

Appendix J

Environmental Inspection and Monitoring Plan

**Yellow Falls Hydroelectric Project
Environmental Inspection and
Monitoring Plan**

File No. 160960168



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February 2009

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ENVIRONMENTAL INSPECTION AND MONITORING PLAN**

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1.0 Introduction

Yellow Falls Power Limited Partnership (“YFP”) is proposing to build, own, and operate a 16-megawatt (“MW”) hydroelectric project at Yellow Falls on the Mattagami River, approximately 18 kilometres upstream (south) of Smooth Rock Falls, Ontario (**Figure 1**). Construction of the Yellow Falls Hydroelectric Project (the “Project”) is targeted to begin during the winter of 2008/2009. Commercial operation is scheduled to begin in the fourth quarter of 2010.

This report details inspection and monitoring activities that will be carried out during construction and operation of the Yellow Falls Hydroelectric Project (the “Project”) to ensure continued compliance with applicable legislation as well as mitigation and protection measures contained in the Yellow Falls Hydroelectric Project Environmental Assessment Report (“EA Report”).

1.1 MONITORING AND INSPECTION PLAN STRUCTURE

The Environmental Monitoring Plan for the Project incorporates and builds on data collection undertaken during the development of the Project as documented in the EA Report and through extensive natural environment inventories, including wildlife surveys, vegetation surveys, and aquatic sampling undertaken over multiple seasons since 2005. These baseline studies are integral to comparison with construction and post construction monitoring results.

Section 6.0 of the EA Report identifies potential effects associated with the Project, as well as mitigation and protection measures to address them. The monitoring and inspection plan has been designed to:

- Monitor the effectiveness of the proposed protection and mitigation measures
- Verify compliance of the Project with applicable provincial, and federal standards and guidelines
- Optimize environmental management programs and procedures with the goal of continual improvement.

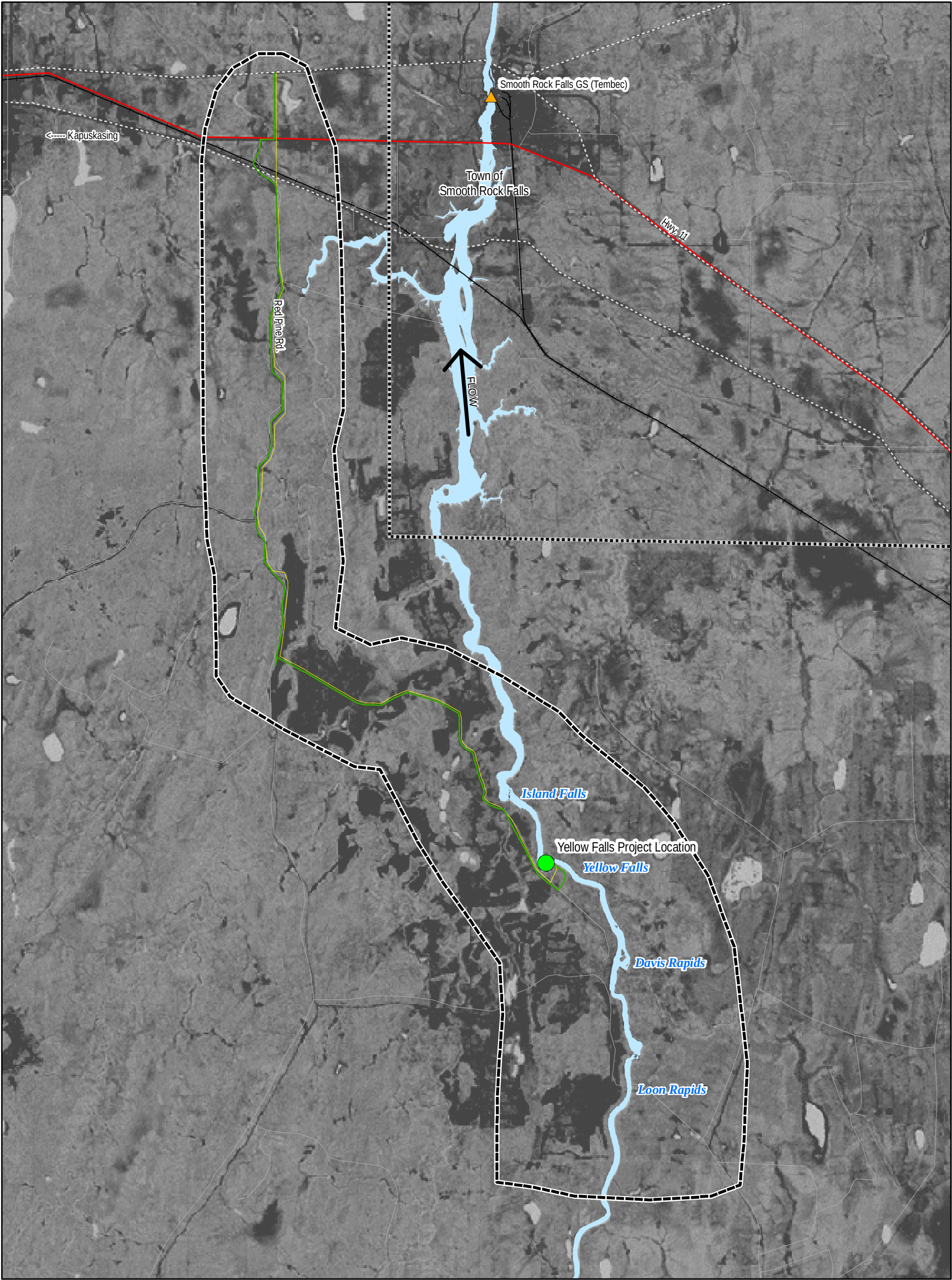
Monitoring activities are prescribed for key environmental components which may experience potential effects (as identified in the EA Report), where legislative requirements must be met, or where necessary to ensure maximum Project benefits to project stakeholders. These environmental components include:

- Terrestrial Environment
- Air and Noise
- Aquatic Environment
- Stakeholder Relations and Local Expenditures

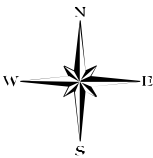
Specific monitoring objectives outlined are described at the beginning of each section. The monitoring activities will determine the level of success in meeting these objectives, and will form

the basis for any subsequent evaluations of the need remediation or mitigation measures. Where objectives are not met, additional mitigation measures may be implemented immediately (e.g. standard on-site construction mitigation measures) or through discussion with the appropriate regulatory agencies.

