality of aquatic species	<ul style="list-style-type: none"> <li>■ Intake velocity</li> </ul>	<ul style="list-style-type: none"> <li>■ Intake locations</li> </ul>	<ul style="list-style-type: none"> <li>■ Flow metering at intakes (also included in hydrology monitoring program considerations)</li> </ul>	<ul style="list-style-type: none"> <li>■ Daily</li> </ul>	<ul style="list-style-type: none"> <li>■ Operations phase through to closure</li> </ul>
Changes to aquatic health due to discharge	<ul style="list-style-type: none"> <li>■ Benthic community and fish health</li> </ul>	<ul style="list-style-type: none"> <li>■ Discharge locations</li> </ul>	<ul style="list-style-type: none"> <li>■ Benthic community assessment (various metrics), fish tissue sampling</li> </ul>	<ul style="list-style-type: none"> <li>■ Bi-annual</li> </ul>	
Loss of fish habitat Changes to habitat due to road construction	<ul style="list-style-type: none"> <li>■ Water levels</li> <li>■ Distribution/success of aquatic vegetation; Instream/littoral cover features; Fish use (age composition, abundance, diversity)</li> <li>■ Construction</li> </ul>	<ul style="list-style-type: none"> <li>■ Habitat offset projects</li> <li>■ Stream crossings</li> </ul>	<ul style="list-style-type: none"> <li>■ Water level recording data loggers; manual readings by staff gauge if continuous recording not possible</li> <li>■ Vegetation mapping, electrofishing/ seine netting at offset projects after construction</li> <li>■ Construction monitoring at stream crossings to ensure erosion and sediment control plans are adhered to and that habitat impingement is minimized</li> </ul>	<ul style="list-style-type: none"> <li>■ Continuous (dataloggers) ; daily or weekly readings gauge if continuous recording not possible</li> <li>■ Bi-annual (biological assessments)</li> <li>■ On-going during construction</li> </ul>	<ul style="list-style-type: none"> <li>■ Construction through operations to closure</li> </ul>
Blasting effects on fish habitat	<ul style="list-style-type: none"> <li>■ Blast-induced water overpressure level</li> </ul>	<ul style="list-style-type: none"> <li>■ Nearest identified fish habitat or location</li> </ul>	<ul style="list-style-type: none"> <li>■ Instrumentation to record water overpressure intensities, including a hydrophone and data acquisition unit</li> </ul>	<ul style="list-style-type: none"> <li>■ Periodic monitoring as the blasts approach the nearest fishery. Based on data recorded during initial blasts, a decision will be made on subsequent monitoring requirements</li> </ul>	<ul style="list-style-type: none"> <li>■ To be determined based data recorded during initial blasts</li> </ul>

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### **8.2.3.2.1 Final No Net Loss Plan**

A conceptual NNLP/Habitat Offset Plan to offset habitat losses due to the project has been completed and is included in the Aquatic TSD. This document has been reviewed and approved in principle by DFO. A final NNLP/Habitat Offset plan to offset habitat losses attributed to the Project will be completed and submitted along with the Fisheries Act Authorization Request and the MMER Schedule 2 listing application. It includes adequate compensation (e.g., creation of new habitat units) to fully offset identified direct and indirect effects to habitat. It is expected that the final NNLP will be a living document as it may require amendment periodically. New HADDs may be added to the list already generated in the conceptual NNLP, which will subsequently require compensation (e.g., if effects of a particular stream crossing cannot be completely mitigated). The final NNLP will include details of the timing and location of construction of compensation works, and a monitoring schedule for each form of compensation. Where monitoring determines that habitat gain objectives have not been met as planned, additional compensation measures will be designed and implemented. In the final NNLP, habitat compensation to address losses from the scheduling of water bodies for tailings and waste rock disposal (to address requirements of the MMER Schedule 2) will be presented separately from habitat compensation for other project-related losses due to physical HADD under Section 35 of the Fisheries Act.

Bill C-38, passed in June 2012, amends the Fisheries Act to focus on the protection of fish that support commercial, recreational or Aboriginal fisheries and to more effectively manage activities that pose the greatest threat to these fisheries. Habitat policy, including “no net loss” is currently under review to ensure consistency with the Act’s focus on managing threats to recreational, commercial and Aboriginal fisheries. While a number of policy documents are now available and DFO is offering general guidance under these new changes, they have yet to be passed in legislation. When new direction regarding habitat management policy becomes available, it may require that final NNLP/Habitat Offset Plan be amended.

The NNLP will also include compliance and effectiveness monitoring programs to evaluate if the compensation measures function as proposed.

### **8.2.3.2.2 Scheduling of Waterbodies under Metal Mining Effluent Regulation**

Using a natural water body frequented by fish for tailings disposal requires an amendment to the MMER, which is a federal legislative action. The MMER, enacted in 2002, were developed under subsections 34(2), 36(5) and 38(9) of the Fisheries Act to regulate the deposit of mine effluent, waste rock and tailings into natural waters frequented by fish. These regulations, administered by Environment Canada, apply to the TMF and the WRMF components of the Project. Environment Canada (2011) outlines a specific process that is required to utilize a natural water body for metal mine waste disposal. This process requires preparation of an assessment of alternatives for mine waste disposal for consideration (Chapter 4) and public and Aboriginal consultations on the EA, including on possible amendments to the MMER. OHRG will be required to submit all required documentation to Environment Canada and may be asked to provide additional background information necessary in the preparation of the regulatory amendment package. Within the TMF, APIs #1, #2, #6, #47 and #48 will likely require scheduling under the Regulations. API #11, within the WRMF will likely also require scheduling.

