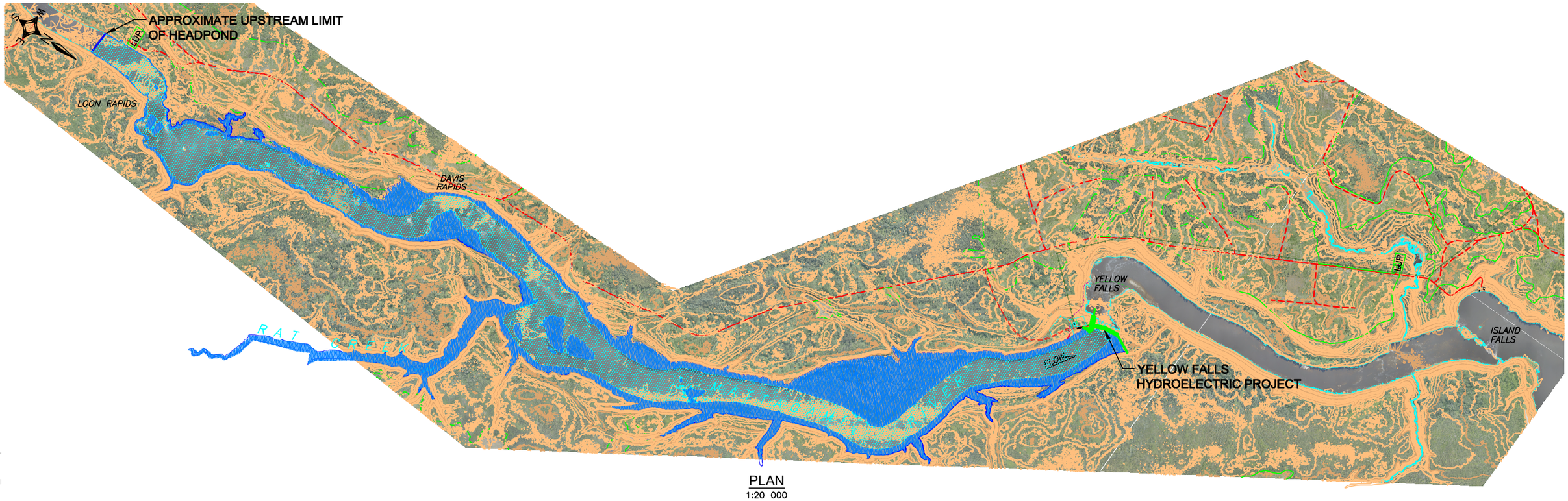

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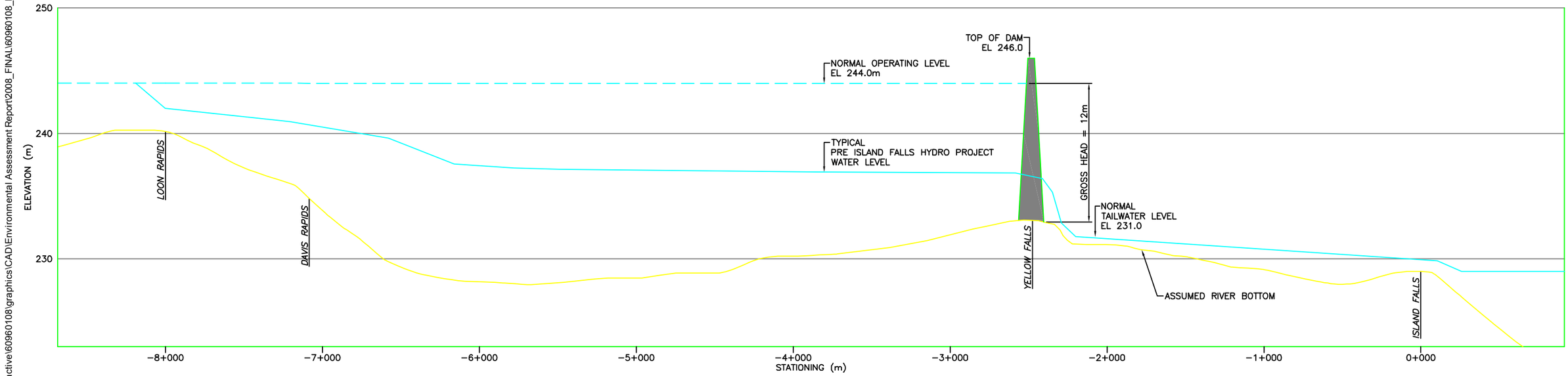

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METRES

NOTES

1. BASE CONTOURS FROM LiDAR SURVEY FLOWN JUNE 2005 BY TERRAPOINT CANADA INC.
2. ELEVATIONS ARE CANADIAN GEODETIC DATUM.
3. MINIMUM RIVER INVERT PROFILE ESTIMATED.
4. WATER SURFACE PROFILES ESTIMATED FROM HEC-RAS MODELLING.
5. TOP OF YELLOW FALLS DAM BASED ON 2m FREEBOARD FOR 1 IN 100 YEAR WIND INDUCED WAVES ON 2km FETCH.

LEGEND

INUNDATED AREA – WATER LEVEL (244.0m)

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YELLOW FALLS POWER LLP
ENVIRONMENTAL ASSESSMENT REPORT

Figure No.
2.4

Title
HEADPOND
PLAN AND PROFILE

2.3.1 Site Access

The main access road to the Yellow Falls site during construction, operation, and decommissioning, will include an existing 14 km section of Red Pine Road, located on the west side of the Mattagami River, and a new 9.4 km section of road required to connect Red Pine Road to the project site. Upgrades to the existing road will be required to accommodate construction and maintenance traffic, particularly in areas of poor drainage. Road works will result in a two-lane gravel road with single-lane bridges from Highway 11 to Yellow Falls. Parking for two operator's vehicles will be provided near the powerhouse. Single-lane concrete and steel bridges will be required to cross:

- An unnamed tributary of the North Muskego River. A bridge at this location was previously removed
- The North Muskego River
- An unnamed watercourse discharging from Two Finger Lake.

If a quarry is required, access will also be required to the quarry site. Quarry access will require upgrades to approximately 3.7 km of Sydere Road from Red Pine Road east to the quarry location.

A memorandum of understanding ("MOU") will be required between the YFP, the MNR, and Tembec - the Sustainable Forest License ("SFL") holder to determine road usage, ownership, and liability.

2.3.2 Intake and Powerhouse

The intake and powerhouse will be combined in a close-coupled arrangement near the left (when facing downstream) river bank. The reinforced concrete structure will be founded on bedrock in an excavated slot. Foundation grouting beneath the powerhouse may be required to minimize foundation seepage.

The powerhouse will be a cast-in-place concrete structure with steel and metal-clad roof system and will contain the following:

- Two 8-MW turbine-generator units
- Turbine shut-off valves
- Hydraulic power unit
- Bearing oil, cooling water, and service water systems
- Sump with oil water separator and redundant pump system
- Generator terminal box, neutral grounding cubicle
- 13.8 kV medium voltage switchgear

- Station service power equipment including: motor control centre, low-voltage distribution panels, AC and DC uninterruptible power supply (“UPS)” including batteries.
- Heating, ventilation, and lighting.
- A service gantry-type crane
- Stairs, walkways, platforms, ladders, and handrails
- Control and protection panels in separate enclosure
- Fire alarm, fire suppression system, intrusion alarm

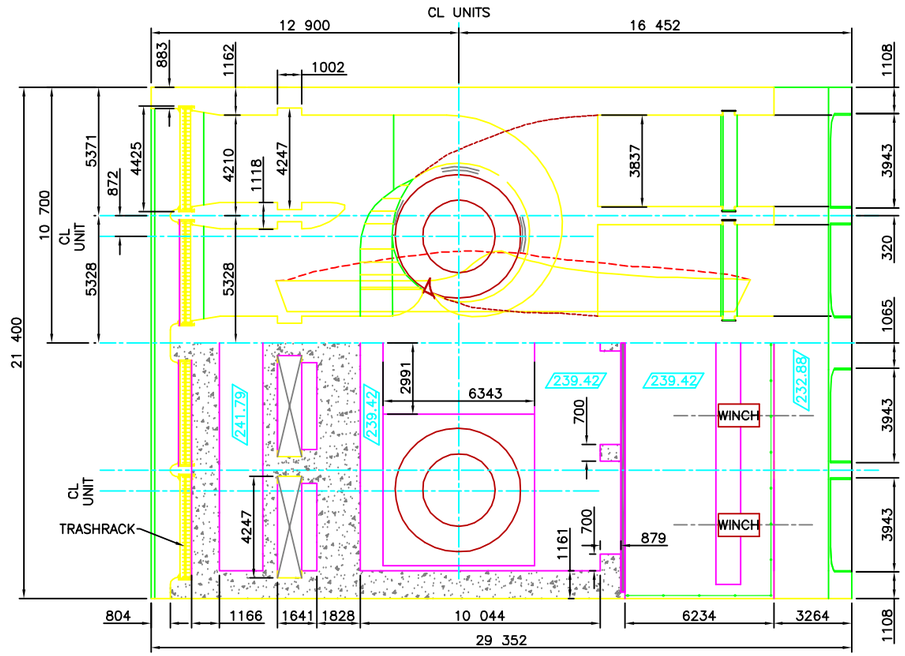
Two turbine units will be supported by the reinforced concrete substructure. The main turbine-generator floor level will be below normal tailwater levels and flood levels. For this reason, the powerhouse will be sealed against leakage up to the design flood level and doors and other openings will be located above these levels.

The powerhouse will have a minimum of two access doors: one for normal access and one for emergency egress. An equipment door will be sized to accommodate installation of larger components such as control panels. Larger components including the generator will be installed (and removable) through a roof hatch centred over the generator using a mobile crane in a specific location outside the powerhouse.

The powerhouse site will be signed, gated and fenced in accordance with applicable regulations and security requirements for safety and to discourage unauthorized access.

2.3.3 Generating Equipment

The powerhouse will contain two vertical 8 MW Kaplan-type turbines with a regulated cylindrical distributor, and regulated four blade Kaplan runner. An intake semi spiral made of concrete and a draft tube elbow of 90° will be provided with a vertical shaft and designed for direct drive of the generator, which will be located on the upper side of the turbine pit (**Figure 2.5**).



INTAKE & POWERHOUSE PLAN
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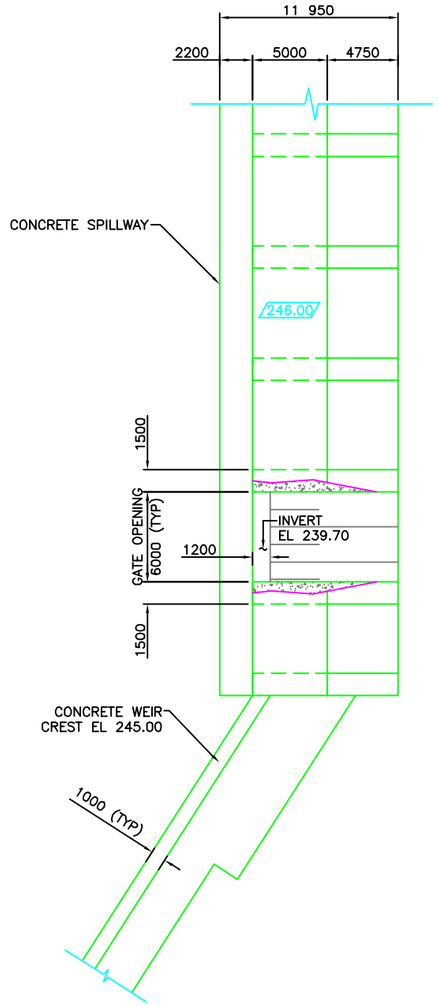

SPILLWAY & WEIR PLAN
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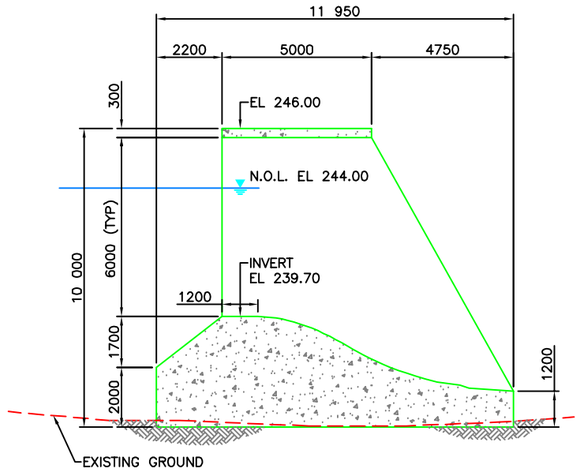
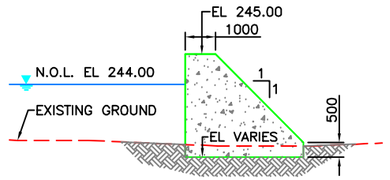