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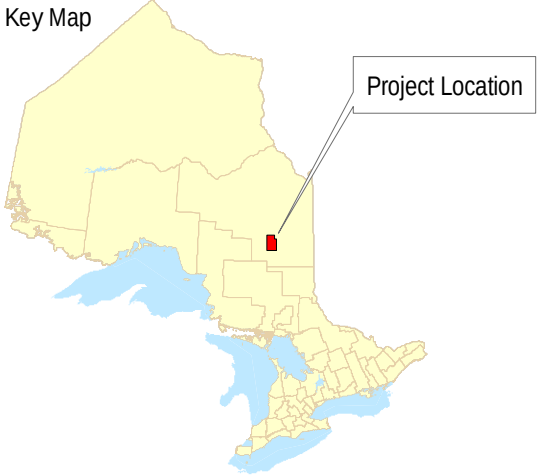
Source:
Airphoto: LANDSAT 7, 2002.
Base Map: LIDS, 2006.



- 60960108_2009-01-30_StudyAreaNew
- Smooth Rock Falls Town Limits
- Yellow Falls Project Location
- Existing 115 kV Power Line
- Proposed Access Road
- Proposed Transmission Line

0 1 2 3 4
Kilometers
1:90,000

Key Map



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FIGURE NO. 1.0

STUDY AREA

Initiated: August 14, 2008
Revised: January 30, 2008

1.2 GUIDING PRINCIPLES

The following principles were used to guide the preparation of the monitoring plan:

- Focus on preventing risks to environment, health, and safety
- Comply with all relevant standards, codes, and practices
- Perform construction, operation, and maintenance activities in a safe and effective manner by trained personnel
- Maintain equipment in good operating condition for protection of worker health and safety, the environment, and property
- Implement all necessary precautions to control, remove, or otherwise correct any environmental, health, or safety hazards identified during the Project lifecycle
- Construct and operate the Project in a manner that meets or exceeds relevant provincial and federal standards that collectively ensure sufficient levels of safety
- Use the results of the monitoring plan in an adaptive management strategy to continually improve management, reduce areas of uncertainty, build on successes and make adjustments to limit failures.

1.3 GOALS AND OBJECTIVES

The monitoring plan seeks to meet the following goals:

- Minimize conflicts with individuals, organizations, and communities
- Minimize or eliminate accidents and malfunctions
- Maintain excellent environmental performance.

Building on these goals, the monitoring plan is designed to achieve the following objectives:

- Comply with all applicable environmental quality standards determined by federal and provincial laws, regulations, and guidelines
- Comply with and evaluate effectiveness of protection and mitigation measures outlined in the EA Report
- Minimize potential environmental effects associated with construction works within waterways
- Characterize and minimize potential environmental effects on natural habitats, flora, and fauna
- Establish measures that provide and promote occupational safety of people directly involved in Project activities
- Characterize and minimize community concerns and address issues in terms of effects identified during the development of infrastructure and/or refurbishment activities.

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1.4 ADAPTIVE RESOURCE MANAGEMENT

Adaptive resource management (“ARM”) is a process that seeks to continually limit effects to baseline conditions or improve on existing conditions through systematic monitoring and adjustment (from MNR, undated). ARM requires managers or planners to make decisions on the best available information and is particularly useful in dealing with uncertainty or addressing complex, changing systems (MNR, 1999). ARM consists of six steps (from MNR, undated):

1. **Plan** resource management using the best available data. Essentially, the EA Report is a plan designed to reduce effects of the Project by planning how resource management will occur and outlining protection or mitigation measures to reduce or eliminate Project effects.
2. **Design** changes, mitigation, or protection measures based on scientific principles. This step represents the detailed design phase of the Project, where it is determined how best to implement management, protection, or mitigation measures outlined in the EA Report.
3. **Implement** changes, mitigation, or protection measures. This step represents construction or application of management, mitigation, or protection measures.
4. **Monitor** changes, mitigation, or protection measures. This document outlines how management, mitigation, and protection measures will be monitored during project construction and operation.
5. **Evaluate** results using data obtained from monitoring, including subsequent publication of monitoring results.
6. **Adjust** management, mitigation, or protection measures to ensure maximum benefits.

This monitoring plan represents Step 4 in the ARM process. Evaluation of monitoring data represents Step 5 of the process. If monitoring data indicates that goals and objectives outlined in the following sections are not being met, alternative or additional mitigation or protection measures may be required as discussed with relevant agencies at that time (Step 6). ARM is an iterative process, which means that in the event additional mitigation or protection measures are required, the results of employing such measures must be determined, evaluated, and adjusted if necessary. In some cases, goals and objectives may be altered to be more, or less stringent.

1.5 REVIEW OF MONITORING EFFORTS

In keeping with the principle of ARM, the monitoring plan and monitoring requirements will be reviewed assessed during years 3, 5, 8, 11, and 14 of operation. The purpose of the review will be to:

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- Identify monitoring activities that are no longer warranted (e.g. monitored parameter is demonstrated to be stable and future changes are not anticipated);
- Identify monitoring activities that require additional monitoring beyond the anticipated monitoring duration (e.g. monitored parameter continues to experience unexpected and undesirable variations);
- Identify monitoring techniques and methods that may be refined to improve monitoring precision.

1.6 MONITORING RESPONSIBILITIES

As the Project proponent, YFP is ultimately responsible for the fulfillment of the monitoring initiatives described in this monitoring plan. Due to the varied and technical nature of the monitoring initiatives, YFP may select certain persons to conduct the required inspections, field work, or reporting of behalf of YFP. These individuals may include any or all of: the on-site construction manager, environmental monitor, contractors, consultants, or YFP operations staff. In all instances, YFP will be responsible for ensuring that the responsible parties acting on its behalf are appropriately qualified and aware of their specific monitoring responsibilities.