### **8.2.3.2.3 Environmental Effects Monitoring (MMER)**

The MMER under the Fisheries Act directs metal mines to conduct Environment Effects Monitoring (EEM) as a condition governing the authority to deposit effluent. EEM is a science-based performance measurement tool used to assess the adequacy of the regulations. EEM studies are designed to detect and measure changes in

aquatic ecosystems (i.e., receiving environments). The metal mining EEM program is an iterative system of monitoring and interpretation phases that is used to assess the effectiveness of environmental management measures, by evaluating the effects of effluents on fish, fish health, fish habitat and the use of fisheries resources by humans. Long-term effects are assessed using regular cyclical monitoring and interpretation phases designed to investigate the impacts on the same parameters and locations. In this way, both a spatial and temporal characterization of potential effects to assess changes in receiving environments are obtained. Study elements include fish population and fish habitat assessments, benthic invertebrate surveys, fish tissue analyses, effluent characterization, sub-lethal toxicity and water quality monitoring.

The first EEM study design must be submitted not later than 12 months after the day on which the mine becomes subject to the Regulations. The first interpretative report must be submitted not later than 30 months after the date on which the mine becomes subject to the Regulations or not later than 42 months after the date on which it becomes subject to the Regulations, if the mine has submitted a report utilizing historical biological monitoring information. Subsequent interpretative reports are submitted 36 or 72 months after the day on which the most recent interpretative report was required to be submitted, depending on the results of the previous interpretative report.

#### **8.2.3.2.4 Construction Monitoring**

Field monitoring will be performed to ensure that the mitigation measures implemented during construction successfully minimize adverse environmental effects. Monitoring will focus on the effects of any sediment release and deposition during construction. Post-construction monitoring will be conducted in watercourses affected by the road culvert crossings to evaluate the effects of any sediment releases and deposition at crossing sites, and to evaluate fish passage potential (e.g., hydraulics) through culverts. The effectiveness of habitat reclamation following construction will also be evaluated. Monitoring will be adaptive in that, if changes to fish and fish habitat are detected, appropriate remedial actions will be implemented and subsequent monitoring programs adjusted to ensure the effectiveness of remedial actions and future operations.

A standardized monitoring procedure will be developed so that monitoring data can be used to validate impact predictions. Various environmental variables may be monitored during construction, depending on the concerns and crossing objectives:

- Suspended sediment load before, during and after construction to provide feedback to construction personnel and document the zone of influence and changes in water quality.
- Substrate composition before, during and after construction to document areas of sedimentation.
- Watercourse flows during construction to ensure that fish passage and minimum flows are maintained.
- Monitoring during blasting and diversion procedures.
- Confirm that specific crossing objectives have been achieved.
- Observe and document actual effects.
- Observe and document recovery.
- Determine the need for maintenance of structures and mitigation measures.
- Fulfil explicit mitigation and compensation requirements.

#### **8.2.3.2.5 Blast Monitoring and Collection of Supplementary Fish Habitat Information (Sawbill Bay)**

To assess potential for vibration impact as development of the open pits approaches the final pit design, blasting operations will be monitored during initial pit development to obtain site-specific data on the potential for damaging vibrations to affect adjacent aquatic habitats. Baseline studies on habitat use, specifically timing and locations of spawning, have not been completed. It is recommended that these studies be undertaken to effectively mitigate the effects of blast vibration on fish in Sawbill Bay. These data also will be useful in evaluating the effects of construction of the retaining wall adjacent to the west pit, on fish habitat. The fish and data from fish habitats studies will be combined with the site-specific blast monitoring data to develop guidance as to when, if at all, blast designs should be altered to accommodate vibration levels at the nearest active spawning beds and to assess the effectiveness of blast mitigation on fish.

#### **8.2.4 Emergency Preparedness and Response and Contingency Planning**

The following is a preliminary discussion related to main components emergency response and contingency planning. As per the requirements of the Environmental Emergencies Regulations of the Canadian Environmental Protection Act, OHRG will develop an environmental emergency plan for any substances stored on site at the appropriate volumes. Detailed planning will be completed following EA approval and activities will be adapted once the program is implemented, to meet conditions encountered in the field. The detailed plan will be periodically reviewed and updated following a continuous improvement process throughout the construction, operations, closure and post-closure of the Project.

Potential accidents that were identified in the effects assessment (Chapter 6) include the following:

- Road accident on main access road resulting in a fuel spill or hazardous material spill from a truck.
- Fuel tank rupture or hazardous material spill on Mine Site.
- Tailings pipeline rupture.
- Spill of tailings water from TMF reclaim pond.
- TMF tailings dam failure.
- Flyrock

In addressing emergency preparedness and response, the EMP will identify the environmental risks, evaluate the risks and provide risk management measures to minimize negative effects. Some additional aspects that are considered for contingency purposes and planning include:

- Medical emergency.
- Fire safety.
- Pit slope failure.
- Excessive Pit inflow.
- Floods and Droughts.