SPILLWAY TYPICAL SECTION
1:200



WEIR TYPICAL SECTION
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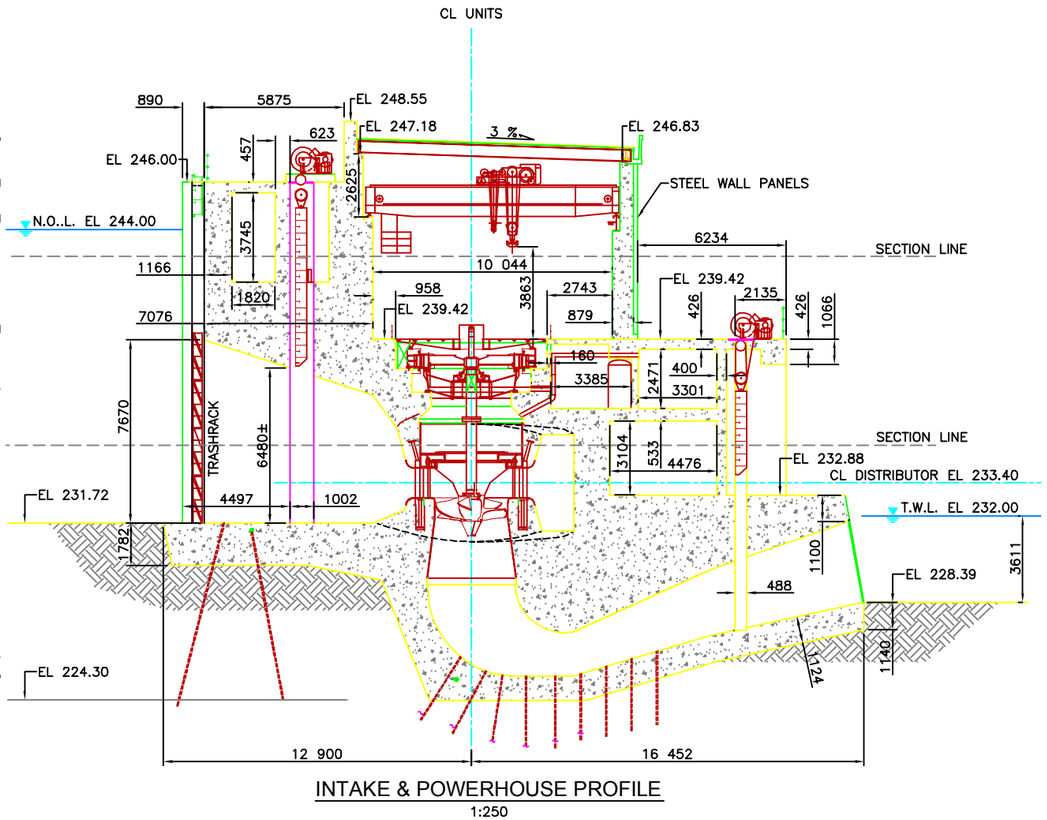

INTAKE & POWERHOUSE PROFILE
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NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS IN METRES, UNLESS NOTED OTHERWISE.
2. DRAWING CREATED FROM ACRES DRAWING, FIGURE 4, POWER FACILITIES – SECTIONS AND DETAILS, YELLOW FALLS HYDROELECTRIC DEVELOPMENT PROJECT DESCRIPTION AND TECHNICAL APPRAISAL, MAY 1990.

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Client/Project
YELLOW FALLS POWER LLP
ENVIRONMENTAL ASSESSMENT REPORT

Figure No.
2.5

Title
GENERAL ARRANGEMENT POWERHOUSE, SPILLWAY & DAM PLAN AND SECTIONS

2.3.4 Spill Facilities

Spill facilities allow water flows in excess of turbine capacity to pass downstream. The spill facilities will consist of a 17-bay gated spillway required for normal and flood operation. The spillway will be reinforced concrete structure with ogee and pier sections founded on bedrock and located adjacent to the powerhouse.

The gated spillway will be equipped with vertical-lift, fixed slide gates with dedicated hoists. Foundation grouting will be performed to minimize foundation seepage. In addition, a pressure relief system will be installed to control foundation uplift pressures.

The spillway gates are raised in order to discharge flows. As the spillway sill elevation is approximately at river bed level, the gates can also be used to pass silt that may have accumulated in front of the structure.

Dam safety analyses will be carried in accordance with the Ontario Dam Safety Guidelines, the Canadian Dam Association Dam Safety Guidelines, and the Lakes and River Improvement Act.

In accordance with the above requirements, the Inflow Design Flood based on the hazard classification of the project was selected as the 1:10,000 yr flood. However, the Project is able to handle the Probable Maximum Flood ("PMF") without freeboard. Therefore, it is considered that there is more than sufficient capacity to pass larger than the design flood.

Two gates on the spillway will be automated such that when the plant trips, the gates will open the corresponding amount. Gate opening speeds will have to be finalized. However, 0.5 to 1.0 m/minute opening times are typical. Therefore, flows downstream of the plant would return to normal within 4 to 8 minutes if the plant is running at full capacity and sooner under partial load. The gates will have the capability of being manually/locally operated and back-up power will be provided to the gates.

2.3.5 Retaining Wall

A concrete gravity retaining wall will form the right abutment of the structure. It will be designed with a crest elevation of 245.0 m. The maximum height of the structure will be approximately 2.5 m.

2.3.6 Headpond

The headpond will extend approximately 6 km to Loon Rapids. The water levels in the river will increase approximately 12 m at the Project site to zero at Loon Rapids resulting in a total headpond surface area of 160 ha. The normal operating level will be near constant at elevation 244 m with minor fluctuations of 0.2 to 0.3 m. During extreme flood events the headpond would surcharge to 245 m.

Average water elevation at Loon Rapids is 244 m above sea level, which is the same elevation as the proposed headpond. Therefore, the headpond will not increase the average water level

above Loon Rapids. However, conditions at Loon Rapids will change from fast-moving, turbulent conditions to slower conditions with little turbulence.

The headpond will have a total storage volume of about 7.4 million m^3. Headpond filling would commence after construction of the spillway and retaining wall is completed in the spring of 2010.

2.3.7 Substation and Transmission

The 13.8/115-kV substation will be located adjacent to the powerhouse. The transmission line will be routed adjacent to the new access road to its intersection with Red Pine Road. The transmission line will turn northwards at this intersection and parallel Red Pine Road to Highway 11. The point of interconnection will be at the existing Hydro One 115 kV transmission line north of Highway 11. The total length of new transmission line is approximately 25 km.

The transmission line route will be located adjacent to the access road route and will require clearing along the right of way which has been selected to include the removal of potential danger trees that could fall on the line.

2.3.8 Controls and Communications

Main control and protection panels for the plant will be located in a control room in the powerhouse along with the man-machine interface ("MMI") computer.

The main control and protection panels include:

- Programmable Logic Controller ("PLC") programmed for general automatic and other modes of operation
- Generator excitation relays
- Control and protection relays
- Manual synchronization instrumentation
- Breaker operation and status

The MMI systems will allow the plant operator to start and stop the plant, monitor or review system status, and modify operating mode or conditions as necessary.

A control panel in the powerhouse will provide water level, flow, and gate position status to the operator. It will also allow gate operation and provide the appropriate emergency stop functions. The panel will include a PLC to perform basic functions, flow calculations, and provide data to the powerhouse. All primary plant control functions are done in the powerhouse PLC.

To maximize safety and responsiveness, the plant will have limited remote control capability. Critical alarms cause a lockout requiring the operator to visit the plant. An autodial system will provide notification, beginning with plant operators. Transportation methods including ATV, snowmobile, boat, truck, and helicopter will be used as required to ensure the Project is always

accessible. Some operations will require the operator to be present, such as ice and debris sluicing or flood discharge operation. These functions need to be performed manually.

Operating conditions including water levels, flows, generation, temperatures, vibrations, gate and valve positions, and alarms will be continuously monitored by the control system as required for operation. This data will be continuously recorded and properly stored at each plant for operator reference and permanent record.

External communications including phone, Hydro One System Control and Data Acquisition ("SCADA"), and remote control will be via satellite.

Critical control and monitoring functions will be powered through an UPS to provide continuous power supply through emergency and outage conditions.

2.3.9 Service Building

The project service building (approximately 10 m x 10 m) will be located on the west side of the river, and will serve the following functions:

- Storage of miscellaneous support equipment and supplies such as a snowmobile, ATV, portable generator, pumps, shovels, etc.
- Workshop for periodic maintenance on generating equipment complete with tools
- Emergency accommodations for the plant operators complete with potable water supply (using filtered water from the powerhouse) and septic system

2.3.10 Portage Trail and Boat Launch

A portage trail including a boat launch adjacent to the headpond will be established on the west bank of the Mattagami River to allow small boats and canoes to be moved around the Project. The boat launch will be accessible for public use via the Project access road. Crown land tenure will be required for the portage trail and boat launch.

2.3.11 Aggregate Extraction Areas

The Project will require a supply of rock, sand, and gravel during construction. These materials will be used for access road and transmission line installation, dam construction, and concrete manufacture.

A rock quarry site has been identified approximately west of the Project site on the Sydere Road. The quarry can supply various types and quantities of quarry material including rock fill, riprap and concrete aggregates to be incorporated in the works. Extensive initial investigations have been undertaken at the proposed quarry location in anticipation of its potential licensing under the *Aggregate Resources Act*.

As a result of moving the dam and powerhouse structure to Yellow Falls from Island Falls, the dam construction has changed from a large rock-fill dam structure to a smaller concrete gravity

dam structure. Based on this design change, the quantity of aggregate materials required for Project construction is significantly reduced.

As a consequence of this reduced aggregate demand by the Project, YFP is planning to acquire the required aggregate materials from existing suppliers. However, given the initial investigations already undertaken by YFP for establishment of the quarry, and the potential that the required aggregate materials may not be available in sufficient quality or quantity locally, YFP continues to include the rock quarry as part of the Project. The need for establishment of the quarry will be determined at the final design stage. Any quarrying activities will be conducted in accordance with the *Aggregate Resources Act*.

Temporary borrow pits for sand and gravel may also be developed as required following acquisition of the appropriate permits from the MNR, including the *Aggregate Resources Act*. Sand and gravel pits will be used for supply of fill materials for road construction.

2.3.11.1 Temporary Concrete Batching Plant

An existing concrete production plant is not located in sufficient proximity to the proposed dam/powerhouse location to prevent spoilage of material during transport and to provide timely and sufficient volumes of concrete. Therefore, a temporary concrete batching plant will be utilized.

A general description of typical operation procedures for a concrete batching plant is provided below:

- Aggregate materials (i.e., limestone, gravel, and sand) will be delivered to the batching plant by truck and will be deposited into storage piles. A front-end loader will transfer aggregate material from the storage piles into an above ground hopper. The hopper will gravity feed an inclined conveyor that will transfer the aggregates to aggregate compartments on the plant. Aggregate materials will then be gravity fed to the aggregate weigh scales located underneath each compartment. The aggregate weigh scale will feed a second conveyor, which will transfer the appropriate mass of material into a truck mixer.
- Cementitious materials (i.e., Portland cements and slag) will be delivered by truck and will be stored in one of two silos. The two silos may be filled simultaneously using blowers on the transport trucks and have a capacity of approximately 65 tonnes each. Cementitious materials from Silo #1 will be transferred to the cement scale by two enclosed cement augers. Cementitious materials from Silo #2 will be transferred to the cement scale by gravity. The appropriate mass of cementitious material from the cement scale will then be gravity fed through a pipe into the truck mixer.
- At the truck mixer, water will be introduced via a spray over the raw material drop point. If necessary, the water will be heated by a heater or boiler. Small quantities of admixes (i.e., chemical additives added to achieve certain properties in concrete) may also be added. Each raw material batch will be mixed inside the truck mixer drum for approximately 15 minutes. The resulting wet concrete product will then be transported to the pour site with the mixer drum set at a constant rate of revolution.

- Power for the plant will have to be provided by a diesel generator set. As appropriate, the generator set will be housed in an outdoor enclosure adjacent to the plant.

A dry wash system will be used as much as possible to reduce water required for the wash down of cement truck drums. For a dry wash, stone is run through the mixer and the stone is later disposed of. Any excess concrete that is returned to the plant will be either wind-rowed and later removed from site, or used to make concrete blocks. All process water from the batch plant and mixer trucks will be contained on the plant site with no discharge to surrounding properties.

The only wash water requiring disposal at the pour sites will be the water required to rinse the truck chutes after the truck is unloaded. Disposal will be done in a manner compliant with regulatory requirements.

A CofA (Air) will be required from the MOE for the concrete batch plant prior to its operation.