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2.0 Air and Noise

2.1 MONITORING AND MANAGEMENT OBJECTIVES

The objective of air and noise monitoring is to provide a management tool that ensures the implementation of mitigation measures that minimize potential effects on air quality and noise. Specific monitoring objectives are provided in **Table 2.1** below.

Table 2.1 Air and Noise Monitoring and Management Objectives

Management Goal	Objective	Timeframe
Minimize dust generation on site	- Limit the effect of dust created by vehicle travel, exposed soil, and blasting on nearby vegetation and local air quality - Meet Certificate of Approval - Air ("CofA - Air") requirements associated with the concrete batch plant (if required)	Construction
Minimize effects on local air quality resulting from equipment use.	- No vehicles are operated without appropriate noise attenuation - Vehicles and equipment are maintained according to manufacturer's service recommendations where appropriate - No unnecessary idling	Construction
Minimize effects of project on background noise	- Sound levels meet CofA (Air) requirements - Ensure project components (i.e. powerhouse/dam structure and electrical equipment) are in compliance with CofA (Air)	Operation

2.2 MONITORING OR INSPECTION METHODOLOGY

2.2.1 Construction

The construction manager or designated person will ensure that visible dust plumes do not exceed opacity (amount of light obscured by particles in the air) of approximately 20%, or extend more than 30 m from the dust generating operation (based on California Air Resources Board, undated) at the construction site and along access roads. A water truck will be available during dry periods to ensure that dust control measures can be quickly implemented if necessary.

An on-site designated person will monitor vehicles and other fueled equipment for fuel/lubricant leaks, and for functional mufflers. Construction equipment maintenance logs will be kept and be made available for inspection by the proponent or relevant agencies. The designated person will enforce the no-idling policy, which prohibits idling in excess of 5 minutes unless necessary.

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During construction of the Project, a concrete batch plant may be required. The establishment of a batch plant will require a CofA (Air) from the MOE. Any monitoring or reporting requirements identified in the CofA (Air) will be undertaken.

2.2.2 Operation

Prior to construction of the Project, a CofA (Air) must be obtained from the MOE in accordance with Section 9 of the *Environmental Protection Act*. In order to obtain the C of A (Air), the Project must adhere to MOE publication *NPC 232 – Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)* and *NPC-233 – Information to be submitted for Approval of Stationary Sources of Sound*. In order to obtain a CofA (Air), the project must demonstrate that during operations, the project will meet MOE guidelines for a Class 3 (rural) environment. Monitoring and reporting requirements identified in the CofA (Air) will be undertaken.

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3.0 Terrestrial Environment

3.1 MONITORING AND MANAGEMENT OBJECTIVES

The objective of terrestrial environment monitoring is to provide a management tool that confirms the effectiveness of prescribed terrestrial mitigation measures in addressing potential effects on the physical terrestrial environment, control of surface runoff and erosion, and flora and fauna. Specific monitoring objectives are provided in **Table 3.1** below.

Table 3.1 Terrestrial Environment Monitoring and Management Objectives

Management Goal	Objective	Timeframe
Physiography and Soil		
Minimize local effects related to spills of hazardous substances	- No reportable accidental releases or spills - In the event a reportable release or spill occurs, prompt action is taken to control the extent of affected soil. Contaminated soil is disposed of properly. If necessary, the MOE Spills Action Centre is notified. - Accurate records and reports of all spills are maintained to ensure that appropriate measures are undertaken to prevent reoccurrence.	Construction and Operation
Minimize soil erosion on site	- No widespread erosion of slopes - Effective silt fence and other erosion control measures - Minimal occurrences of slumping/sliding - Erosion control measures are located appropriately - Erosion control measures are maintained to ensure proper function at all times	Construction
Minimize effects to local soil quality/quantity	- Topsoil integrity is maintained - Topsoil is redistributed to same or greater depth than pre-existing conditions - Compaction is removed as necessary to ensure success of revegetation efforts	Construction
Reduce or mitigate the potential for Acid Rock Drainage (ARD)	- No decrease in the pH of surface waters - Minimize the potential generation of ARD	Construction and Operation
Reduce or mitigate releases of alkaline cement leachate from concrete structures and cement waste	No increase in the pH of surface waters	Construction and Operation
Unexpected Finds		
Unexpected finds are managed appropriately	- All instances of unexpected finds (i.e. archaeological, contaminated soil) are reported - Appropriate actions are undertaken in accordance with relevant provincial or	Construction

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	Federal guidelines. ■ Action taken is recorded	
Waste Disposal		
Waste and recyclable material is disposed of appropriately	■ Materials are recycled where reasonably possible ■ All hazardous materials are stored and disposed of appropriately ■ All hazardous waste is registered on the Ministry of the Environment's Hazardous Waste Information Network	Construction and Operation
Vegetation		
Minimize losses of natural terrestrial vegetation	■ No removal of unnecessary trees and other vegetation ■ Proper treatment and processing of merchantable timber ■ Proper disposal of slash	Construction and Operation
Ensure vegetation is re-established as appropriate	■ All areas where soil exposed during have regenerated within 3-5 years post operation	Operation
Ensure fire hazards are minimized	■ Project-related activities do not cause any uncontrolled fires	Construction and Operation
Wildlife		
Maintain local ecological integrity	■ No unnecessary effects on wildlife during on-land construction	Construction

3.2 MONITORING OR INSPECTION METHODOLOGY

3.2.1 Construction

Physiography and Soil

A record-keeping and reporting mechanism will be developed for any accidental spills or releases. All accidental spills or releases will be recorded by the construction manager and reported to the MOE through the Spills Action Centre as required by the Ontario *Environmental Protection Act and Ontario Regulation 675/98 – Classification of Spills and Reporting of Discharges*.

A designated person will make a periodic inspection of areas where the potential for soil erosion is high and erosion control measures are in place. A record will be made of any continuing erosion or repairs needed. The record will include the date that repairs were needed and the date the erosion control measure was repaired. A record will also be kept of any additional erosion control measures needed and the date installed.

During topsoil removal, a designated person will note and record the depth and quality of the topsoil in a number of areas. During re-distribution, topsoil depth will be recorded to ensure similarity to pre-existing conditions. Any further mitigation undertaken such as de-compaction will also be recorded.