- Loss of communication.
- Explosion.

Together the potential accidents, contingency measures and associated environmental risks will form the basis for development of a **Risk Management Plan** that will be developed for the Project following EA approval. The items listed are not intended to provide a comprehensive listing, but rather provide an example of aspects that will be included in the plan.

Table 8-11 provides information related to management/mitigations as applied for each response or contingency identified; compliance or management monitoring expectations; and potential adaptive management strategies that will be implemented or could be considered depending on monitoring results. Additional discussion specifically related to the some of the components identified is provided following the summary table.

Table 8-11: Environmental Management Planning, Monitoring and Compliance – Emergency Response and Contingency

Aspect	Component	Considerations	Implementation, Management or Mitigation	Monitoring Objective and Plan	Regulating Authority / Compliance Requirements
Emergency Response	Road Accident	<ul style="list-style-type: none"> <li>■ Potential for injury to personnel, loss of equipment, effect to the environment through direct contact with wildlife or spills</li> <li>■ Potential for spill of fuel or hazardous materials</li> </ul>	<ul style="list-style-type: none"> <li>■ Posted speed limits, worker training</li> <li>■ Implement a policy for delivery workers requiring employers to certify that their workers have appropriate training</li> <li>■ Develop a spill response team and communication linkages</li> <li>■ Conduct drills on emergency response for spills</li> <li>■ Maintain a current emergency response contact list and plan</li> <li>■ Road maintenance program</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintain and periodically review driver training and driver credentials</li> <li>■ Maintain and periodically review a list of approved suppliers and delivery personnel</li> <li>■ Periodically retrain and monitor performance of emergency response team members</li> </ul>	<ul style="list-style-type: none"> <li>■ Ontario Provincial Police (OPP)</li> <li>■ Ontario Ministry of the Environment (MOE)</li> <li>■ Ministry of Transportation of Ontario (MTO)</li> <li>■ Ontario Ministry of Labour (MOL)</li> </ul>
Emergency Response	Fuel Tank Rupture or Hazardous Material Spill	<ul style="list-style-type: none"> <li>■ Potential for environmental contamination;</li> <li>■ Loss of process and equipment</li> <li>■ Worker injury</li> </ul>	<ul style="list-style-type: none"> <li>■ Worker training</li> <li>■ Regular fuel tank inspection</li> <li>■ Maintain current Material Safety Data Sheets (MSDS) of all materials transported, stored and used on-site</li> <li>■ Develop a spill response team and communication linkages</li> <li>■ Conduct drills on emergency response for spills</li> <li>■ Maintain a current emergency response contact list and plan</li> </ul>	<ul style="list-style-type: none"> <li>■ Periodically retrain and monitor performance of emergency response team members</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE; MOL; possibly OPP or others as necessary</li> </ul>
Emergency Response	Tailings Pipeline Rupture	<ul style="list-style-type: none"> <li>■ Potential for environmental contamination</li> <li>■ Loss of process and equipment</li> </ul>	<ul style="list-style-type: none"> <li>■ Worker training</li> <li>■ Regular pipeline inspection</li> <li>■ Perform appropriate maintenance checks on piping and pumping systems</li> <li>■ Report and correct problems promptly</li> <li>■ Develop a procedure for containment and cleanup of tailings</li> <li>■ Periodically retrain staff on proper operation of the tailings systems</li> </ul>	<ul style="list-style-type: none"> <li>■ Periodically review maintenance, records, reporting, and response procedures</li> <li>■ Maintain and review training records</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE; MOL; others as necessary</li> </ul>

Table 8-11 Environmental Management Planning, Monitoring and Compliance – Emergency Response and Contingency (Continued)