2.4 CONSTRUCTION, OPERATION, AND DECOMISSIONING

Descriptions of the construction, operation, and repowering/decommissioning phases of the Yellow Falls Hydroelectric Project are provided in **Table 2.1**. The estimated schedule of these three phases includes:

- Construction: Approximately 24 months
- Operation: 50 years or more beginning from the date of commissioning
- Repowering/decommissioning: 50 years or more in the future

2.4.1 Construction

2.4.1.1 Construction Activities

Table 2.1 provides an approximate construction schedule. The preferred start date for construction is in the winter to facilitate road construction (frozen conditions preferred). YFP plans to begin construction in the first quarter of 2009.

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Table 2.1 Construction Activities

Construction Phase	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Site preparation																								
Upgrade existing access roads																								
Clear right-of-ways and build access roads																								
Prepare abutment, channel, and powerhouse areas																								
Prepare soil and rock borrow areas																								
Clear headpond																								
Powerhouse Construction																								
Excavate powerhouse																								
Construct concrete base slabs and walls																								
Construct draft tubes and equipment bases																								
Install embedded turbine components																								
Construct superstructure and steelwork																								
Backfill and landscape																								
Install turbine, generator, and auxiliary equipment																								
Install mechanical works																								
Install electrical works																								
Spillway and Retaining Wall Dam																								
Construct cofferdam																								
Excavate spillway and weir areas																								
Construct concrete base slabs and walls																								
Install spillway gates and hoists																								
Remove cofferdam																								
Transmission Infrastructure Construction																								
Build substation at plant																								

Table 2.1 Construction Activities

Construction Phase	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Construct transmission lines Interconnect substation																								
Commission Plant																								

Construction of the dam and powerhouse will be carried out in two stages. Stage 1 will involve the construction of the powerhouse and four or five bays of the spillway structure on the left bank and the retaining wall on the right bank. The ogee sections of the spillway will not be constructed at this stage.

Once this Stage 1 work is complete, Stage 2 works will begin. Cofferdams will be constructed and river flow will pass through the spillway bays completed in Stage 1. The remainder of the spillway would then be constructed to close the structure. The upstream and downstream cofferdams will be designed to accommodate flows up to the 1:20 year flood level with an allowance for freeboard. The cofferdams will be constructed of granular fill with an outside, sloping impervious membrane. On completion of construction on the remaining spillway bays including the ogees, the cofferdams will be removed. Bulkheads would then be installed in the first four or five bays and the ogee sections completed.

2.4.1.2 Land Requirements

During construction, approximately 7,520 m^2 of land will be required on-site for temporary construction staging areas, material storage, laydown, equipment and assembly areas, site offices, and vehicle parking (**Figure 2.2**). These areas are in addition to land required to site permanent facilities and infrastructure. Land Use Permits under the *Public Lands Act* will be required for these areas.

2.4.1.3 Resource and Material Requirements

The production processes consist of the generation of renewable electrical energy as harnessed from the river resource present in the area. The Project's raw materials consist of standard building materials for construction including aggregate, concrete, wood, and metal.

Aggregate resources will be required for construction of the Project, including impervious fill, granular fill, rock fill, riprap and concrete aggregates to be incorporated in the works. As discussed previously, YFP anticipates that concrete materials will be obtained from existing concrete suppliers. In the event that concrete supply from existing suppliers is not feasible, YFP may obtain the requisite permits from the MNR for the establishment of the Sydere Road Quarry.

Excavation requirements for Project construction will include the powerhouse and intakes, spillway, substation, and transmission lines. Grading and limited excavation may be required to construct access roads. Excavation for the powerhouse, intakes, and spillway will require excavation into the hornblende/granite gneiss bedrock. Bedrock grouting will be used where necessary to prevent seepage through bedrock fractures.

Bedrock excavation may also be required for installation of transmission/substation infrastructure where shallow bedrock depths exist. **Table 2.2** presents estimated volumes of excavated material.

Fill requirements during construction will include importation of aggregate for the access road surfaces, substation foundation, and dams. Extensive filling in addition to these specific structures is not anticipated.

Table 2.2 Estimated Excavated Material

Location	Cut (m^3)	Fill (m^3)
Powerhouse	20,000	
Spillway	5,000	
Left Abutment Adjacent to Powerhouse		6,000
Access Road		21,500
Total	25,000	27,500

2.4.1.4 Labour Requirements

Approximately 100,000 person-hours of labour will be required to construct the Project. It is anticipated that a large portion of the construction labour force will be accommodated in the Smooth Rock Falls area and will travel to the site on a daily basis along Red Pine Road. No construction camp will be required.

2.4.1.5 Site Access

Site access will primarily be along Red Pine Road, with limited access from the south and access to and from aggregate extraction pits west of the Project if required.

2.4.1.6 Hazardous Materials

During construction, hazardous waste materials will not be generated in large quantities and will be disposed of through conventional waste-oil and hazardous waste disposal streams. Hazardous materials to be used during the course of the project are limited to explosives, fuels, oils, and lubricants that will be on-site for use in equipment during the construction phase. During the operation phase, lubricants and fluids will be required for turbine, generator, equipment, and substation maintenance

Poly-chlorinated biphenyls (“PCBs”) will not be present in the oils and lubricants used on-site. There are no known hazardous by-products of the hydroelectric generation process itself.

Hazardous waste will be removed by a licensed contractor and stored and disposed of appropriately in accordance with Technical Standards and Safety Authority (“TSSA”) and MOE regulations.

2.4.1.7 Waste Materials

Non-hazardous waste materials will consist of general domestic and construction waste, including packaging, food, concrete, steel, and wood.

Non-hazardous waste will be disposed of through conventional local waste handling facilities operated by local municipalities and approved by the MOE. Materials will be reused or recycled where possible.

During construction, waste materials will be removed by a licensed contractor and disposed of appropriately. During operation, a minimal amount of household waste is expected. The material will be delivered to the local landfill by plant operators as required.

2.4.2 Operation

Hydroelectric plants such as the proposed Yellow Falls Hydroelectric Project can produce renewable electricity for over 100 years. For example, the Bracebridge Generation Ltd. Bracebridge Falls Plant has been in operation since 1900 and still uses the original generator bearings (Bracebridge Generation Ltd., n.d.). A few examples of older plants in Ontario include (Canadian Hydro Developers, Inc., 2006; Bracebridge Generation Ltd., n.d.; OPG, 2008):

- Galetta Hydroelectric Plant (Canadian Hydro Developers, Inc.) in-service 1907
- Wilson's Falls (Bracebridge Generation Ltd.) in-service 1909
- Auburn Generating Station (OPG) in-service 1911-1912
- Coniston Generating Station (OPG) in-service 1905
- Nipissing Generating Station (OPG) in-service 1909
- Seymour Generating Station (OPG) in-service 1909
- Sills Island Generating Station (OPG) in-service 1900
- DeCew Falls I (OPG) in-service 1898

Ongoing seasonal maintenance such as lubricant changes, gate seal repairs, and painting is required. On occasion, more considerable maintenance may be necessary, such as concrete structure rehabilitation, gearbox replacement, generator rewinding, turbine runner blade repair or replacement, and electrical equipment upgrades; the frequency of which could be 10 to 20 years or more.

The Yellow Falls Hydroelectric Project is designed as a run-of-river facility. Once the headpond is filled, outflow for the facility will be adjusted to match inflow into the headpond from upstream. Since outflow will be equal to inflow, no additional water above operational level will be stored in the headpond. A full glass of water can be used as an analogy. If one continues to pour water, the amount that spills over the sides will be equal to that entering the glass. Headpond water levels will be held relatively constant, and flows downstream of the Project will fluctuate with according to the amount of water entering the headpond. The Project is designed to operate in

this manner because electricity will be sold at a fixed price per kWh, and operation as a run-of-river facility rather than a peaking plant maximizes electricity generation from natural river flows. A headpond is required by the Project to provide the necessary hydraulic head (height between inflow and outflow), water pressure, and continual discharge to generate electricity.

Inflows into the headpond will not be measured as the plant will be operated on level control (i.e. as long as outflows equal inflows the headpond will remain at a relatively constant elevation). Communications with OPG will provide information on releases from Lower Sturgeon GS. Operation activities are provided in **Table 2.3** below.

Table 2.3 Operation Activities

Operation and Maintenance Phase	Timeline
Seasonal, annual, and comprehensive five-year inspections	50 Years or more from plant commissioning (estimated)
General powerhouse and substation seasonal maintenance and housekeeping	
Daily maintenance and inspection	
Monitoring of turbine conditions	
Major maintenance such as a turbine-runner replacement and generator rewinds (20 to 40 year interval)	
Cleaning and occasional repair of headworks and trash racks as necessary	
Powerhouse systems periodic filter and lubricant replacements	
Grounds keeping, including maintenance or repair of buildings, landscaping, fences, gates, lights, and signs as required	
Transmission line and tapping structure maintenance (For safety reasons, powerhouse sites, sub-stations, and transmission line corridors will be mechanically kept clear of brush and trees and public access will be limited)	
Intermittent maintenance of generating equipment	
Access road and bridge maintenance to Ministry of Natural Resources standards as arranged with interested parties and as required	
Visual survey of condition of poles and lines	
Testing and maintenance of electrical equipment	

2.4.2.1 Hydraulic and Energy Estimates

Relevant hydraulic parameters for the Project are provided in **Table 2.4** below.

Table 2.4 Hydraulic Parameters

Parameter	Unit
Normal headpond level	244 m asl
Normal tailwater level	232 m asl
Gross head	12 m
Rated flow at capacity	160 m^3/s
Average annual energy	70.1 GWh
Average capacity factor	51.2 %

Table 2.4 Hydraulic Parameters

Parameter	Unit
Spillway design flow (17 gates – each gate has a discharge capacity of 120 m^3/s at normal operating level)	2040 m^3/s

Estimates of power generation are based on 75 years of continuous simulated Mattagami River stream flow data (1921-1995), the gross head, minor losses in the intake and powerhouse, efficiency of the Kaplan turbines and generators, transmission losses, and downtime. A total 1.5% allowance for lost production downtime was applied to the energy estimates. An estimate of generation downtime is based on continued operation of one turbine during major maintenance. Transmission line loss is calculated using the appropriate conductor resistance (Partridge 0.09210/km) over a length of 25 km. The line loss is estimated at 0.3% of plant capacity.

Although the project has a capacity of 16 MW, the average power is estimated at 8.19 MW, corresponding to a capacity factor of 51.2%, which is typical for many modern run-of-river power facilities. During the spring freshet, power production is expected to be 16 MW (full plant capacity).

Peak power production is expected to occur during the month of May, which coincides with the spring freshet typically experienced in this river system. An analysis of fluctuations in energy production throughout a 24-hour period is not available since data for the Water Survey of Canada ("WSC") hydrometric station 04LB001 – Mattagami River at Smooth Rock Falls are only available as daily values, However, fluctuations over the course of a day are expected to be minimal since the Lower Sturgeon GS operates in run-of-river mode.

Based upon a two turbine unit configuration, the estimated minimum continuous rated discharge of the plant is approximately 16.24 m^3/s; depending upon final turbine selection. This flow volume is the minimum rate under which the plant can produce power. Based on the adjusted historic flow data, this minimum flow should be exceeded 99% of the time, resulting in minimal low flow shutdown periods. Actual minimum discharge rates will be determined by the quantity of water entering the headpond.

As a requirement of the draft Mattagami River Water Management Plan, a 15 m^3/s minimum flow requirement must be met at Smooth Rock Falls GS. The reason for this minimum flow requirement is described variously in the WMP as required to ensure a minimum dissolved oxygen saturation of 47% downstream of the Smooth Rock Falls plant, to meet ecological base flow requirements, and to provide sufficient flow to dilute effluent from the former Tembec pulp and paper mill in the Town of Smooth Rock Falls. This minimum flow requirement has been adopted by YFP to ensure compliance with the draft Mattagami River WMP. However, historical data indicates that river discharge is typically greater than 15 m^3/s minimum flow requirement 99.7% of the time. The only time this minimum flow requirement will not be meet is

in the very extreme conditions when the flow is not available in the river (i.e. the head pond will not be used to compensate for any shortcoming in natural river flows).

The power and energy simulation summarized in **Figure 2.6** illustrates the typical fluctuations in river flow and power generation throughout the year.