Samples of local bedrock will be analyzed for acid-generation potential following recognized techniques such as are provided in Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia (Price and Errington, 1998). Results of tests will be discussed with MOE, MNR, and EC to develop mitigation strategies if required.

Unexpected Finds

Where soil excavation is occurring, construction personnel will watch for unexpected finds such as contaminated soils, human remains, or other items of potential concern. If unexpected finds are encountered, a record will be made of the time and location of work stoppage and subsequent actions taken as prescribed in the EA report.

Waste Disposal

The quantity of material sent to landfill and recycled will be recorded by the licensed waste contractor.

Vegetation

In accordance with the *Crown Forest Sustainability Act*, YFP and the Sustainable Forest License holder (Tembec Industries Inc.) are required to execute an agreement pertaining to the harvesting of merchantable timber associated with Project construction. As required by Ontario Regulation 247/06, the agreement includes requirements for the recording of harvested timber, as well as requirements for its delivery to mills.

Records regarding merchantable timber will be kept and reported (to Tembec and MNR) in accordance with the overlapping agreement between Yellow Falls Power LP and Tembec Industries Inc.

The designated person will ensure adherence to clearing limits and will record any infractions or remedial actions necessary as a result of clearing. Records will be kept of fire-hazard planning, training, and infractions.

Wildlife

If clearing during bird breeding season (May 16 to July 31) is required, a biologist will inspect the site prior to construction to ensure that there are no sensitive species that may be harmed by tree removal or other activities. Trees with nesting migratory birds will not be cut. A biologist will be consulted regarding vegetation clearing plans to ensure breeding birds losses are avoided in the event that clearing will occur during breeding season.

3.2.2 Operation

Physiography and Soil

All accidental spills or releases will be recorded by the plant operator and reported to the MOE Spills Action Centre as required by the Ontario *Environmental Protection Act* and *Ontario Regulation 675/98*.

Waste Disposal

The quantity of material sent to landfill and recycled will be recorded by the waste contractor. The Project will be registered with the MOE Hazardous Waste Information Network ("HWIN"). All Hazardous waste disposal will be documented through HWIN.

Vegetation

The condition of re-vegetated areas will be evaluated and reported on an annual basis beginning the first year following completion of construction. The need for continued annual monitoring will be reviewed with the MNR after each year. The need for subsequent monitoring will be based on effectiveness of re-vegetation activities. If re-vegetated areas show evidence of erosion, or if plant material has not survived, additional mitigation (e.g. replantings, alternative planting methods, nurse crops, etc.) and additional reporting may be required.

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4.0 Aquatic Environment

4.1 MONITORING AND MANAGEMENT OBJECTIVES

The objective of aquatic environment monitoring is to provide a management tool to evaluate the effectiveness of aquatic mitigation measures and identify changes in the aquatic environment through the measurement of various parameters, including water quantity and quality, sediment quality, and fish and fish habitats. Specific monitoring objectives are provided in **Table 4.1** below.

Table 4.1 Aquatic Monitoring and Management Objectives

Management Goal	Objective	Timeframe
Water Quantity and Quality		
Limit changes to water quantity downstream of the dam	- Compliance with applicable Permits to take Water - Maintain a minimum of 15 m³/s discharge to the downstream reach.	Construction
	- No significant negative effect on the existing regulated flow regime - Maintain a minimum of 15 m³/s discharge to the downstream reach.	Operation
Limit changes to water quality in the headpond or downstream of the dam	- No increase in turbidity of the Mattagami River downstream of the construction site in excess of the Provincial Water Quality Guideline (i.e., background + 10%) - No releases of deleterious substances as defined in the Ontario Water Resources Act (Section 53), or in Section 36 of the <i>Fisheries Act</i>.	Construction
Ice Formation		
Record ice formation	Monitor the development of ice during winter	Operation
Sediment		
Limit unexpected changes to quantity of sediment in the headpond	No input of sediments to the Mattagami River from soil erosion associated with construction-related activities	Construction
	Minimize amount of shoreline erosion in the headpond	Operation
Limit unexpected changes to sediment quality in the headpond or downstream of the dam	No input of sediments to the Mattagami River from soil erosion associated with construction-related activities.	Construction
	- Minimize amount of shoreline erosion in the headpond - Maintain natural flow regime.	Operation
Fish and Habitat		
Minimize effects to fish from construction	Recovery and relocation of fish in dewatered	Construction

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activities	areas - relocation will be considered complete when no fish are readily located in the dewatered area Record of fish relocated for verification of compliance	
Habitat features and habitat utilization are similar to that predicted following commencement of operations	Quantify and characterize post-construction habitat and utilization	Operation
Fish movement is similar to that predicted following commencement of operations	Characterize post-construction fish movement	Operation
No unexpected changes to the fish community in the vicinity of the headpond, with particular reference to the four key species (white sucker, northern pike, walleye, lake sturgeon).	Quantify and characterize post-construction changes to upstream and downstream fish populations	Operation
No unexpected changes to the forage-base fish community in the vicinity of the headpond.	Quantify and characterize post-construction changes to upstream and downstream forage-base fish community.	Operation
Aquatic vegetation in the headpond naturally develops to appropriate levels providing fish habitat.	Quantify aquatic vegetation communities.	Operation
Habitat Compensation		
Compensation provides intended net benefit as per predictions within anticipated time frame.	- Quantify and characterize productivity of habitat enhancement efforts - Determine stability of spawning structures and substrate	Operation
Impingement		
Limit fish mortality due to facility impingement	Characterize impingement losses	Operation
Benthic Communities		
No unexpected changes to the composition of the benthic community within the vicinity of the headpond.	Quantify and characterize post-construction changes to upstream and downstream benthic communities	Operation
Mercury in Sport Fish Tissues		
Document any increase in methyl mercury levels in tissues of sport/game fish.	- Removal of trees within proposed headpond to minimize amount of organic matter within the inundated areas, as per MNR guidelines - Quantify and characterize upstream and downstream accumulation of methyl-mercury in sport fish	Operation

4.2 MONITORING AND INSPECTION METHODOLOGY

Monitoring of the aquatic environment will occur during construction and operation. Construction monitoring will focus on establishing the performance of environmental mitigations such as fish recoveries, sediment and erosion control measures. Operational monitoring will characterize changes to water and sediment quality, and fish and fish habitats within the immediate study area. As noted in **Section 1.5**, the need for, and refinement of, any subsequent monitoring activities will be reviewed following monitoring for years 3, 5, 8, 11, and 14 and determined with the relevant agencies (e.g. MNR, DFO, MOE, and EC).