Aspect	Component	Considerations	Implementation, Management or Mitigation	Monitoring Objective and Plan	Regulating Authority / Compliance Requirements
Emergency Response	Spill of Tailings Water from TMF	<ul style="list-style-type: none"> <li>■ Potential for environmental contamination</li> <li>■ Loss of process</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop water management plan and standard operating procedures for TMF</li> <li>■ Monitor and adapt to hydrologic conditions (See Section 8.2.2)</li> <li>■ Perform appropriate maintenance checks on piping and pumping systems</li> <li>■ Report and correct problems promptly</li> <li>■ Periodically retrain staff on proper operation of the tailings systems</li> <li>■ Develop and implement spill contingency and monitoring strategy</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintain and review operational and maintenance logs</li> <li>■ Monitor and review hydrologic information as detailed in the Monitoring Program</li> <li>■ Monitor downstream water quality following any spill to ensure water quality objectives are met or clean-up is implemented</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE; others as necessary</li> </ul>
Emergency Response	Tailings Dam Failure	<ul style="list-style-type: none"> <li>■ Potential for environmental contamination</li> <li>■ Loss of process and equipment</li> <li>■ Loss of property</li> <li>■ Worker injury</li> <li>■ Loss of wildlife and habitat</li> </ul>	<ul style="list-style-type: none"> <li>■ Perform appropriate dam inspections</li> <li>■ Repair issues promptly</li> <li>■ Develop a tailings management system that includes appropriate response measures</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintain records of all dam inspections</li> <li>■ Monitor dam performance where repairs were completed</li> </ul>	<ul style="list-style-type: none"> <li>■ MNM; MOE; MOL; others as necessary</li> </ul>
Emergency Response / Contingency Planning	Medical Emergency	<ul style="list-style-type: none"> <li>■ Potential for injury to personnel</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintain first aid room</li> <li>■ Develop a medical team and communication linkages.</li> <li>■ Worker awareness of medical emergency resources</li> <li>■ Emergency helipad landing</li> </ul>	<ul style="list-style-type: none"> <li>■ Record medical emergencies in Incident Reports</li> <li>■ Periodically retrain and monitor performance of emergency response team members</li> <li>■ Review and reflect previous incident records to improve response times and treatment effectiveness</li> </ul>	<ul style="list-style-type: none"> <li>■ MOL; others as necessary</li> </ul>
Emergency Response / Contingency Planning	Pit Slope Failure (see also Section 8.24)	<ul style="list-style-type: none"> <li>■ Loss of process and equipment</li> <li>■ Loss of property</li> <li>■ Worker injury or death</li> </ul>	<ul style="list-style-type: none"> <li>■ Perform appropriate and routine geotechnical inspections</li> <li>■ Identify issues and adjust mine planning appropriately if necessary</li> <li>■ Develop a procedure for pit evacuation</li> </ul>	<ul style="list-style-type: none"> <li>■ Monitor groundwater levels in the vicinity of the pit</li> <li>■ Maintain records of all Project pit slope inspections</li> </ul>	<ul style="list-style-type: none"> <li>■ MNM; MOL; others as necessary</li> </ul>
Contingency Planning	Fires (on site)	<ul style="list-style-type: none"> <li>■ Loss of process and equipment</li> <li>■ Loss of property (i.e., worker accommodation camp, administrative office, etc.)</li> <li>■ Worker injury</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop a fire prevention plan and fire response plan</li> <li>■ Develop site evacuation plan</li> <li>■ Provide appropriate firefighting equipment on-site</li> <li>■ Worker training and awareness of firefighting resources, procedures and techniques</li> <li>■ Maintain adequate supply of water on-site at all times</li> </ul>	<ul style="list-style-type: none"> <li>■ Perform routine checks on fire safety equipment</li> <li>■ Regularly update building floor plans identifying emergency exits and firefighting equipment</li> <li>■ Document and analyze fire incidents to improve prevention measures</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE; MOL; MNR</li> </ul>

Table 8-11 Environmental Management Planning, Monitoring and Compliance – Emergency Response and Contingency (Continued)

Aspect	Component	Considerations	Implementation, Management or Mitigation	Monitoring Objective and Plan	Regulating Authority / Compliance Requirements
Contingency Planning	Forest Fire	<ul style="list-style-type: none"> <li>■ Loss of process and equipment</li> <li>■ Loss of property</li> <li>■ Worker injury</li> <li>■ Loss of wildlife and habitat</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop an emergency evacuation plan</li> <li>■ Ensure communication linkages are adequate for fast and reliable reporting to worker accommodation camp</li> <li>■ Review daily weather conditions</li> <li>■ Post forest fire hazard ratings in a visible location and ensure workers are aware of fire hazards</li> </ul>	<ul style="list-style-type: none"> <li>■ Periodically review and update emergency evacuation plan</li> <li>■ Periodically retrain and monitor performance of emergency response team members</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE; MOL; MNR</li> </ul>
Contingency Planning	Drought or Flood	<ul style="list-style-type: none"> <li>■ Loss of process and equipment</li> <li>■ Loss of property (i.e., worker accommodation camp, administrative office, etc.)</li> <li>■ Worker injury</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop a storm water management system</li> <li>■ Include emergency features in design (i.e., spillways)</li> <li>■ Implement flood control measures (sand bags, dykes) and evacuation procedures</li> <li>■ Monitor water levels as per Section 8.2.2 and develop a response plan for dealing with excessively high or low water levels</li> <li>■ Use the TMF as a storage reservoir if necessary (taking into consideration dam and TMF design)</li> </ul>	<ul style="list-style-type: none"> <li>■ Periodically review and update water management plan to account for emergency conditions</li> <li>■ Periodically retrain and monitor performance of emergency response team members</li> </ul>	<ul style="list-style-type: none"> <li>■ MOE; MOL; MNR</li> </ul>
Contingency Planning	Excessive or Rapid Pit Inflow	<ul style="list-style-type: none"> <li>■ Loss of process and equipment</li> <li>■ Worker injury or death</li> </ul>	<ul style="list-style-type: none"> <li>■ Identify issues and adjust mine planning appropriately if necessary</li> <li>■ Develop an emergency pit evacuation plan</li> <li>■ Develop a procedure for grouting, pumping or stopping excessive pit inflow</li> </ul>	<ul style="list-style-type: none"> <li>■ Monitor groundwater levels in the vicinity of the pit</li> <li>■ Maintain records of water levels and routinely compare against expected levels</li> <li>■ Maintain records of pumping rates from the pit and monitor for unexpected changes</li> </ul>	<ul style="list-style-type: none"> <li>■ MNDM; MOL; others as necessary</li> </ul>