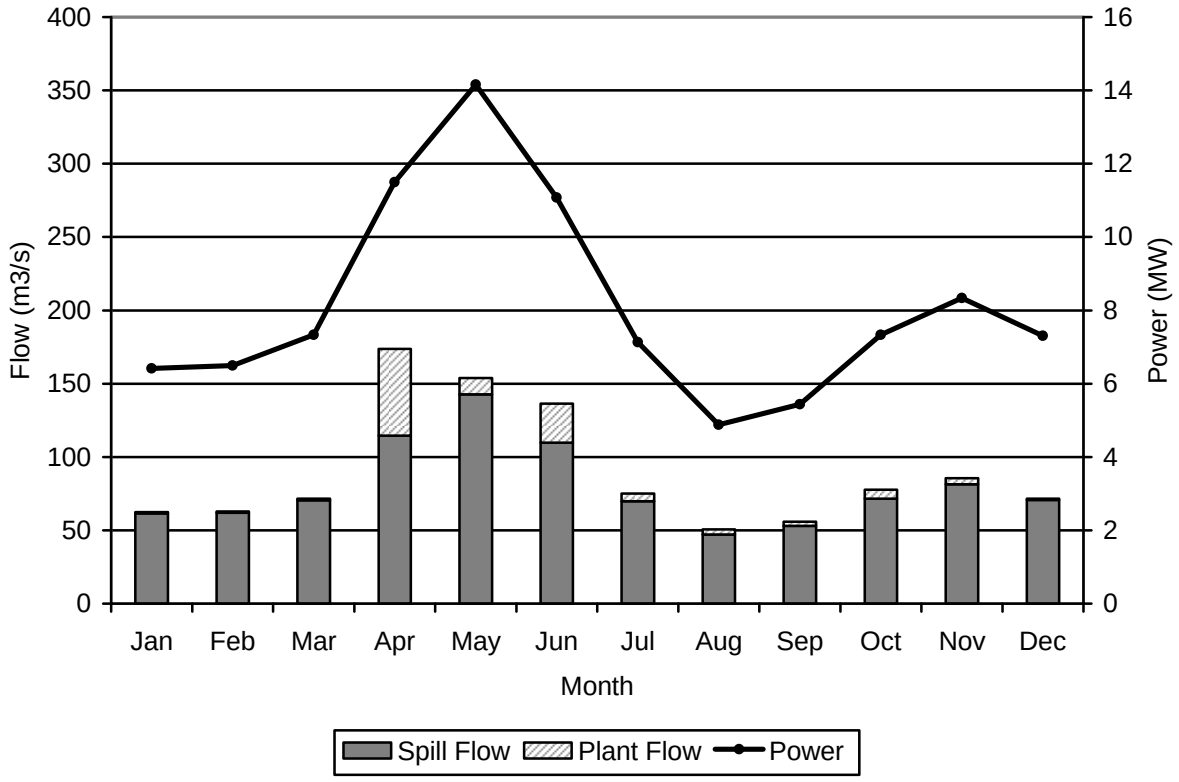

Figure 2.6: Power and Energy Simulation Summary

2.4.2.2 Labour Requirements

The automatic nature of plant operation does not require personnel to be on-site full time, although remote monitoring is available 24 hours/day and key alarms will be sent to the operator as they occur. Two operators will conduct daily operation, maintenance and inspection visits. One operator will have electrical training, while the other operator will be mechanically trained. Both operators will undergo extensive training prior to beginning plant operations.

2.4.2.3 Material Requirements

Resource requirements for ongoing operation of the Yellow Falls Hydroelectric Project include the existing, renewable river resource and the land base required for the powerhouse, spillway,

headpond, access roads, and power lines. Additional small quantities of aggregate may be required to maintain the access road(s) in sufficient working order for the plant's operational requirements.

Hazardous Materials

There are no known hazardous by-products of the hydroelectric generation process. During operation, hazardous waste materials will not be generated in large quantities and will be disposed of through conventional waste-oil and hazardous waste disposal streams. Hazardous materials to be used during the course of the project are limited to fuels, oils, coolants, and lubricants for the maintenance of the turbines, equipment, and substation. Some materials (i.e. gas and oil) will be stored on-site. PCBs will not be present in the oils and lubricants used on-site.

2.4.2.4 Waste Materials

No waste by-products are produced as a result of the hydroelectric generation process. Maintenance and maintenance personnel will produce limited household and construction waste.

Non-hazardous waste will be disposed of through conventional local waste handling facilities operated by the local municipalities approved by the MOE. Materials will be reused or recycled where possible.

2.4.3 Repowering/Decommissioning

End of life for a hydropower facility usually occurs when generating equipment becomes overly inefficient or obsolete based on advances in technology. At this point, anticipated to be at least 50 years in the future, the Project will be repowered by upgrading the facility using new technology or it will be decommissioned.

Generally, hydroelectric sites are repowered instead of being decommissioned. In some cases, abandonment is also an option. Repowering will involve overhauling the entire facility by performing necessary structural upgrades, replacing generating equipment, and upgrading control equipment.

If decommissioning was to occur, it may involve removal the powerhouse, substation, embankment dams, spill facilities, and associated infrastructure (**Table 2.5**). Decommissioning would be completed in consultation with regulatory agencies and in accordance with regulations and standards of the time.

Table 2.5 Decommissioning Tasks

Decommissioning Phase	Timeline
Removal of powerhouse and substation infrastructure Removal of powerhouse and substation	2059 or later
Removal of powerhouse and substation	
Removal of service spillway infrastructure	
Access road removal	
Site grading and rehabilitation as appropriate	
Transmission line and tapping structure	
Removal of lines and poles	
Removal of transformers and gravel pads	
Removal of tapping structure	
Site grading and rehabilitation as appropriate	

3.0 Environmental Features Screening

Under Ontario Regulation 116/01, the EA process requires completion of a Screening Criteria Checklist as outlined in the EA Guide (MOE, 2001). The MNR's 1990 WPPG also requires completion of an Integrated Resource Management ("IRM") Checklist. As many of the environmental features in these two checklists overlap, they were combined into one Integrated Screening Checklist (**Table 3.1)** in accordance with the harmonized WPPG and EA process being followed for this Project.

The Integrated Screening Checklist was used to determine potential environmental effects of the Project and to focus the EA process. A "No Effect" listing in the table indicates environmental features that are not affected by construction, operation, or maintenance. A "Benefit" listing acknowledges the potential for positive effects prior to the application of protection and mitigation measures. A "Concern" listing represents the potential for negative effects prior to the application of protection and mitigation measures. An "Unknown" listing indicates that the potential effect of the Project is uncertain. Environmental features identified with a "No" effect have subsequently been screened out from further analysis and discussion, while those potentially identified as "Benefit," "Concern," or "Unknown" are discussed in detail in **Section 6.0**.

Based on the above screening of environmental features, the following Project-specific aspects have been identified that require further analyses and discussion:

- Bedrock and surficial geology
- Physiography / topography and landforms
- Soils
- Surface water
- Ground water
- Air and noise
- Terrestrial vegetation
- Aquatic vegetation
- Wildlife
- Fish
- Resources
- Land use
- Utilities and services
- Socio-economic features
- Heritage and Culture
- First Nations

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
1. Land							
Geology							
	2.1.2	Bedrock Geology		✓			• No unique or significant geological features have been identified in the Study Area • Excavation into bedrock will be required for construction of the headworks • Excavation of nearby bedrock resources will be required to supply aggregate to the Project • Permits will be required for aggregate extraction in accordance with the *Aggregate Resources Act* • Aggregate sites are not located within the Mattagami River Area or other areas that may restrict aggregate extraction
	2.1.2	Surficial Geology		✓			• No unique surficial geological resources have been identified in the vicinity of the Project • Excavation of surficial materials will be required for construction of the Project • Excavation of aggregate resources (gravel) may be required to supply aggregate during construction of the Project • Aggregate sites are not located within the Mattagami River Area or other areas that may restrict aggregate extraction • Permits will be required for aggregate extraction in accordance with the *Aggregate Resources Act*
	2.1.1	Physiography / Topography and Landforms		✓			• No unique physiographic/topographic features or landforms have been identified in the vicinity of the Project • The local topography will be altered in the immediate vicinity of the dam and powerhouse as a result of site grading • Aggregate extraction will result in shallow topographic depressions where material has been removed • The headpond will result in the inundation of portions of the existing river shoreline and adjacent lands • The installation of access roads and transmission line will generally follow existing topography. Limited cut and fill will be required to ensure safety and engineering requirements are met

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
• *Soils*							
	2.2.1	Soil Type, Texture and Permeability		✓			• There is potential for effects on soil density and permeability in the immediate vicinity of the dam, powerhouse and access roads associated with soil disturbance during construction operations • There is potential for effects on soil type, texture and permeability from inundation of the headpond, which may alter local drainage patterns
	2.2.2	Erodibility		✓			• There is potential for effects on soil erodibility as a result of clearing and excavation activities during construction • There is potential for shoreline erosion as a result of shoreline vegetation removal, headpond filling and headpond level fluctuation • There is potential for erosion of stockpiled soil and aggregate materials during the construction period • There is potential for riverbed and shoreline erosion immediately downstream of the dam as a result of modification of flow patterns at Yellow Falls
	2.2.3	Sedimentation		✓			• There is potential for sedimentation of waterways associated with land-based and shoreline construction activities as a result of soil disturbance • There is potential for waterway sedimentation as a result of the construction and removal of cofferdams used during powerhouse and dam construction, as well as access road water crossings • During the inundation period, there is potential for sedimentation as a result of shoreline erosion around the headpond • Sediment accumulation within the headpond is possible as a result of reduced water velocities • There is potential for reduced sediment transport downstream of the Project as a result of reduced flow velocities within the headpond
	2.2.4	Compaction		✓			• There is potential for localized soil compaction as a result of construction equipment traffic
	2.2.5	Contamination		✓			• There is potential for soil contamination as a result of fuel and lubricating fluid spills from construction equipment during construction • During operation, there is potential for soil contamination as a result of fuel and lubricating fluid spills from maintenance activities, electrical equipment, and chemicals used or stored on-site
	2.1.3	Surface drainage		✓			• There is potential for alteration to local drainage patterns as a result of headpond inundation • There is potential for localized changes to surface drainage patterns as a result of access road construction and site grading • An increase in impermeable surfaces, such as access roads and the powerhouse, may result in a slight increase in surface runoff

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
2. Water							
Surface Water							
1.1	3.4	Effects on surface water quality		✓			There is potential for effects on surface water quality associated with: • Sedimentation and spills affecting upstream and downstream water quality • Increased temperature upstream and downstream • Mercury methylation as a result of anaerobic decay of organic materials within the headpond • Super saturation of oxygen • Reduced oxygenation of surface waters due to the creation of deep-water conditions within the headpond area • Increased sediment deposition within the headpond area as a result of reduced flow velocity
1.1		Effects on surface water quantity		✓			• There is potential for effects as water pumping may be required during construction to ensure dry conditions • The Project will not result in the permanent consumption of surface waters and water entering the facility will be immediately released downstream
1.1		Effects on surface water flow		✓			• The Project will not operate as a water storage (peaking) facility and will have limited effect on outflow. Under most operating conditions, inflow will be equal to outflow. Although variable pitch turbines and intake vanes will be used to optimize power generation, the amount of water flowing through the headpond will significantly influence the amount of electricity produced • Following construction, surface water flow at Yellow Falls will be focused through the powerhouse and gate structures, rather than across the width of Yellow Falls and may alter local river morphology downstream of the Project • There will be temporary reduction in river flows downstream of the facility during headpond filling
1.4		Effects on surface water from accidental spills or releases to the environment		✓			• There is potential for accidental spills or releases of undesirable materials on-site (fuel, lubricating oils) during construction and operation

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
1.3		Cause significant sedimentation, soil erosion or shoreline or riverbank erosion on or off site		✓			• Construction of the hydroelectric dam will require in-stream construction of two cofferdams. There is potential for sedimentation during this period • There is a potential for increased soil erosion during clearing operations and access road construction • There is a potential effect on surface water sedimentation during headpond filling • Following construction, surface water flow at Yellow Falls will be focused through the powerhouse and gate structures, rather than across the width of Yellow Falls and may alter local river morphology downstream of the Project • There is no effect on flow velocities or rates upstream of the Project headpond, and thus there are no anticipated effects on upstream sedimentation
	3.1.1	Water level fluctuations		✓			• The development will maintain a stable headpond elevation under most flow conditions. There is potential for limited fluctuation in the headpond during low flow conditions, spring and fall freshets, and storm events • Peaking activities (storage and opportunistic release of water) are not proposed for this facility • There is potential for effects on downstream water levels as a result of the Project
	3.1.2	Flood history		✓			• There is a potential effect on the Project from extreme high flow events (i.e. 1 in 100 years floods or greater)
	3.1.3	Lake and river depth and area		✓			• The Project will affect river depth and the establishment of a headpond will increase the area and depth of the river upstream of the facility for a distance of approximately 6 km to Loon Rapids • Scouring at the tailrace may increase river depth at this location • Change in river flow patterns may affect water depth immediately downstream of the concrete gravity dam on the eastern side of the Mattagami River as a result of river flow being directed through the powerhouse located on the west bank of the river.
	3.1.4	River substrate profile and composition		✓			• River substrate materials will be disturbed within the footprint of the headworks and cofferdams during the construction of the dam During operation of the Project, there is potential for: • Increased sediment deposition upstream of the dam due to reduced flow velocities in the headpond area • Reduced sediment deposition and transport of bed material downstream as a result of decreased water velocity in the headpond • Riverbed scouring in the immediate vicinity of the tailrace