4.2.1 Construction

Water Quality and Quantity

Turbidity of water will be monitored during periods of any in-water work to demonstrate that excess sedimentation did not occur. A hand-held turbidity meter instead of a secchi disk (as specified in the *Provincial Water Quality Objectives*) will be used to collect water samples upstream and downstream of the work area to characterize the natural background turbidity and effects of in-water work to water clarity as described in *Provincial Water Quality Objectives* (MOE, 1994). An increase in turbidity in excess of the background + 10% will cause a work stoppage until sources of sediments and other suspended materials can be mitigated. The MOE Timmins District manager will be notified in the event that downstream turbidity exceeds 10% of upstream readings during construction.

The designated person will take turbidity readings as required. During in-stream work, this may be necessary several times per day to ensure compliance. Once cofferdams have been constructed, turbidity readings may only be required on a daily basis. Visual inspection of the affected water body for sedimentation indicators such as colour change and sediment plumes will aid in determining the need for turbidity measurements to ensure that turbidity does not increase beyond 10% of background levels at the time. A log book of daily measurements will be maintained on-site for inspection by relevant agencies. In addition, a daily photographic record of surface water conditions will be maintained in digital format prior to, during, and after construction and will be made available to relevant agencies on request.

Large-volume (> 50,000 L per day) water takings during construction will be permitted using a Permit to Take Water ("PTTW"), as required by MOE in accordance with Ontario Regulation 387/04 under the *Ontario Water Resources Act*. Reporting of water takings to the MOE will be as required under the PTTW.

Fish

Fish will be removed from areas to be dewatered prior to and during dewatering activities as necessary using non-lethal methods such as seine netting, electrofishing, and dip netting. Fish will be relocated to a designated (upstream) area of the Mattagami River. Fish removed from the work areas will be identified to the species level. Number of each species will be recorded to provide additional baseline data.

4.2.2 Operation

Water Quantity and Quality

Due to the nature of run-of-river operation, and the limited storage capability of the Project, discharges from the powerhouse and spillway will be determined by natural river flow. The Project will operate based on headpond level control, whereby a headpond level of 244 +/- 0.15

metres above sea level is maintained. Therefore, release flows from the facility match the flows entering the headpond. Flows and levels will be monitored and reported as recommended by the MNR (2006) and as described in Section 12.0 of the Mattagami River Water Management Plan.

- Instantaneous discharge reading will be recorded to two significant digits hourly on the top of the hour
- Instantaneous headpond water level reading will be recorded to two significant digits hourly on the top of the hour
- Data will be supplied to the MNR on an annual basis in comma-delimited format. Each file will begin with metadata required by the MNR followed by time series information.

An Annual Compliance Report will be provided to the MNR, the Standing Advisory Committee and Steering Committee for the Mattagami River Water Management Plan by January 30 of each year. The report will outline actual operations compared to planned, detailed description of any non-compliance incidents, rationale for non-compliance incidents, and proposals for corrective actions if required

Notwithstanding the limited ability of the Project to affect downstream flows, in order to meet the Mattagami River Water Management Plan requirements for the Smooth Rock Falls Generating Station, a minimum of 15 m³/s will be maintained to the downstream reach at all times. If the minimum discharge requirement cannot be provided (resulting from low-water yields from the upstream reach for example), or in the event headpond levels differ from Mattagami River Water Management Plan ("WMP") requirements, YFP is required to verbally notify the MNR within 24 hours of the incident with the following information in accordance with the WMP:

- Nature of the incident
- Reason for occurrence
- Corrective measures taken to regain compliance
- Timeframe
- Any corrective action required.

YFP will be required to provide a written report to MNR of the non-compliance incident within 30 days, including a rationale for the incident and any corrective actions if required. The MNR will then have 90 days to respond.

Water discharges from the Project will require a PTTW from the MOE. Reporting of water takings to the MOE will be as required on an annual basis under the PTTW.

Water quality of the mainstem Mattagami River will be monitored seasonally (winter, spring, summer, autumn) for the first five years of operation, with sampling occurring upstream of the headpond (Loon Rapids), in the headpond, and downstream of the dam (three locations). Water quality parameters will include temperature, dissolved oxygen, turbidity, total dissolved solids, total suspended solids, total mercury, pH, conductivity, alkalinity, metals, and nutrients (specifically, phosphorus, nitrate/nitrite, ammonia). Congruent maximum air temperatures will be recorded.

Profiles of dissolved oxygen, pH, and, nutrients in the headpond will be characterized during periods of possible stratification (i.e., winter, summer), and when safety allows (i.e., not during periods of thin or instable ice).

Any on-site potable water supplies will be tested and results reported as set out in *Ontario Regulation 252/05*.

Ice Formation

Ice thickness in the headpond will be monitored to investigate changes in ice formation on the Mattagami River in this area. Ice development within the headpond and downstream of the dam will be monitored and documented photographically on an annual basis for the first three years of operation. Ice thickness on the headpond will be determined prior to conducting any winter sampling of water quality.

Photographs will be taken at locations in the headpond, immediately upstream of the facility, and immediately downstream of the facility. The same photo locations and views will be used each year.

Sediment Quality

The bathymetry of the headpond will be characterized during the first year of operation and subsequently in 5-year intervals to year 15. Bathymetry will be benchmarked to permanent stations situated above the high-water mark to allow an estimation of the volume of materials being retained behind the dam. An electronic map of headpond bathymetry will be provided to the MOE.

Sediments within the headpond will be sampled during years 1-5 of operation, and subsequently in years 8, 11, and 14 as determined in consultation with relevant agencies. Sediment samples will be analyzed for both physical (grains size, moisture content, total organic carbon), and chemical attributes (nutrients, metals, total mercury). Sediment samples will be collected from multiple locations within the headpond including deep water, and sublittoral areas (i.e., newly flooded terrestrial environment) to be determined following commencement of operation. Sediment sampling will be conducted during summer.