Table 8-11 Environmental Management Planning, Monitoring and Compliance – Emergency Response and Contingency (Continued)

Aspect	Component	Considerations	Implementation, Management or Mitigation	Monitoring Objective and Plan	Regulating Authority / Compliance Requirements
Contingency Planning	Loss of Communication	<ul style="list-style-type: none"> <li>■ Potential to reduce efficiency of emergency response procedures</li> </ul>	<ul style="list-style-type: none"> <li>■ Ensure multiple lines of communication are available and accessible to workers (including: radio, telephone, sat-phone, email)</li> </ul>	<ul style="list-style-type: none"> <li>■ Perform routine maintenance checks on communication devices.</li> </ul>	
Contingency Planning	Explosion (explosives, fuel or chemicals)	<ul style="list-style-type: none"> <li>■ Loss of process and equipment</li> <li>■ Loss of property (i.e., mine, worker accommodation camp, administrative office)</li> <li>■ Worker injury</li> </ul>	<ul style="list-style-type: none"> <li>■ Partner with the explosives contractors to develop emergency procedures.</li> <li>■ Identify and communicate with workers locations of explosives, or hazardous materials and chemicals</li> <li>■ Ensure workers have appropriate WHMIS training and are appropriately trained for their job</li> <li>■ Post proper signage</li> <li>■ Develop communication procedures to notify workers when explosives will be detonated</li> <li>■ Strictly enforce handling of explosives by certified contractor personnel only</li> <li>■ Ensure contractor employees are trained and familiar with all relevant OHRG health and safety procedures</li> </ul>	<ul style="list-style-type: none"> <li>■ Maintain and review explosives training records</li> <li>■ Maintain, review and periodically update WHMIS and job specific training</li> </ul>	<ul style="list-style-type: none"> <li>■ MOL; MOE; OPP; others as necessary</li> </ul>

**8.2.4.1 Fire Safety**

OHRG will maintain the capability to respond to fires on or near the Project. To achieve this, OHRG will:

- Maintain adequate pumping capacity all times to meet anticipated fire suppression requirements.
- Develop and implement procedures for making sure that the potential for fires in the vicinity of the Project is minimized on an ongoing basis.
- Maintain fire-fighting equipment in good working order.

Training is one of the most essential parts of fire preparedness. Fire suppression basic training will be provided to OHRG staff and contractors. The degree of wildfire risk inherent in a Project activity is based on its potential to cause sparks. As the fire hazard increases so does the need to modify work procedures in order to reduce the chance of starting a fire (Table 8-12). A risk characterization exercise of Project activities will be part of the Fire Prevention and Preparedness Plan.

During periods of high to extreme fire hazard, the potential to inadvertently cause a wildfire increases greatly. Mining representatives should consider altering their work practices to further reduce the chance of causing wildfire during the high fire hazard conditions. The table below outlines the incremental prevention measures that are expected to be included in a Fire Prevention and Preparedness Plan and should be followed as the fire hazard increases.

**Table 8-12: OHRG Wildfire Prevention Guidelines**

Level of Fire Hazard	OHRG Response		
Extreme	<b>Enhanced Prevention Measures</b>	<b>Implement Short Shift</b>	<b>Review feasibility of operations and make appropriate adjustments as necessary to maintain a safe working environment</b>
High		<b>Enhanced Prevention Measures</b>	<b>Implement Short Shift</b>
Moderate	<b>Normal Prevention Measures</b>		<b>Enhanced Prevention Measures</b>
Low	<b>Normal Prevention Measures</b>	<b>Normal Prevention Measures</b>	<b>Normal Prevention Measures</b>
	Low Risk Operations	Moderate Risk Operations	High Risk Operations

### **8.2.4.2 Floods and Droughts**

The Ore Processing Facility and supporting infrastructure are constructed on higher ground that would not be susceptible to flooding within the Upper Marmion Reservoir system.

A **storm water management system** will be implemented to ensure safe water levels are maintained in the Project facilities. Monitoring of hydrology and storm events will allow staff to determine when to:

- The need to divert excess non-contact water to local water bodies.
- The required capacity for contact water is available in the PPCP.
- The need for the tailings facility spillway to release excess water.

Drought may affect the ability to provide the water required for processing. During periods of drought, water storage in the TMF could be increased to provide sufficient water to meet operating needs.

The effects of drought can be mitigated through storing of excess water when climatic conditions indicate that a potential water shortage may occur in the future. This type of adaptive management practice will minimize the effects of the Project on water levels in Upper Marmion Reservoir and permit the Project to continue operations.

### **8.2.4.3 Tailings Dam Safety**

Project tailings dams were designed according to Canadian Dam Association (CDA) Guidelines and Ontario MNR Guidelines. The MNR has authority to approve dams in Ontario and CDA guidelines are referenced in the Ontario Mine Closure regulations. The design of the tailings dam was completed by Golder Associates Ltd. and will be peer reviewed by an independent expert in tailings dam construction and operation.