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
	3.1.5	Flow characteristics		✓			• Although flow rates into and out of the Project will remain unchanged, there is potential for reduced flow velocities within the headpond • Since inflows will be approximately equal to outflows, flow rates downstream of the Project will not be significantly altered. Flow patterns (direction, turbulence, etc.) may be affected
	3.1.6	Ice		✓			• Ice formation will occur more readily within the headpond area because of reduced flow velocities, compared to existing conditions • The Project may also affect the normal transport of ice and alter ice jamming potential downstream of the power plant/dam structure
Groundwater							
1.2	3.2.1	Effects on groundwater quality		✓			• The Project is not anticipated to affect groundwater quality
1.2	3.2.1	Effects on groundwater quantity / levels/flow		✓			• There is potential for effects on groundwater levels and flow resulting from increased water levels within the headpond
1.4		Effects on groundwater from accidental spills or releases to the environment		✓			• There is potential for effects on groundwater from fuel and lubricating fluid spills during construction and operation of the Project
	3.2.2	Groundwater recharge areas			✓		• Existing background information and hydrogeological studies have not identified any recognized groundwater recharge areas
3. Air							
Air Quality							
3.1	5.1	Effects on air quality from emissions of nitrogen dioxide, sulphur dioxide, suspended particulates, or other pollutants	✓				• There is potential for effects on air quality from engine emissions from motorized construction equipment (e.g., excavators and haulage trucks) during the construction phase of the Project • Hydroelectric power does not utilize fossil fuels for electricity generation. Operation of the Project will not result in significant emissions of NO_X, SO_2, TSP, or particulate matter • Off-site rock-crushing and batching may result in increased localized dust emissions

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
3.2	5.1	Effects from the emission of greenhouse gases (CO_2, methane)	✓				• Hydroelectric power does not utilize fossil fuels for electricity generation. Operation of the hydroelectric Project will not result in significant emissions of CO_2 or methane • The Project is expected to result in a small net benefit on the Province-wide emission of greenhouse gases by reducing the need for other forms of electricity generation such as coal or natural gas • Hydroelectric facilities in northern Ontario do not typically generate significant amounts of greenhouse gases from decomposition of organic matter in the area of inundation due to the generally low productivity of cold water systems • There is potential for effects on air quality from engine emissions from motorized construction equipment (e.g., excavators and haulage trucks) during the construction phase of the Project
3.3	5.1	Effects from the emission of dust or odour		✓			• There is a potential for dust or odour during construction
Noise							
3.4	6.3.2	Effects from the emission of noise		✓			• There is potential for noise effects due to operation of heavy machinery during dam construction and vegetation removal • There is potential for limited environmental noise effects at sensitive receptors due to operation of the spillway • There is potential for noise and vibration from operation of the turbine and generator. This equipment will be contained within a powerhouse structure
4. Natural Environment							
Terrestrial Vegetation							
	2.3.1	Terrestrial ecosystems (rare, unique, representative)			✓		• Background information and terrestrial field investigations have not identified any rare, unique, or representative terrestrial ecosystems
	2.3.2	Trees		✓			• Tree clearing will be required for access roads, transmission lines, and the headpond footprint • The Project is located within the sustainable forest license area held by Tembec Industries Inc (“Tembec”)

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
Wetlands							
4.3	3.3.4, 1.4.11	Effects on wetlands		✓			• There are no known Provincially Significant Wetlands in the Study Area • There is potential for effects on wetlands due to inundation and construction of access roads and other ancillary facilities. This may potentially affect non-provincially significant wetlands or wetland vegetation. Unclassified wetlands may also provide substantive ecological function • Headpond formation may affect drainage of adjacent lands, inducing wetland conditions
	2.3.3	Ground cover / shoreline		✓			• Ground cover will be removed during headpond clearing and inundation • Most existing riparian vegetation will be removed during headpond clearing. Understory vegetation within 3m of the Mattagami River will be left in place to reduce the potential for sedimentation during construction, but trees will be removed. • There will be effects to the existing river shoreline within the headpond footprint • The Mattagami River shoreline upstream of the headpond and downstream of the headworks will not be affected • Existing ground cover will be removed for construction staging areas, in the footprint of Project components, and for construction of access roads and transmission lines
Aquatic Vegetation							
	3.3.1	Submergent and / or emergent	✓				• Submergent and emergent vegetation within the headpond area may be affected by increased water depths • The Project will result in a new littoral zone approximately 30,000 m^2 larger than currently exists. New submergent and emergent vegetation is likely to be established in this area, potentially providing fish habitat and moose feeding area
	3.3.2	Nuisance			✓		• Background information and field surveys have not identified nuisance aquatic vegetation in the vicinity of the Project • No nuisance vegetation will be imported for the purposes of the Project
	3.3.3	Rare / threatened / endangered			✓		• No rare/threatened/endangered aquatic plants have been identified in existing background information or during the aquatic sampling program
Wildlife							
4.4	4.3	Wildlife species and habitat		✓			• There is potential for effects on existing wildlife habitat from forest clearing, facility construction and headpond creation • Wildlife species may be disturbed during construction activities

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
4.4		Effects on wildlife populations, corridors, or movement		✓			• There is potential for effects on wildlife corridors by the installation of access roads and transmission line infrastructure • There is potential for effects wildlife movement by increased anthropogenic activity during the construction period
4.6		Effects on migratory birds, including effects on their habitat or staging areas		✓			• There is potential for effects on breeding birds from tree clearing, noise, lights, nest disturbance, and loss of habitat • Background information review has not identified any unique breeding bird areas • Waterfowl habitat may be positively or negatively affected by creation • of the headpond
	4.2	Invertebrate		✓			• There is potential for effects on invertebrate habitat within the area of inundation and immediately downstream of the proposed Project.
4.1	2.3.4	Rare / threatened / endangered species or their habitat			✓		• No terrestrial species of conservation concern have been identified within the Project footprint •
Fire Hazards							
	2.3.5	Fire hazards		✓			• There is potential for effects from fire, as timber stockpiling and tree limbing activities may increase potential fuel loads during the construction period • Burning of river debris during operation may result in increase fire hazards • Construction equipment exhaust and personnel may inadvertently present fire hazards
	1.4.3	Fire zones			✓		• The Project is located in the MNR's East Fire Region, Zone 16. No effect on MNR fire zones will occur. Fire regulations will be adhered to during Project construction and operation
Protected Natural Areas and Species of Concern							
4.2	1.4.6	Effects on protected natural areas such as ANSIs, ESAs or other significant natural areas			✓		• No ANSIs have currently been identified in the Study Area. • Three conservation reserves and one forest reserve are located within the Study Area but are well outside the Project footprint and will not be affected
4.7		Effects on locally important or valued ecosystems or vegetation		✓			• There is potential for effects on locally important ecosystems or vegetation, as the Project will require forest clearing in the area of inundation • The Smooth Rock Falls Forest is under a sustainable forest license area held by Tembec and currently represents a renewable economic resource

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
	1.4.1	MNR reserves			✓		• Three conservation reserves and one forest reserve are located in the Study Area but will not be affected by the Project. The closest conservation reserve is approximately 19 km southwest of the Project
	1.4.5	Provincial and federal parks / candidates			✓		• No provincial or federal parks or candidate parks have been identified in the Study Area
Fish							
4.5	4.1	Fish species and habitat		✓			• There will be effects on fish habitat within the dam/power house footprint at Yellow Falls • There is potential for effects on fish habitat as a result of creation of the headpond area • There is potential for effects on fish habitat by construction of water crossings for access roads • There is potential for effects on fish species as a result of inundation of the headpond • There is potential for effects downstream of the Project as a result of flow alteration • There is potential for effects on fish habitat as a result of removal of woody debris downstream of the Project during operation
4.5		Fish spawning, movement or environmental conditions (e.g. water temperature, turbidity, etc.)		✓			• There is potential for effects on upstream fish movement upstream by inundation of Yellow Falls • There is potential for effects on upstream fish movement due to the construction of a dam at Yellow Falls • There is potential for effects on downstream fish movement due to the construction of a dam at Yellow Falls • Inundation will result in alterations to environmental conditions in the headpond
	1.4.4	Fish sanctuary			✓		• A fish sanctuary is located downstream of Lower Sturgeon Generating Station, approximately 30 km upstream of the proposed headpond • The Project will not affect the fish sanctuary
5. Resources							
5.1		Result in inefficient (below 40%) use of a non-renewable resource	✓				• The electricity created by the Project is generated from flowing water, which is a renewable resource • The Project will use non-renewable resources such as petroleum for construction equipment, and aggregate materials, but no inefficient uses are envisaged

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
5.2		Effects on the use of Canada Land Inventory Class 1-3, specialty crop or locally significant agricultural lands?			✓		• There is no known agricultural production in the area where the Project is proposed • The Project will not occupy agricultural lands
5.3	1.1.5	Effects on existing agricultural production			✓		• There is no known agricultural production in the proposed Project footprint • The Project will not affect agricultural production
5.4	1.1.2	Effects on the availability of mineral, aggregate or petroleum resources		✓			• There are no known petroleum resources within the Study Area • Mining claims have been identified within the Study Area, but will not be affected by the Project • There is potential for effects on aggregate resources, as construction will consume aggregate materials extracted from temporary pits in the Study Area • No aggregate extraction will occur in the Mattagami River Crown Land Use Policy Area
5.5	1.1.1	Effects on the availability of forest resources		✓			• There is potential for effects to forest resources for the life of the Project. Clearing will be required for construction of access roads, transmission lines and in the headpond area • Timber will be harvested in accordance with an overlapping agreement between the Project proponent and Tembec • Shoreline tree clearing buffer zones will be re-established following headpond creation
5.6	1.1.6	Effects on game and fishery resources, including negative effects caused by creating access to previously inaccessible areas		✓			• Construction of the powerhouse and dam may limit access to recreational areas upstream of the Project • Recreational use of access roads may be limited during upgrades and transmission line construction • There is potential for increased pressure on game and fishery resources during operation, as access will be improved to the site and to upstream areas of the Mattagami River
	1.1.4	Commercial fisheries			✓		• No commercial fisheries have been identified in the Study Area
	1.1.7	Aquaculture			✓		• No aquaculture activities have been identified in the Study Area
	1.1.8	Wild rice production			✓		• The nearest wild rice stand is located approximately 1.3 km east of the nearest Project component and will not be affected
6. Socio-Economic Features							

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
	6.2.4	Nature and organization of local governments			✓		• There are no anticipated effects upon the nature and organization of local governments
	6.2.2	Population		✓			• Construction may require an influx of temporary workers
6.1		Effects on neighbourhood or community character		✓			• There is potential for effects on neighbourhood or community character, as the Project will result in alterations to landscape character viewed by hunters, anglers, and other recreational users • There are no permanent residents within 1 km of the proposed Project. However, Crown Land throughout the Study Area is utilized by anglers, hunters, trappers, and outdoor enthusiasts • Cottages and trapping cabins are location within 1 km of the Project and may experience effects due to alterations to landscape character
6.2	6.2.8	Effects on local businesses, institutions or public facilities	✓				• The construction of the Project will involve the local procurement of materials and services • The Project may affect local businesses such as trappers, guides, and outdoor tourism providers • The Project may affect the dam safety ratings of Lower Sturgeon GS and Smooth Rock Falls GS
6.5		Effects on the economic base of a municipality or community	✓				• To the extent possible, goods and services will be procured locally during construction, operation, maintenance, and decommissioning of the Project • Temporary workers employed during construction will likely procure goods and services locally, resulting in indirect economic benefits
6.6	6.2.5	Effects on local employment and labour supply	✓				• To the extent possible, local people will be employed during the construction, operation, maintenance, and decommissioning
6.4	6.2.7	Effects related to increases in the demands on community services and infrastructure			✓		• The Project will not be physically connected to community services or infrastructure and hence no increases for these services are required (e.g., no new demand for potable water, wastewater connections, etc.). • Temporary workers employed during construction may place an additional short-term demand on community services and infrastructure
	6.2.6	Housing	✓				• Two operating personnel will be required to maintain the hydroelectric Project; therefore there will be no significant additional demand for housing • During construction, there may be an increased requirement for rental housing for workers, resulting in an indirect economic benefit