Fish and Fish Habitat

Fish and Fish Habitat monitoring will be undertaken each year for the first five years, then every three years (i.e. years 8, 11, and 14) until the end of the 14th year of operation, subject to periodic review of the scope of monitoring efforts as noted in **Section 1.5**. At year 14, the need for, and nature of, any subsequent monitoring activities will be reviewed and determined with the relevant agencies (e.g. MNR, MOE, EC, DFO).

Aquatic vegetation in the headpond will be mapped each year in which monitoring is conducted. Vegetation will be classified as emergent, submergent or floating, and will be identified to genus/species. Coverage will be mapped using GIS so that the area of coverage can be computed each year, and so that changes in coverage can be quantified and mapped.

In the first summer of operation, flow velocities, depths (see bathymetry characterization above) and substrate will be characterized in the headpond and downstream of the dam, in sufficient detail to re-compute habitat suitability scores for the four target species (white sucker, walleye, pike, lake sturgeon). A comparison of habitat suitability scores for the headpond reach and the reach below the dam with baseline suitability scores contained in **Appendix G1** of the EA Report will be made.

Use of fish habitats within the Mattagami River will be characterized during Project operation as part of aquatic environment monitoring. Fish communities will be sampled with a variety of gear, employed systematically throughout reaches within the headpond, and downstream of the dam.

Sampling locations will generally align with those at which baseline data was collected prior to Project construction so that operational data can be directly compared with pre-construction data. Fishing will include the use of short gill-net sets to characterize the use of habitats by the target species (i.e. white sucker, walleye, northern pike and lake sturgeon). Shoreline habitats may be fished using electrofishers (boat or backpack) to characterize the composition of the forage-base fish community, as well as young-of-the-year and juvenile stages of key species (white sucker, walleye, pike, lake sturgeon). Confidence intervals will be provided for Catch per Unit Effort ("CPUE").

All catch data will be effort-related to allow for computing catch-per-unit-effort within major habitat classes.

The condition of individuals of the target fish species will be assessed. For specimens of white sucker, walleye, pike and lake sturgeon, any caught fish will be measured (length), weighed, and aged (from a non-lethal aging structure, scale or fin ray). Gender will be determined from external features, if possible. Data for each species and each major location (upstream, headpond, downstream) will be used to estimate average condition factor and size-at-age (i.e., growth). Sturgeon will be marked using Floy tags located on the left dorsal side of each fish. Trends over time in each of the three locations will be determined, and compared to baseline

data. For any fish that do not survive capture, additional endpoints will be recorded including the following: liver weight, gonad weight, carcass weight. These additional measurements can provide additional evidence of the condition of a population as per the *Metal Mining Environmental Effects Monitoring – Technical Guidance* (Environment Canada, 2002).

Any bass and perch caught will be recorded, measured (length) and weighed to determine population changes resulting following Project construction.

Habitat Enhancement

Two fish habitat compensation measures will be constructed by YFP. A spawning channel will be created in the headpond, and improvement will be made to spawning habitat in the North Muskego River. Compensation measures are detailed in the **Fisheries Compensation Plan** prepared by YFP (**Appendix G4**). Fish habitat compensation measures will be assessed during years 1-5 of operation, and subsequently in years 8, 11, and 14 during spring sampling, subject to the periodic review described in **Section 1.5**.

Headpond Habitat Compensation Monitoring

Utilization of the spawning channel by the target fish species will be determined through fishing and deployment of egg mats.

Fishing will utilize short-set gill nets and/or electrofishing as appropriate. Fish caught in the vicinity of these structures will be identified (to species), aged (with a non-lethal aging structure), measured for length and weighed.

Egg mats will be deployed during spring at water temperatures corresponding to spawning temperatures of target species. Captured eggs will be enumerated and identified by species.

Benthic invertebrate production within the spawning channel will be assessed in the fall of each of the first three years following channel construction. A qualitative assessment of benthic species present and their relative abundance will be completed. Results of these assessments will be compared to benthic community monitoring taking place elsewhere within the Project footprint.

Stability of the spawning substrate and structures within the channel will also be visually assessed, while photographs will be taken for communication to DFO.

North Muskego Habitat Compensation Monitoring

Monitoring of fish utilization will be undertaken in the spring and will include a visual assessment of stability/condition of the channel, as well as a description of substrate disruption or sedimentation (if any). A photographic record will be maintained for transmission to the MNR and DFO as part of the annual monitoring report. Egg mats will be deployed on the new substrate during spring at water temperatures corresponding to spawning temperatures of target species. Captured eggs will be enumerated and identified by species.

Benthic invertebrate production on new substrate will be assessed in the fall of each of the first three years following channel construction. A qualitative assessment of benthic species present and their relative abundance will be completed.

Benthic Communities

Surveys of benthic invertebrates will be carried out as a core component of the aquatic environment monitoring. Benthos will be collected upstream of the headpond, within the headpond, and downstream of the dam, in areas in which baseline data have been collected, in order to assess effects of the dam on benthos. Surveys of benthic invertebrates will be synoptic with surveys of water and sediment quality. Surveys will occur in the summer/fall for the first five years of operation. Sampling design will be in accordance with Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring (EC, 2002)

Mercury in Sport Fish Tissue

Methyl-mercury (MeHg) can accumulate in water, sediment and biota due to inorganic mercury release from vegetation (i.e., trees) and soil sources in anoxic conditions (i.e., flooded) and then methylated by anaerobic microbial transformation. In this section of the Mattagami River, mercury levels in the tissues (filets) of local game fish species (walleye, pike) will be used to investigate MeHg concentrations following impoundment.

Samples of each species will be collected from three locations: upstream of the headpond, within the headpond, and downstream of the dam (representing three sets of samples). Sampling will target a range of sizes of fish to characterize the effect of fish size on tissue body burdens, and with an adequate number of fish per year per location to produce a statistically robust comparison across years as discussed in Environment Canada's 2002 *Metal Mining Environmental Effects Monitoring – Technical Guidance*. Sampling with non-lethal methods (i.e., tissue plugs) will be explored to minimize effects on the local fishery.