In addition, the Mining Association of Canada (MAC) provides guidelines for best practices for management of tailings dams. OHRG intends to develop a customized tailings management system, (an Operations Management and Surveillance (OMS) Manual), that address the specific needs of OHRG, local regulatory and community requirements. The management system will include:

- A framework for tailings management.
- Sample checklists for implementing the framework through the life cycle of a tailings facility.

The framework will offer a foundation for managing tailings in a safe and environmentally responsible manner through the full life cycle of a tailings facility from site selection and design, through construction and operation, to eventual decommissioning and closure.

The tailings management framework will be expanded into checklists that address the various stages of the life cycle. These checklists will provide a basis for developing a customized management system, operating procedures and manuals, exposing gaps within existing procedures, identifying training requirements, communicating with Communities of Interest, obtaining permits, conducting internal audits, and aiding compliance and due diligence, at any stage of the life cycle.

#### **8.2.4.4 Spill Management**

Accidental releases of controlled materials into the aquatic or terrestrial environment could cause acute local damage to those environments. The main risks to the aquatic and terrestrial environment due to an accident or malfunction throughout the Project include the accidental release of:

- hydrocarbons
- tailings
- process water (before treatment).

Appropriate spill response will be initiated should an incident occur and spills will be contained to minimize the areas affected in order to prevent migration to surface waters and to minimize any potential for impact. The potential for damaging fuel spills can be minimized by ensuring that fuel will be shipped to the Project site using licensed carriers, using compartmentalized vehicles equipped with spills containment materials. Drivers will be trained in the use of the materials. Consistent with good operating practice, the fuel storage area has been designed with double-walled tanks to hold 110% of expected capacity.

For tailings, the pipeline has been designed with berming to prevent lateral migration of any spilled materials from a pipeline rupture, and with containment areas in low points along the route. The system will be equipped with flow monitoring devices that will provide automatic shutoff of the pumps. In addition, in the event of a rupture, additional containment has been provided along the pipeline route that is designed to contain 2 hours pumping volume of tailings.

##### **8.2.4.4.1 Minimizing Negative Effects – Spills**

A **Spill Management Plan** will be developed to ensure the negative effects of spills are minimized.

- Spills to terrestrial habitats would be cleaned up as soon as possible following the spill and would include soils testing to ensure that any contaminated soils are also removed.
- Spills to aquatic habitats would require containment followed by cleanup of spills.
- Spilled fuels would be appropriately remediated on site or removed by licensed contractors.
- Soils would be tested during a spill cleanup and adjacent soils that exceed acceptable levels will also be remediated or removed.

OHRG is committed to documenting spills, and further understand their cause so that spills can be minimized. Our spill response procedure will generally include the following step-wise approach:

- 1) Notify your supervisor immediately.
- 2) Ensure your own personal health and safety is protected.
- 3) Stop what you are doing and contain the spill.
- 4) Notify the environmental department.
- 5) Recover the spilled product.

- 6) Put all contaminated materials into an identified spill container.
- 7) Fill out an environmental incident report.
- 8) Implement recommendations.

A **system of safety berms and containment areas** will be included in the Project design.

- Spilled fuels would be contained within the bermed area.
- Effects on aquatic life would be minimized though appropriate containment measures implemented immediately following any spill.
- Berming of the route and containment areas will prevent migration of tailings to adjacent areas of the environment.
- As a result, spills will collect in the containment areas constructed at low points along the pipeline route that are designed to contain 2 hours pumping volume of tailings.

An **Emergency response plan** will be developed with the intention of ensuring cleanup will be quickly implemented to minimize potential effects. Trigger levels for initiating a plan response will be developed and included in the plan, and will be communicated to workforce supervisors as part of their training.

Some additional land disturbance will result from a spill that would affect limited areas of adjacent terrestrial habitat, primarily through subsequent cleanup activities. The effects are predicted to be localized, and affected areas can be re-vegetated to restore most of the original habitat function.

As such the effects from a tailings pipeline rupture would be minor on the terrestrial environment.

#### **8.2.4.5 Contingency Planning and Continuous Improvement**

OHRG will follow a Continuous Improvement Process order to improve processes and environmental management. The fundamentals of this process involve a Plan-Do-Check-Act philosophy. Plans are established based on input from stakeholders. From those plans mitigation and monitoring actions are determined. During operations the plans are implemented and in-design mitigation measures are put in place.

The effectiveness of mitigation measures is checked through a series of monitoring and reporting activities as defined during the formation and implementation of the plan and as identified within this EIS/EA Report. A periodic review of the monitoring information and data then leads to actions which can be taken to improve the effectiveness of the mitigation measures. Initial contingency actions are identified in Tables 8-2, 8-8 and 8-11.

It is expected that OHRG will conduct an annual management and contingency planning review meeting followed by review and updating of contingency plans and standard operating procedures if necessary. The objective of this process will be to identify measures that will improve the safety and security of workers, decrease the potential for environmental impacts and ensure that appropriate contingency measures are considered and available should they be required.