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
6.7		Effects related to traffic		✓			• The transport of equipment and supplies during the construction phase will result in additional (temporary) road use and traffic to the Project sites carrying excess loads • Numerous trucks trips will be required for equipment and materials transportation during Project construction • During operation supplies will be intermittently delivered to the Project as required
6.8	6.1	Concerns related to public health and safety (sanitation, toxic substances, safety)		✓			• There is potential for effects on public safety, due to unsafe conditions near the powerhouse and dam structure • There is no anticipated public health and safety effect associated with sanitation • There is potential for effects on safety due to accidents and malfunctions • There is potential for effects on health, as mercury methylation may present a health hazard for individuals that consume large quantities of fish
	6.2.3	Traditional uses		✓			• There is potential for effects on areas traditional used by First Nations
	6.3.2	Ambient noise levels		✓			• There is potential for effects on noise levels, which will be limited to construction of the hydroelectric Project resulting from the operation of heavy machinery during dam construction and vegetation removal • The operation of the spillway has the potential for limited environmental noise effects at sensitive receptors
7. Land-Use							
2.1		Effects on residential, commercial, or institutional land-uses within 1 km of the site			✓		• A hunting camp is located approximately 1.5 km from Yellow Falls, but this establishment will not be affected by construction or operation of the project • There is a Land Use Permit for Polar Bear Outfitters immediately south of the Project near Loon Rapids, which is within 1 km of the headpond terminus • Several cottages and trapping cabins are located downstream
2.2		Consistency with the Provincial Policy Statement ("PPS"), provincial land-use, and resource management plans			✓		• Project activities will be consistent with the PPS. • The Project will be consistent with the Mattagami River Waterpower Management Plan • The Project is consistent with MNR land use policy contained in the Crown Land Use Atlas

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
2.3		Consistency with municipal land-use policies, plans, and zoning by-laws			✓		• The proposed access road and transmission line corridor is not located within the municipal boundary of Smooth Rock Falls, but is located on Crown Land. No local land use policies, plans or zoning by-laws apply to the Project. However, MNR Crown Land Use policies apply to the Project. Hydroelectric power generation is a permitted use in the Mattagami River Policy Area.
2.4	1.4.9	Use of hazard lands or unstable lands subject to erosion			✓		• No designated hazard lands have been identified in the Study Area.
Recreational Land Uses							
6.3	1.1.3	Tourism			✓		• Tourist establishments in the vicinity of the Study Area will not be affected by the Project
6.3	1.2.1	Cottaging		✓			• Existing cottages and cottaging opportunities have been identified in the Study Area. The Project may affect existing cottaging opportunities by increasing access to the area, changing the viewscape, or by changing the shoreline • Subdivided and remote cottages are a permitted land use in the MNR Crown Land Use Atlas Mattagami River Area. Easier access and formation of a slower-moving, deeper waterbody may increase local opportunities for cottages and camps
6.3	1.2.2	Canoe routes / portages		✓			• The Mattagami River is a designated provincial canoe route. Although the canoe route is not maintained by the MNR, it is occasionally used by canoeists. Overgrown portages still exist at Loon Rapids, Davis Rapids, Yellow Falls, and Island Falls. There is potential to affect recreational canoeing opportunities during construction and operation. • There is potential for the project to affect whitewater canoeing/kayaking opportunities
	1.2.3	Access points		✓			• Safety measures will warn river users of unsafe conditions in close proximity to the dam • The powerhouse, dam, transformer station, and other ancillary facilities will be fenced
	1.2.4	Hunting		✓			• Access road construction could facilitate access for hunting purposes. • There is potential for effects on movement of game animals due to increased activity in the area • There is potential for effects on wildlife habitat as a result of Project construction
6.3	1.2.5	Sport fishing		✓			• There is potential for effects on sport fishing as a result of alteration of fish habitat and water depths within the vicinity of the Project

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
6.3	1.2.6	Boating / sailing		✓			• Existing access to the river from Smooth Rock Falls downstream of the dam will not be affected by the Project • The increased water depth within the headpond will allow for vessel navigability within the headpond • There is potential for the project to affect whitewater canoeing/kayaking opportunities
6.3	1.2.7	Swimming			✓		• No public recreational swimming locations have been identified •
	1.2.8	Crown land activities		✓			• The Project is consistent with MNR policies for the Mattagami River land use area • There is a potential effect on future Crown Land activities such as fishing, hunting, trapping and boating
	1.2.9	Trails	✓				• There is the potential for effects such as improved access on existing hiking, ATV, and snowmobile trails as a result of the Project
	1.2.10	Provincial parks / candidates			✓		• Provincial parks and candidate parks will not be affected by the Project
	1.2.11	Other parks and conservation areas			✓		• Three conservation reserves and one forest reserve have been identified in the Study Area, but will not be affected by the Project
Utilities and Services							
	1.3.1	Transportation and access		✓			• There is potential for effects on transportation and access, as the Project will require upgrades to an existing access road during construction and operation • The Project will increase traffic levels on existing roads and highways during the construction period • The proposed transmission line and access road will cross an existing Ontario Northland Transportation Commission Railway
	1.3.2	Power transmission towers / lines		✓			• The Project will require transmission line construction from Yellow Falls to the proposed interconnection at the existing Hydro One 115kV transmission line • The Project will utilize existing capacity on Hydro One's existing 115kV transmission line
	1.3.3	Communication towers / lines			✓		• A communication cable will be installed on the new power line • The Project will not place a significant demand on existing communication infrastructure
	1.3.4	Sewage and solid waste disposal		✓			• The Project will require the installation of a septic system to dispose of wastewater from the dam/powerhouse structure at Yellow Falls

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
	1.3.5	Water supply			✓		• The Project will obtain domestic water (hand washing etc.) from the powerhouse intake. Potable water will be delivered to the site in containers. The Project will not place an additional demand on existing water supply infrastructure in the area
	1.3.6	Gas / oil pipelines		✓			• TransCanada Pipelines owns and operates natural gas pipelines bisecting the Study Area south of the Town of Smooth Rock Falls. The transmission line for the Project will be required to cross these pipelines
9.1		Creation of waste materials requiring disposal		✓			• There is potential for creation of construction wastes, such as woody debris, excavated soils, equipment packaging and wrappings, and scraps • Woody debris may be produced during operation from vegetation maintenance or removal of debris from the headpond • During operation and maintenance, limited domestic waste will be produced
	1.4.8	Settled areas	✓	✓			• The closest community to the Project is the Town of Smooth Rock Falls, located approximately 18 km downstream of Yellow Falls. During construction, the Project may have a beneficial effect on Smooth Rock Falls since employment will be available, and an influx of workers will additional bring business to the community.
	1.4.10	Peat and peatlands			✓		• There are known peatlands in Haggart and Kendrey Townships which are not within the Project footprint. The Project is not expected to have an effect on peatlands
	1.4.2	Types of land and resource tenure			✓		• The Project is located on Crown land, although private lands occur in the Study Area • Resource tenures in the Study Area include forest resource licenses, land use permits, private recreation camps, outpost camps, and trap cabins, and mining claims • The proponent will conduct all forest clearing in accordance with an overlapping agreement with Tembec • The Project will not affect existing mining claims in the Study Area
2.5		Effects related to the remediation of contaminated land			✓		• No contaminated land has been identified
	1.1.9	Other users / stakeholders		✓			• Industrial river users in the Study Area include OPG (Lower Sturgeon GS) and Tembec (Smooth Rock Falls GS). The Project has the potential to affect the operation or dam safety rating of Lower Sturgeon and Smooth Rock Falls GS • Other land and river users in the area including a local snowmobile club, anglers, and hunters may be affected by the Project
8. Heritage and Culture							

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
7.1	7.2	Effects on heritage buildings, structures or sites, archaeological resources, or cultural heritage landscapes		✓			• Several heritage sites are near the proposed headpond location. A Stage 3 Archaeological Assessment was performed to determine the potential for heritage resources • One significant pre-contact and historic logging camp exists near the proposed headpond • An unconfirmed burial site may require further investigation
	7.1	Locally, regionally and provincially significant features		✓			• One significant pre-contact and historic logging camp exists near the proposed headpond at Yellow Falls • Site protection will be required for the duration of the Project
	6.2.1	Lifestyle	✓				• River accessibility for recreational activities such as fishing, canoeing, cottaging, and hunting may be improved during operation
7.2	6.3.1	Effects on scenic or aesthetically pleasing landscapes or views		✓			• There is potential for effects on the local landscape as a result of dam construction, access road construction, and headpond inundation • Yellow Falls is a locally known recreational area
9. Aboriginal							
8.1		Effects on First Nations or other Aboriginal communities				✓	• There is potential for effects on the traditional area of the Taykwa Tagamou Nation • Lands affected by the Project may include a First Nation heritage site. • Taykwa Tagamou Nation supports the Project
	7.3	Treaty and Aboriginal rights		✓			• There is potential for effects on the traditional area of First Nations
	1.4.7	Native land claims		✓			• There is potential for effects on the traditional area of First Nations
10. Accidents and Malfunctions							
9.2		Cause any other negative environmental effects not covered by the criteria outlined above		✓			• Extreme weather events, accidents, and malfunctions may effect the Project
11. Conformity with Agency Plans							
	1.5.1	Conformity with existing MNR plans			✓		• The Project conforms to the policies identified in the Mattagami River Land Use Area • The Project will be developed in accordance with MNR policies

Table 3.1 Integrated Screening Checklist

MOE Section	IRM Section	Criterion	Benefits & Concerns				Additional Information
			Benefit	Concern	No Effect	Unknown	
	1.5.2	Conformity with other agency plans			✓		• The Project is being developed in consultation with the public, First Nations, MNR, and the provincial and federal governments • The Project has a power purchase agreement with the Ontario Power Authority • The proponent will acquire all necessary permits and approvals before construction

4.0 Existing Environment

This section provides an overview of existing environmental features in the Study Area. The overview uses information from the following detailed appendices:

- **Appendix F – Environmental Features**
- **Appendix G – Aquatic Resources**
- **Appendix H – Terrestrial Vegetation and Wildlife Resources**

Detailed environmental features mapping is provided on the following figures, available in **Appendix F2**:

- **F2-1 – Study Area**
- **F2-2 – Geology**
- **F2-3 – Soils**
- **F2-4 – Water**
- **F2-5 – Natural and Man-made Barriers in the Moose River Basin**
- **F2-6 – Ontario Land Cover**
- **F2-7 – Natural Environment**
- **F2-8 – Mineral and Aggregate Resources**
- **F2-9 – Agricultural Resources**
- **F2-10 – Socioeconomic, Natural, and Recreational Features**
- **F2-11 – Land Use Planning and Infrastructure**
- **F2-12 – Land Ownership**

The Study Area is located in Cochrane District, in Northeastern Ontario, and comprises a block of land approximately 58 km by 37 km, encompassing an area of over 2,000 km^2. Key settlements include the Town of Smooth Rock Falls and the community of Departure Lake (**Figure 1.1**).

4.1 DATA SOURCES AND MAPPING

By necessity, the analysis, integration, and synthesis of data are iterative processes, as information becomes available at various stages of the EA process, and at different mapping scales. The level of detail of data and mapping increases as the EA progresses from a general overview of features within the broader Study Area, to a site-specific analysis of the lands occupied by the proposed Project.

Base mapping (**Figures F2-1** through **F2-11**, **Appendix F2**), was generated from 2002 Landsat 7 satellite imagery and data from Land Information Ontario ("LIO") (2006). Mapping sources are identified on each figure. Where information has been digitized, scales have been adjusted from the original to better represent the features mapped. Stantec has digitally reproduced additional features and has added them to 1:200,000 base maps and air photos.

Information resources used to identify environmental characteristics of the Study Area include site photographs, aerial photography, publications by the Ontario Geological Survey ("OGS"), Environment Canada ("EC"), Natural Resources Canada ("NRCan"), the Ontario Ministry of Northern Development and Mines ("MNDM"), the Ontario Ministry of Natural Resources ("MNR"), and other background sources. Agencies typically request that sensitive information be kept confidential, such as the precise location of species of conservation concern, including rare, vulnerable, threatened and endangered species, and archaeological sites. Such information has been mapped so that specific site locations are not identified.

4.2 LAND

4.2.1 Geology

The Canadian Shield comprises seven geological provinces (NRCan, 2006). The Study Area is located in the Superior geological province and the Abitibi subprovince. Bedrock is mostly composed of metavolcanic and metasedimentary rock. The dominant rock type is biotite-quartz-feldspar gneiss and granitic gneiss. Mafic to intermediate metavolcanic rocks are common throughout the lower half of the Study Area, south of Davis Rapids. A geologic fault is located at the division between the area of gneiss rock and the area of mafic metavolcanic rocks (Ontario Department of Mines, 1968; MNDM, 2003a; MNDM, 2003b). Bedrock type throughout the Study Area is shown in **Figure F2-2**. Please see **Appendix F1** for more information on the geology of the Study Area.