5.0 Stakeholder Relations and Local Expenditures

5.1 MONITORING AND MANAGEMENT OBJECTIVES

The objectives of stakeholder relations and local expenditures monitoring are described in **Table 5.1** below:

Table 5.1 Stakeholder Relations and Local Expenditures Monitoring and Management Objectives

Management Goal	Objective	Timeframe
Complaints, comments, and requests are recorded and an appropriate response is given in a reasonable time frame	▪ Inquiries responded to within five business days ▪ Limited number of complaints regarding same subject matter	Construction and Operation
Compliance with WMP and note any stakeholder requests which may be met through future operating modifications	▪ Maintain record of stakeholder suggestions/requests for WMP review	Operation
Expenditures are made within the local community where possible	▪ Quantify local expenditures as percentage of total project budget ▪ Verify local expenditures	Operation

5.2 MONITORING OR INSPECTION METHODOLOGY

5.2.1 Construction

A comment tracking and response procedure will be developed that will involve:

- Posting of contact phone number and e-mail address at strategic locations at the site during construction and publication in local newspapers 1-2 weeks prior to the start of construction.
- Creation of a database which will allow contact information, date, and the comments to be recorded. The database will also record the date and content of response.

The location of major construction expenditures for goods and services (i.e. over \$10,000) should be recorded and mapped to ensure that local expenditures can be quantified. Following construction, results should be provided to the Town of Smooth Rock Falls and the District MNR.

5.2.2 Operation

A comment tracking and response procedure will be developed that will involve:

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- Posting of contact phone number and e-mail address at strategic locations at the site during construction
- Development of a database which will allow contact information, date, and the comments to be recorded. The database will also record the date and content of response. All comments should be responded to.

The location of major maintenance expenditures for goods and services (i.e. over \$10,000) should be recorded and mapped to ensure that local expenditures can be quantified.

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6.0 Summary of Inspection and Monitoring Requirements

6.1 CONSTRUCTION INSPECTION AND MONITORING

The construction inspection and monitoring will be undertaken by a qualified designated person who will report to YFP and will be responsible for ensuring that all environmental regulations, procedures, and specifications are adhered to, including mitigation and protection measures contained in the EA Report. A daily log will be recorded by the designated person.

A summary of construction inspection and monitoring tasks is provided below. In some cases, specialized personnel may be required to undertake inspection or monitoring.

Table 6.1 Summary of Construction Inspection and Monitoring Requirements

Feature	Monitoring Requirements	Parameter Triggering a Response	Reporting Requirements
Air and Noise			
Dust control	Record dry or dusty conditions and actions taken as necessary	- Dust plume opacity of approximately 20% - Dust plume exceeding approximately 30 m in length	Following construction
Condition of construction equipment/ emissions Emissions from temporary concrete batching plant	- Monitor for leaks, maintenance records, and functional mufflers - Record anti-idling policy infractions as required - As detailed in CofA (Air) for temporary concrete batching plant	- Leaks - Scheduled maintenance - Extended idling - As detailed in CofA (Air) for temporary concrete batching plant	- Following construction - As detailed in CofA (Air) for temporary concrete batching plant
Terrestrial Environment			
Accidental spills or releases onto soil	Collect data on type of spill, frequency, and volume	Accidental spill or release	- If necessary, the MOE Spills Action Centre is notified as soon as reasonably possible - Minor spills and remedial actions undertaken will be recorded and reported following construction
Erosion control	Monitor and record continuing erosion, mitigation measures taken, and repairs	- Continuing erosion - Deterioration of mitigation measures	Following construction

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Summary of Inspection and Monitoring Requirements

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Table 6.1 Summary of Construction Inspection and Monitoring Requirements			
Feature	Monitoring Requirements	Parameter Triggering a Response	Reporting Requirements
Topsoil	- Record depth and quality of topsoil removed during construction - Record depth and quality of topsoil replaced following construction	Inadequate topsoil depth	Following construction
Unexpected finds	Record and notify appropriate agencies regarding unexpected finds	Unexpected find	As required
Waste and recycled materials	- Record of material sent to landfill or recycled - Documentation of hazardous waste through HWIN	- Large amount of recyclable material sent to landfill - Hazardous waste produced	Following construction
Acid rock drainage and metal leaching	Samples of local bedrock will be analyzed for acid-generation potential following recognized techniques such as are provided in <u>Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia</u>.	Potential for acid rock drainage/metal leaching	- Prior to construction involving excavation or exposure of bedrock - Results of tests will be discussed with MOE, MNR and EC to develop mitigation strategies (if required).
Avoid disturbance of breeding birds	Record locations of active nests and measures taken to avoid disturbance to breeding birds if tree clearing is required during breeding bird season	- Nests noted in construction/clearing area - Tree clearing during breeding bird season	Following construction
Habitat changes/forest valuation	Record general type of tree species and quantity removed	As required by Forest Resource License/Sustainable Forest Licence holder	Following construction
Fire hazards	Record fire hazard planning, training, and planning/policy infractions	Fire hazard planning/policy infraction	Following construction
Aquatic Environment			
Sedimentation/turbidity	Record turbidity readings taken during construction and actions taken to avoid or reduce sedimentation	Turbidity approaching 10% over background levels	Following construction

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 Summary of Inspection and Monitoring Requirements
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Table 6.1 Summary of Construction Inspection and Monitoring Requirements

Feature	Monitoring Requirements	Parameter Triggering a Response	Reporting Requirements
Accidental spills or releases onto soil	Collect data on type of spill, frequency, and volume	Accidental spill or release	- If necessary, the MOE Spills Action Centre is notified as soon as reasonably possible - Minor spills and remedial actions undertaken will be recorded and reported following construction
Permit to Take Water	Record volume of water taken on a daily basis or as required by the PTTW	As required by PTTW(s)	As required by PTTW(s)
Fish	- Relocate fish from dewatered areas - Record species and quantity	Dewatering activities	Following construction
Stakeholder Relations and Local Expenditures			
Stakeholder relations	Maintain record of comments, issues, and complaints, including responses	Comment, issue, or complaint received	Following construction
Local expenditures	- Maintain records of locations and amounts of Project expenditures - Geographical representation	Expenditures greater than \$10,000	Following construction

6.2 OPERATION MONITORING

Monitoring during operation will consist of detailed investigations to occur as noted below. Monitoring is designed to ensure objectives outlined in the preceding sections are met. Following the principle of adaptive management, if objectives are not achieved, additional mitigation, protection, or compensation may be required as discussed with relevant agencies.