### **8.2.5 Preliminary Cost Estimate**

Costs associated with monitoring plans will be developed in detail following EA approval, based in part on the programs and measures as identified in this section. Some preliminary considerations related to monitoring costs are provided below and include:

- Cost and maintenance of Environmental, Health and Safety Department, workforce training, and environmental staff on site (six full-time staff at \$75K per person = \$450K/yr – salary only).
  - Facilities – laboratory and office space (to be included in capital costs).
  - Minimum of two full-time training staff (one on-site) are required and will work on a rotational basis.
  - Minimum of four full-time environmental staff (two on-site at any given time) are required and will work on a rotational basis.
- Laboratory analyses costs (estimated at \$1 million per year).
- Annual inspections and special programs.
  - Geotechnical / Geochemical inspection (\$50 K/yr).
  - Pit Stability inspection (\$50 K/yr).
  - Vibration Monitoring (\$ 50K/yr).
  - Hydrology \$300 K/yr.
  - Hydrogeology (\$1 million initial cost plus \$100 K/yr monitoring).
  - Conducting of an Aquatic Environmental Effects Monitoring Plan (\$500K/yr).
- Review and reporting (\$500K/yr).

For the purpose of preliminary cost estimation it is assumed that a monitoring budget of \$2 million to \$3 million per year will be required. These estimates will be included in the feasibility costs for the project and will require refinement and updating as the plans are fully developed following EA approval.

## **8.3 Social Management Planning**

Osisko identified community support as an important corporate social objective in the 2012 Sustainable Development Report. Osisko's corporate objective is to support community development by maximizing local and regional benefits. OHRG plans to maximize local benefits by creating jobs and favouring local purchases, facilitating local business development, improving public infrastructure and sharing the wealth with the local and Aboriginal communities.

The socio-economic assessment and Aboriginal findings presented in Chapter 6, Effects Assessment are considered in the following Social Management Plan. These findings are based on community consultation activities such as meetings and workshops as presented in Chapter 7, Public and Aboriginal Engagement.

The overall objectives of the following Social Management Plan is to provide the means for OHRG to work together with the Local and Aboriginal Communities to:

- Understand community needs.
- Clarify community expectations.
- Communicate OHRG's development plans.
- Identify mutually beneficial business opportunities.
- Identify potential independent business opportunities.

The following Social Management Plan was developed to address the avoidance of, minimization of, and/or compensation for negative socio-economic effects and the enhancement of positive benefits that could result from the Project.

### **8.3.1 Atikokan/OHRG Committee**

A local monitoring committee will be established to allow for ongoing communications with the local members of the public. The mandate of the Atikokan/OHRG Committee will be to provide a direct link for communications between community members and OHRG. Information about the Project will be shared with the Committee, and Committee members will disseminate this information to the community at large. In turn, community members can approach the Committee with their concerns, and the Committee can share these community concerns with OHRG.

It is anticipated that the Atikokan/OHRG Committee will be formed prior to the construction phase of the Project, likely in 2014. The structure of the committee will be based on the key parameters to be monitored and is anticipated to include representatives from the following sectors:

- Recreation and tourism.
- Emergency response and preparedness.
- Health and wellness.
- Education and training.
- Municipal infrastructure and services.

The Atikokan/OHRG Committee will also include two Osisko staff members. The committee is anticipated to meet on a quarterly basis and will be consulted throughout all phases of the Project.

As part of Osisko's move towards commercial production at Canadian Malartic in 2011, an independent Monitoring Committee was set up in the Town of Malartic to facilitate ongoing communications with the public and ensure the long term well-being of the community of Malartic is represented. In 2011, the Malartic/Osisko Committee had six members and one coordinator. In 2011, the committee met 12 times. Committee members were able to represent the local community and reached out to community members through:

- Participation in regional mining conferences.
- Meeting with local politicians.
- Participation in Chamber of Commerce activities.
- Meetings with Osisko's management.

OHRG will work with the Atikokan/OHRG Committee to develop measures that contribute to the quality of life of the local populations, including improvements to local infrastructure as may be required.

OHRG will continue to provide **community sponsorships and support** throughout the Project phases. OHRG will follow the same model developed at the Canadian Malartic Project, where a long term beneficiary fund was created. The general criteria for selection of projects supported by the Atikokan/OHRG Committee will be their capacity to improve the cultural, social, physical, educational and environmental components of life for as many Atikokan residents as possible.

### **8.3.2 Aboriginal Committees**

OHRG has initiated a number of Aboriginal committees that will provide focussed communications between OHRG and the communities, and identify ways that the Project can provide ongoing benefits to identified Aboriginal communities. In December 2010, OHRG signed a Resource Sharing Agreement with the member nations of the FFCS and the Lac des Mille Lacs First Nation. OHRG's commitment to providing benefits to First Nations has been ongoing throughout the exploration phase of the Project

**Environment Committee Mandate:** Reviews environmental findings and shares environmental information with community. Supports OHRG management in the development, operation and closing of its project by recommending environmental, archeological and historical considerations relating to the participation of the First Nation peoples or partnered communities in the Project.

**Training, Employment and Economic Development Committee Mandate:** Identify training, employment and economic opportunities and recommend investment projects and initiatives.

**Social and Cultural Committee Mandate:** To provide cross-cultural training to Osisko and First Nations partners by seeking advice through elders and leaders. Determine and advise on necessary cultural activities for events and activities.