4.2.2 Physiography

Erosion over time has smoothed topographic relief within the Study Area, resulting in relatively flat terrain (MNDM, 2003a). Topographic relief ranges from about 225 m above sea level ("asl") at the north end of the Study Area to localized hummocks of about 335 m asl in the south-west corner of the Study Area. Surface water drainage is northward to James Bay (Energy, Mines, and Resources Canada, 1986a; 1986b; 1989).

4.2.3 Soil

The Study Area is located in a lacustrine plain, formed by the post-glacial Lake Barlow-Ojibway. Surficial deposits are primarily lacustrine and morainal sand, silt, and clay deposited during deglaciation (Buttle et al., 1998). Alluvial clay deposits form the substrate in localized stretches of the Mattagami River (**Appendix F1**). Soil types are depicted on **Figure F2-3**.

Drift thickness within the Study Area varies considerably. Drift thickness ranges from less than 1 m to 8 m deep in the vicinity of the North Muskego River (**Figure F2-3**). Drift is generally greater than eight metres east of the Mattagami River. Isolated outcrops of bedrock and areas of thin drift occur throughout the Study Area.

4.2.4 Seismicity

The probability of seismic activity (i.e., earthquakes) in the Study Area has been rated as "low" by NRCan (2006b). Seismic activity and risk is recorded and estimated by the Geological Survey of Canada. The risk of seismic activity is described by estimating the likelihood of exceeding a certain spectral acceleration (the vibration experienced by a building during a seismic event) based on a 2% probability over 50 years.

4.2.5 Climate

The Study Area is located in the Northern Clay Belt Climatic Region, characterized by a cold climate and a short growing season (Chapman and Thomas, 1968). January is the coldest month of the year, with an average temperature of –17.5^{o}C, while July is the warmest month, with an average temperature of 17.4^{o}C. Average annual temperature is approximately 1.3^{o}C (**Figure 4.1)**.

Consistently frost-free days occur from approximately the end of April to the beginning of October, with the annual frost-free period lasting approximately 92 days (Chapman and Thomas, 1968). The approximate growing season is between May 7 and October 13 (Chapman and Thomas, 1968).

On average, the Study Area receives approximately 831 mm of precipitation per year with total rainfall of 558 mm (67%), and total snowfall of 273 mm (33%). Summer and autumn months receive the most precipitation, while the winter is comparatively dry (**Figure 4.2;** EC, 2006a).

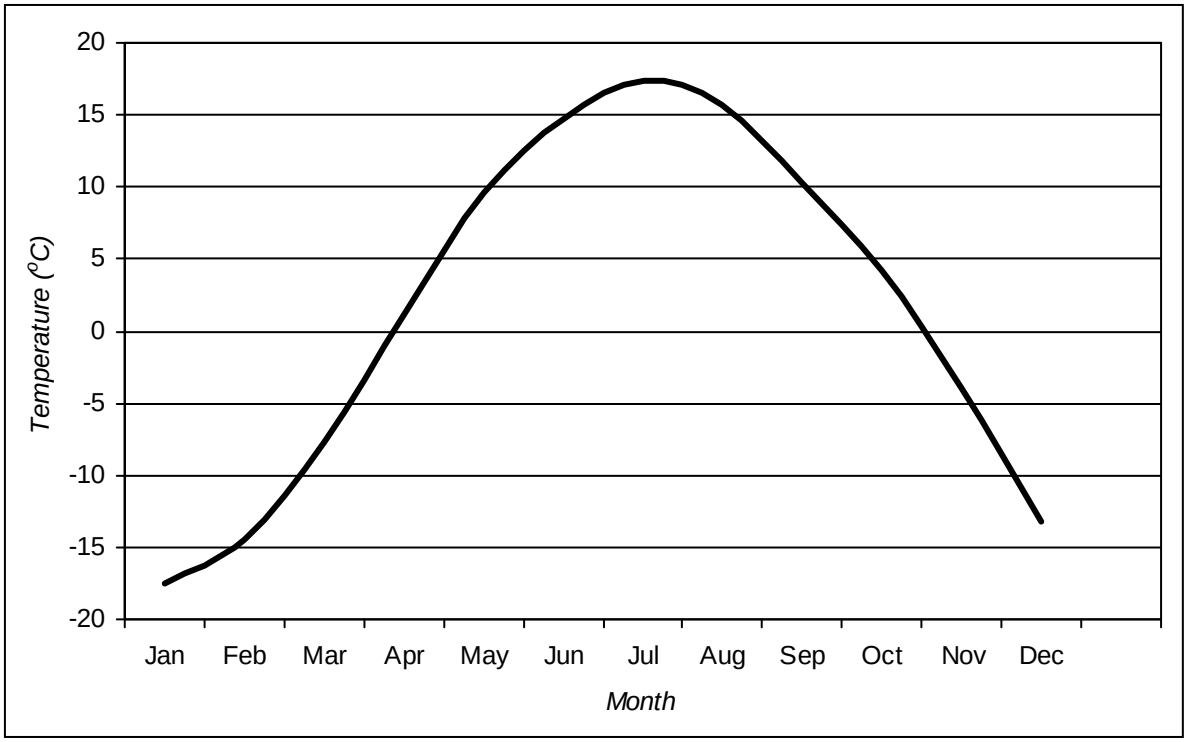

Figure 4.1: Average Monthly Temperature (1971 to 2000; EC, 2006a)

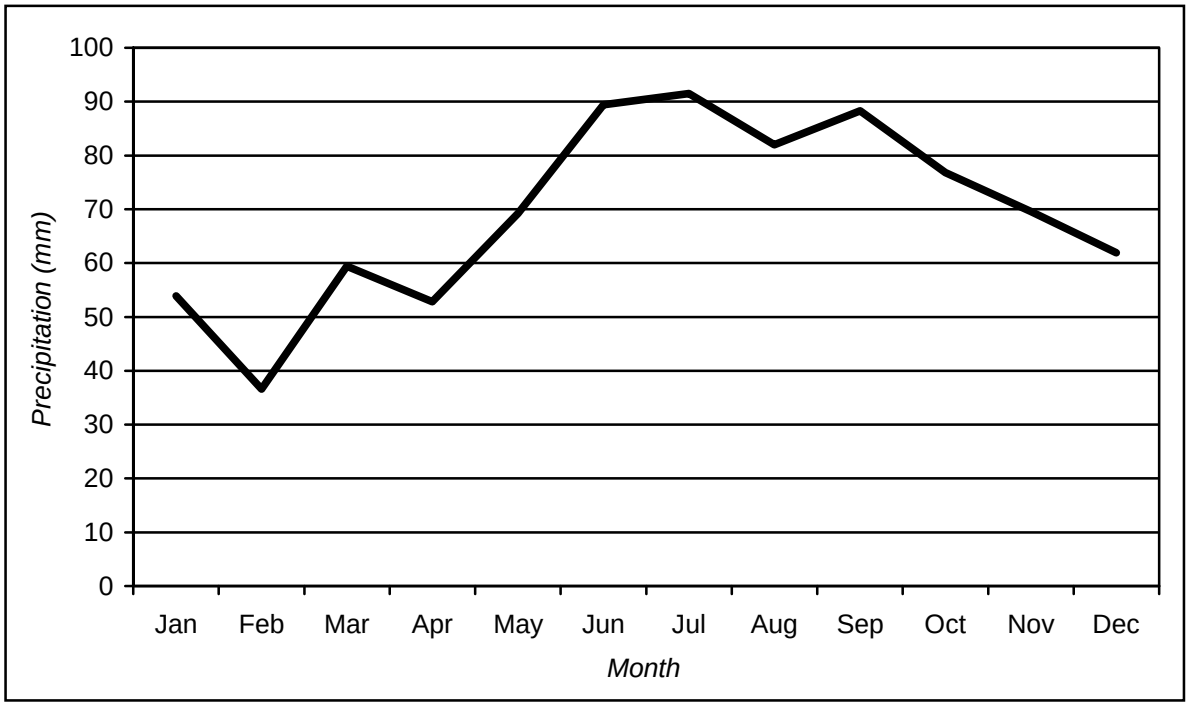

Figure 4.2: Average Monthly Precipitation (1971 to 2000; EC, 2006a)

4.3 WATER

4.3.1 Surface Water

The Study Area is located in the Mattagami River Watershed, a sub-watershed of the Moose River Basin. The Moose River flows into James Bay, and its major tributaries include the Mattagami, Abitibi, Kwataboahegan, Missinaibi, and North French Rivers. Major tributaries of the Mattagami River include the Kapuskasing and Groundhog Rivers (Buttle et al., 1998).

The headwaters for the Mattagami River stem from Lake Mesomikenda, southwest of Gogama, Ontario (MNR et al., 2004). The Mattagami River flows approximately 443 km north to its confluence with the Missinaibi River to become part of the Moose River. The Mattagami River has a total drainage area of approximately 37,000 km^2, and falls 329 m over its length (NRCan, 2004). The overall gradient of the Mattagami River is 0.74 m fall per km.

The largest tributary of the Mattagami River in the Study Area is the North Muskego River, which enters the Mattagami River approximately 4.5 km upstream of the Town of Smooth Rock Falls, approximately 13.5 km downstream of the Project. Other named tributaries include Aubin Creek, Bradburn Creek, Dargavel Creek, Jocko Creek, Pullen Creek, Rat Creek, Thorburn Creek, and White Caribou River. Watercourses in the Study Area are shown in **Figure F2-4**. In addition to watercourses, large wetland areas and numerous small lakes and ponds dot the landscape, providing a considerable amount of available surface water storage.

Watershed area was calculated using Digital Elevation Models of the Mattagami River watershed by Canadian Projects Limited ("CPL"), the project engineer.

Water surface profiles in the headpond reach were calculated using the US Army Corps of Engineers Hydraulic Engineering Centre River Analysis System ("HEC-RAS") version 3.1 by CPL using Bathymetric cross sections of the river surveyed at 500 m intervals from Island Falls to the Lower Sturgeon GS developed in August 2007.

The Project has an effective watershed area of approximately 9,111 km^2. The nearest Water Survey of Canada Hydrometric Station (Station No. 04LB001), located at Smooth Rock Falls, has an effective watershed area of 9,886 km^2, a difference of approximately 7.8%. As no data are available for Island Falls, 1922 to 1995 data from the Smooth Rock Falls Hydrometric Station were adjusted by approximately 7.8% to reflect the reduced watershed area at the Project site (Canadian Projects Limited, 2007). **Table 4.1** presents a summary of key hydrological statistics.

Table 4.1 Hydrological Summary of Yellow Falls

Measure	Discharge Rate (m^3/s)
Average annual discharge	102.6
Median annual discharge	60.3
1 in 100 year flood	1,164
1 in 1,000 year flood	1,414
1 in 10,000 year flood	1,946
Probable Maximum Flood	3,893
Long-term average flow	112.4
1 in 20 year 7-day low flow	4.6

The Mattagami River supports eight generating stations ("GS"), seven of which are operated by Ontario Power Generation ("OPG"), with the remaining GS operated by Tembec Industries Inc. ("Tembec"). Locations of hydroelectric generating stations and other control structures in the Moose River Basin are shown in **Figure F2-5**. The Lower Sturgeon GS (operated by OPG) is located at the southern limit of the Study Area, while the Smooth Rock Falls GS (operated by Tembec) is located at the northern limit. The current production capacity of generating stations on the Mattagami River is about 501 MW. OPG plans to redevelop its existing stations on the Mattagami River using updated technology, resulting in a proposed capacity increase of about 413.5 MW (OPG, 2007; OPG, undated). The Lower Sturgeon GS is proposed for redevelopment to increase its capacity to 14 MW from its existing 5 MW.

Lower Sturgeon GS and Smooth Rock Falls GS provide some water flow regulation through the Study Area, but are approved to operate as run-of-the-river facilities. Operating regimes for both stations were determined during the Mattagami River Water Management Planning ("WMP") exercise (MNR et al., 2004). Generating stations in the Mattagami River watershed are required to operate headpond levels within maximum and minimum boundaries (**Table 4.2**) measured as height above sea level ("asl"). Recently, the Smooth Rock Falls GS has evaluated alternative operating regimes which have resulted in lower headpond levels at certain times. Changes to the Smooth Rock Falls GS operating regime are not anticipated to affect the construction or operation of the Yellow Falls Project.

Table 4.2 Operating Limits for Lower Sturgeon and Smooth Rock Falls Hydroelectric Generating Stations

Description	Lower Sturgeon GS	Smooth Rock Falls GS
Absolute maximum (m asl)	258.60	228.99
Absolute minimum (m asl)	254.17	223.28
Normal maximum (m asl)	258.42	228.92
Normal minimum (m asl)	254.17	228.77
Absolute summer minimum (m asl)	257.70	Not applicable
Other comments	Maintain daily average minimum flow of 15 m^3/s to Smooth Rock Falls for dilution of pulp and paper mill effluent	

Water quality samples in the Study Area were taken as part of the Yellow Falls Hydroelectric Project Aquatic Assessment (**Appendix G1**). Water quality analysis was performed for 35 metals, inorganics such as arsenic, sodium, selenium, cyanide, nitrates and nitrites, total phosphorus, and other parameters, including nitrogen, hardness, suspended solids, and dissolved solids.