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Summary of Inspection and Monitoring Requirements

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Table 6.2 Summary of Operation Inspection and Monitoring Requirements			
Feature	Monitoring Requirements	Parameter Triggering a Response	Reporting Requirements
Air and Noise			
Noise emissions from power plant	As detailed in CofA - Air	As detailed in CofA - Air	As detailed in CofA - Air
Terrestrial Environment			
Accidental spills or releases onto soil	Record and collect data on type of spill, frequency, and volume	Accidental spill or release	If necessary, the MOE Spills Action Centre is notified as soon as reasonably possible
Waste and recycled materials	- Record quantity of material sent to landfill and recycled - Documentation of hazardous waste through HWIN	- Large amount of recyclable material sent to landfill - Hazardous waste produced	- Internal reporting – available to government agencies as requested - As required by HWIN program
Condition of re-vegetated areas.	Visual assessment of re-vegetated areas on an annual basis	Re-vegetation appears to be unsuccessful	Annual report for first 3 years
Aquatic Environment			
Water Quantity and Quality	- Record headpond level on a continuous basis - Record volume of water taken as required by the PTTW and WMP (i.e. m³/s) - Record and collect data on any accidental spills - Record water quality parameters (temperature, dissolved oxygen, turbidity, total dissolved solids, total suspended solids, total mercury, pH, conductivity, alkalinity, metals, and nutrients (specifically, phosphorus, nitrate/nitrite, ammonia)) in the headpond and downstream of the Project works - Document powerhouse drinking water quality as required by Ontario Regulation 252/05	- Headpond level or discharge does not meet WMP limits - As required by PTTW - Accidental spill or release - Unexpected changes in water quality parameters - Sampled powerhouse drinking water quality does not meet Ontario Drinking Water Quality Standards (Ontario Regulation 169/03)	- Report headpond level as specified by WMP requirements - Report volume of water taken as specified by the PTTW - Report accidental spills, if necessary, the MOE Spills Action Centre is notified as soon as reasonably possible - Report on powerhouse drinking water quality as required by Ontario Regulation 252/05

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Summary of Inspection and Monitoring Requirements

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Table 6.2 Summary of Operation Inspection and Monitoring Requirements

Feature	Monitoring Requirements	Parameter Triggering a Response	Reporting Requirements
Ice Formation	Photographic record of ice conditions in headpond, at powerhouse, and downstream for first three years of operation	Development of excessive frazil ice	- Annual reporting in years 1-5 of operation - Subject to periodic review as outlined in Section 1.5
Sediment Quality	- Characterize bathymetry - Monitor sediment quality (grain size, moisture content, total organic carbon, nutrients, metals, total mercury) collected from several locations in the headpond	- Unexpected changes to headpond bathymetry - Unexpected changes to sediment quality	- Bathymetry characterization in 5-year intervals to Year 15 - Annual reporting in years 1-5 of operation, and subsequently in years 8, 11, and 14 as discussed in consultation with relevant agencies. - Subject to periodic review as outlined in Section 1.5
Fish and Fish Habitat	- Map aquatic vegetation - Record and calculate HSI scores for comparison with baseline values (First year of operational monitoring only) - Fish community sampling using short gill net sets and electrofishers as appropriate in spring and summer of each sampling season	- Failure of aquatic vegetation to re-establish/excessive aquatic vegetation growth - Unexpected changes to fish habitat utilization - Unexpected changes to fish community	- Annual reporting in years 1-5 of operation, and subsequently in years 8, 11, and 14 as discussed in consultation with relevant agencies - Subject to periodic review as outlined in Section 1.5

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 Summary of Inspection and Monitoring Requirements
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Table 6.2 Summary of Operation Inspection and Monitoring Requirements

Feature	Monitoring Requirements	Parameter Triggering a Response	Reporting Requirements
Habitat Compensation	• Photographically record stability of enhancement structures during spring sampling • Evaluate utilization for spawning through use of egg mats • Evaluate fish usage using short-set gill nets or electrofishing as appropriate during spring sampling • Evaluate benthic invertebrate community using qualitative assessment and comparison with other areas in the Project footprint	• Failure or excessive movement of habitat enhancement structures • Failure of fish to utilize habitat compensation structures for spawning	• Annual reporting in years 1-5 of operation, and subsequently in years 8, 11, and 14
Impingement	• Visual inspection and record-keeping of any fish mortalities noted during trash rack cleaning or inspection	• Excessive impingement of fish as determined with input from MNR and DFO during operation	• Annual reporting in years 1-3 of operation
Benthic Communities	• Sampling of benthos at three locations during summer/fall sampling season	• Unexpected changes to benthic communities, including measures of evenness, richness, and diversity as recommended in Environment Canada's 2002 <u>Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring</u>.	• Annual reporting in years 1-5 of operation • Subject to periodic review as outlined in Section 1.5
Mercury in Sport Fish Tissue	• Sampling at three locations during spring sampling season	• Mean mercury in fish flesh approaches total restrictions for persons 17 years or younger, or women of child-bearing age (0.52 mg/kg)	• Annual reporting in years 1-5 of operation, and subsequently in years 8, 11, and 14 as discussed in consultation with relevant agencies. • Subject to periodic review as outlined in Section 1.5

Stakeholder Relations and Local Expenditures

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Summary of Inspection and Monitoring Requirements

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Table 6.2 Summary of Operation Inspection and Monitoring Requirements

Feature	Monitoring Requirements	Parameter Triggering a Response	Reporting Requirements
Stakeholder relations	• Maintain record of comments, issues, and complaints, including responses	• Comment, issue, or complaint received	• Records maintained and reported as may be required during operations.
Local expenditures	• Maintain records of locations and amounts of Project expenditures	• Expenditures greater than \$10,000	• Records maintained and reported as may be required during operations.

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7.0 References

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