Throughout the construction and operations phases of the Project, the established Social and Cultural Committee will provide oversight and direction for appropriate ceremonies that should take place during Project

meetings. The committee will also promote cross cultural awareness and bring forward suggestions for cultural investment opportunities.

- Incorporation of Traditional Knowledge
- Traditional Use Information
- Ojibway Language

Ongoing consideration of traditional use information can contribute to the evaluation of potential effects and their significance, effectiveness of proposed mitigation, and consideration of follow-up monitoring.

In March 2012, OHRG signed a Memorandum of Understanding (MoU) with the Métis Nation of Ontario, including four identified Métis community councils (Kenora, Sunset Country, Northwest and Atikokan). The MoU allowed for the formation of a Métis Consultation Committee that has met regularly throughout the Project planning process. It is anticipated that a similar committee will be formed prior to the construction phase, likely in 2014. The structure of the committee will be dictated based on a negotiated agreement between Osisko and the Métis Nation of Ontario. Based on the success of consultation activities throughout the exploration phase, it is anticipated that the structure of the committee will be similar to the consultation committee engaged throughout the exploration phase, which included the president of each of the four identified Métis communities, the Captain of the Hunt and the Regional Chair, as well as two Osisko staff members, or as mutually agreed upon between Osisko and the Metis communities.

### **8.3.3 Benefit Enhancement**

The Project is predicted to have a positive effect on employment and training. Through ongoing community consultation, OHRG has identified some measures that will further enhance the economic and education benefits of the Project.

OHRG plans to work with local academic institutions such as school boards to develop specialized labour skills in the workforce. On site and on the job training will be a focus as well as upgrading of workforce skills.

OHRG will continue to share anticipated workforce and equipment requirements information with Aboriginal communities and local economic development corporations. Employment opportunities, and their corresponding job postings, will be communicated to the local and Aboriginal communities in a timely manner. OHRG will implement a hire local priority policy, and seek out business opportunities within the local community.

OHRG will continue to promote the utilization of Aboriginal and local enterprises whenever possible in supplying goods and/or services required during each phase of the project. Procurement policies that favour local businesses will be implemented.

The criteria used for the evaluation and awarding of all contracts by OHRG include cost competitiveness, continuity of supply, quality of work and timeliness. Targeted employment, training and business opportunities will be identified through work with local committees.

Throughout consultation, OHRG has heard from Aboriginal communities that Aboriginal culture is important. OHRG has worked with Aboriginal communities to respect customs and provide capacity for traditional ceremonies at the Project site and within the communities.

OHRG has provided capacity for Metis community feasts and a Metis Traditional Knowledge Study in the Project area, both which provide tangible support for the Métis Way of Life.

### **8.3.4 Follow Up Plan**

Social indicators will be identified and confirmed through ongoing consultation. These indicators will be included in a detailed social management plan and will be based on measurements that can be compared over time with those presented in Chapter 3 Baseline Conditions.

Social indicators and detailed social monitoring will be developed in cooperation with the Atikokan/OHRG Committee and Aboriginal Committees established as the Project planning process moves forward.

Monitoring will facilitate the adaptive management of socio-economic effects, many of which are inherently unpredictable. In practice, the monitoring will be based both on ongoing data collection and consultations, and will also use secondary data sources where available.

#### **8.3.4.1 Construction Monitoring**

Consultation on construction monitoring activities is planned for Q2 2014. Consultation will include a committee meeting where the following topics will form the basis of discussion:

- Planned monitoring framework
- Parameters, methods, duration and frequency of monitoring
- Opportunities for community involvement in monitoring activities
- Preferred mechanism for sharing monitoring results

Osisko will also prepare and present community information materials for review by the committee members. Committees will be asked to provide feedback on the preferred method of sharing of information materials with the communities, and be directly involved in communications efforts. A follow up meeting will take place to provide committee members with the opportunity to share community feedback on monitoring plans.

Consultation on operations monitoring is planned to take place prior to operations phase in 2016 and closure monitoring consultation will likely take place in 2027.

Three separate committees will be engaged and consulted on the topic of environmental and social monitoring for the Project. The First Nations committee has already been formed, and consultation with Métis and the public has also been ongoing throughout the exploration phase of the Project.

### **8.3.5 Follow Up Consultation**

OHRG will continue to engage with Project stakeholders, including the local Atikokan/OHRG and Aboriginal communities and consider their comments throughout the Project planning process.

The following broad goals will provide the framework for a follow up consultation plan:

- Share land use information and reporting with First Nations communities: OHRG has collected traditional use information from elders and community members. This information has been shared in a presentation form with the participants of the study; however, OHRG has also committed to providing a report to the communities.

- Respond to questions and concerns heard at open house events: Throughout the community open house events OHRG heard questions and concerns from community members. OHRG will endeavor to provide responses to the comments in a timely and meaningful way.
- Information sharing of EA results: OHRG will prepare and deliver summary presentations that capture the predicted environmental effects and proposed mitigation measures presented in the EIS/EA Report.
- Notice of Submission of Closure Plan: OHRG will circulate a formal Notice when the Certified Closure Plan is submitted to the government.