Tested water quality parameters are within MOE guidelines (2005) for potable water in fine-grained soils. Iron exceeds MOE aesthetic objectives for drinking water (2006a), as is common in rivers throughout the Canadian Shield. Naturally occurring iron gives the water in the Mattagami River a characteristic yellowish colour.

4.3.2 Ice

Several natural occurrences can limit or promote the formation of ice, as well as determine the type of ice formed. These natural variables include fluctuating air temperatures, river flows, wind velocities, evaporation rates, natural damming caused by ice or other debris, and precipitation events.

The Study Area is characterized by two major drops in water elevation that result in waterfalls (Island and Yellow Falls) as well as two major sets of shallow, wide flowing, high gradient areas known as rapids (Davis and Loon Rapids). The aforementioned areas are conducive to zones of high water turbulence, which favours the development of frazil ice.

Frazil ice is limited to riverine waters and occurs during freeze-up, continuing throughout winter in turbulent regions devoid of other ice formations. Cold air temperatures and high surface area contact with water typical of turbulent regions, resulting in a slight super-cooling of water, which generates fine ice particles. The potential for frazil ice formation therefore increases proportionally with increases in the extent of open water area and rate of heat loss. The fine

particles then coagulate under these super-cooled conditions, resulting in the formation of frazil clusters or flocs. These flocs become buoyant causing them to rise to the surface, where they may be easily transported downstream. Flocs can then grow in size until they either form ice pans, that may go on to form continuous ice cover, or the flocs may attach and accumulate underneath existing ice cover, forming hanging dams. Hanging dams may cause widespread blockage of water flow, which eventually causes the water levels above the hanging dam to rise and drastically increasing the potential for flooding (Beltaos et al., 1989).

4.3.3 Groundwater

According to MOE records, there are 113 water wells in the Study Area. The earliest well on record was drilled in November 1948 and the latest was drilled in August 2005. On average, water wells are drilled to a depth of approximately 50 m. The shallowest well is 2 m, while the deepest is 126 m (MOE, 2006b). Approximate well locations are shown in **Figure F2-4**. Background information and hydrogeological studies have not identified any recognized groundwater recharge areas within the Study Area (Acres, 1990).

4.4 AIR AND NOISE

4.4.1 Air Quality

The MOE conducted an air quality study in Timmins, located approximately 80 km south of the Study Area, in 2003 with results published in 2004. The study measured concentrations of ozone ("O_3"), fine particulates ("$PM_{2.5}$"), sulphur dioxide ("SO_2"), and nitrogen dioxide ("NO_2"). Measurement of these four pollutants from July to August 2003 indicates that the Timmins area enjoys better air quality than other less northerly cities including Sault Ste. Marie, Sudbury, and North Bay. Throughout the study period, pollutant levels remained well below the Ontario Ambient Air Quality Criteria (MOE, 2004). Air quality in the Study Area is anticipated to be similar to the air quality recorded in Timmins.

4.4.2 Noise

The Study Area is predominantly rural. The nearest urban area is the Town of Smooth Rock Falls, located in the northern portion of the Study Area. Anthropogenic (human-related) use of the majority of the Study Area is related to outdoor recreation, hunting, fishing, and forestry activities. The main sources of ambient sound within the Study Area, in the vicinity of the proposed facility generally include:

- Natural sounds from wind, flowing water and other atmospheric sources, wildlife, etc.
- Vehicle traffic on Red Pine Road, logging roads, and ATV trails
- Boat traffic on Mattagami River

- Forestry Activities (these sounds are transient in nature as forest clearing operations move over time)

Most of the Study Area would be classified as a Class 3 area, defined by the MOE as rural or small communities with a population less than 1,000 and an acoustic environment that is dominated by natural sounds and little or no road traffic. However, human activity in the Town of Smooth Rock Falls, the Village of Departure Lake, and along Highway 11 would likely result in Class 2 classification in the northern portion of the Study Area, defined as an acoustic environment with low ambient sound levels between 19:00 hours and 07:00 hours; where the evening and night time levels are defined by natural sounds, infrequent human activity, and there are no clearly audible sounds from stationary sources (e.g., industrial and commercial facilities). The closest trapping cabin is approximately 3,200 m north of Yellow Falls. One MNR Land Use Permit ("LUP") holder has a seasonal residence located approximately 1,600 m northwest of Yellow Falls and may be a potential noise receptor. Polar Bear Outfitters holds a LUP approximately 4,900 m upstream of Yellow Falls at Loon Rapids. LUP holders have been contacted during the course of the EA process and an evaluation of potential affects on noise receptors was conducted by Aercoustics Engineering Limited on behalf of YFP (**Appendix I**). YFP will continue to communicate with LUP holders throughout Project construction and operation.

4.5 NATURAL ENVIRONMENT

4.5.1 Terrestrial Vegetation

The Study Area is predominantly forested, as it is located in the Boreal Forest zone (Kershaw, 2001). A Vegetation Survey (**Appendix H**) was carried out by Stantec in the summer and fall of 2006 according to sampling techniques described in the Field Guide to Forest Ecosystem Classification ("FEC") for Northeastern Ontario. A total of fifty-five 20 m x 20 m sample plots were established and data was collected on the tree, shrub and herbaceous under-storey layers. Extensive logging activities have altered the forest from its natural state (**Figure F2-7**). There are areas of clear-cut forest, and regeneration has resulted in a number of successional stands of similarly aged trees. A range of ecosystem types representative of local topographic features, soil types and moisture regimes in the vicinity of the Project were sampled.

Natural vegetation communities are interspersed with areas of regenerating forests associated with previously logged lands in tableland areas. Mesic and wet-mesic sites found on tablelands are typically covered by diverse mixed forest communities dominated by successional species such as trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), white birch (*Betula papyrifera*), white spruce (*Picea glauca*) and balsam fir (*Abies balsamea*). Imperfectly drained bottomland sites typically contain a higher proportion of balsam, poplar and black spruce (*Picea mariana*).

Dense mixed forest communities situated on well-drained soils can be found on the slopes of the Mattagami River valley. Occasional stands dominated by white birch or trembling aspen are

present along the river valley, but pure deciduous or coniferous stands are infrequent. White cedar (*Thuja occidentalis*) and white spruce mixtures occur in some locations and are primarily associated with areas of steeper slopes. Some lower slope areas and many islands in the river contain meadow habitats with varying compositions of broad-leaf herbs, sedges and grasses.

4.5.2 Wetlands

Bogs and fens are abundant in the Boreal Forest zone, but have limited representation within the Study Area. Where present, bog communities occur in poorly drained depressions with organic substrates generally consisting of sphagnum peat. Treed bogs are typically forested with black spruce and tamarack, while shrub bogs are dominated by leatherleaf with sparse tree cover. None of the wetlands within the Study Area have been identified by the MNR as provincially significant.

Speckled alder (*Alnus incana*), willow and red-osier dogwood (*Cornus sericea*) thickets comprise most of the riparian wetlands along the margins of the Mattagami River and its meandering tributaries within the Study Area. These shrub thicket communities are, for the most part, situated on mineral soils. Open areas within the floodplains that are seasonally inundated support various meadow communities comprised of a mixture of herbaceous and graminoid species.

Aquatic wetland communities, such as those dominated by submerged pondweeds, are limited within the Study Area. These communities were observed in slow current areas and sheltered bays along some sections of the Mattagami River as well as in some lower reaches of tributary creeks. Approximately 14% (linear measurement) of the Mattagami River shoreline within the Study Area supports aquatic macrophyte vegetation.

4.5.3 Species of Conservation Concern

Two plant species of conservation concern have been reported from the Study Area. Yellow-rattle (*Rhinanthus minor* ssp. *groenlandicus*), found during the terrestrial fieldwork in 2006, has a provincial rank of S3 (vulnerable in the province due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation) by the Natural Heritage Information Centre (“NHIC”) (NHIC, 2006). However, this plant appears to be common in the area, and is frequently found along roadsides and trails off Highway 655 within the Study Area.

Sphagnum jensenii, a moss, was reported in the NHIC database, and has been found in peatland under coniferous forests or on wet rocks near streams in the general vicinity of the Study Area. It is provincially ranked as S2, which means that it is imperiled in the province due to its rarity as a result of its very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the province. The last recorded sighting of *Sphagnum jensenii* in the area was in 1976 (NHIC, 2006). This species was not observed during the 2006 terrestrial field surveys.

Although both species are considered rare in the province by NHIC, neither species is designated by the Committee on the Status of Species at Risk in Ontario ("COSSARO") or the Committee on the Status of Endangered Wildlife in Canada ("COSEWIC").

4.5.4 Terrestrial Wildlife

4.5.4.1 Amphibians and Reptiles

A review of the Ontario Herpetofaunal Summary Atlas (Oldham and Weller, 2000) indicated that a total of eleven species of amphibians potentially occur in the Study Area. Based on the Atlas, the amphibian species known to occur in the general geographic area include the American toad, spring peeper, boreal chorus frog, grey tree frog, wood frog, northern leopard frog, green frog, mink frog, blue-spotted salamander, spotted salamander, northern two-lined salamander.

Male frogs and toads use calling to attract mates as breeding partners. This vocal group of amphibians is known as *anurans*. Four species of anurans were observed in and around wet areas along Red Pine Road during the 2006 field surveys: American toad (*Bufo americanus)*, spring peeper (*Pseudacris crucifer*), northern leopard frog (*Rana pipiens*), and mink frog (*Rana septentrionalis*), all of which are ranked as S5 (secure, common, widespread and abundant in Ontario).

The Ontario Herpetofaunal Summary Atlas indicates that the eastern garter snake (*Thamnophis sirtalis*) is the only reptile species likely to be observed in the Study Area. Very little potential habitat for snakes (e.g., potential hibernacula, cobble, boulder or sandy areas) or salamanders (large logs) was observed along the potential road and transmission line routes. Rocky outcrop habitat was located at Island Falls and Yellow Falls, and one garter snake was observed during the 2006 field surveys on the riverbank below Island Falls, where suitable cobble and boulder habitat was present.

4.5.4.2 Mammals

The Atlas of the Mammals of Ontario (MNR, 2002) lists 26 species of mammals in the 100 x 100 km block that includes the Study Area. All species are designated S5 (secure, common, widespread and abundant in Ontario) or S4 (apparently secure, uncommon but not rare in Ontario), and one species, house mouse, is ranked SE (exotic, not a native component of Ontario's fauna).

Lynx, marten, mink, and river otters are all listed as being common within the Study Area in the Atlas of the Mammals of Ontario (MNR, 2002); however none of them were observed during the field survey conducted in 2006. In recent years, lynx have been regularly encountered, but populations vary cyclically as they are dependent on snowshoe hare populations. Lynx populations in the vicinity of the Study Area have been very low for the last few years (Y. Arsenault, pers. comm.). Mammals observed by Stantec include: field mouse, bear, moose, and rabbit.

Potential aquatic feeding areas for moose and feeding and denning areas for mink, otter, and marten are present in the Study Area. However, very little shallow aquatic habitat with preferred moose food plants (MNR, 2000) was recorded along the Mattagami River.

4.5.4.3 Birds

During field surveys, 103 bird species were observed. All species are designated S5 (secure, common, widespread and abundant in Ontario) or S4 (apparently secure, uncommon but not rare in Ontario), the Bald Eagle is designated as S4B/SZN (apparently secure, uncommon but not rare in Ontario, with breeding migrants/non-breeding migrants present) and one species, the European Starling, is ranked SE (exotic, not a native component of Ontario's fauna). Four colonial species (Great Blue Heron, Ring-billed Gull, Herring Gull and Common Tern) were observed foraging or moving through the Study Area, but no breeding colonies were present. White-throated Sparrow (*Zonotrichia albicollis*) was the most abundant species in the Study Area, and was the most abundant species in every habitat type, with the exception of deciduous forest, where the Red-eyed Vireo (*Vireo olivaceus*) was the most abundant. Ninety-eight (98) bird species identified are expected to breed in the Study Area.

A search of the Ontario Breeding Bird Atlas was also conducted to determine if there was potential for any additional COSEWIC-listed birds in the Study Area (data for Region 42, Squares 17MQ40 to 45, 50 to 55, 60 to 65, and 70 to 75 using data updated July 28, 2008 for all years).

The search of the Atlas identified the following COSEWIC-listed birds (using a cross-referenced with a Wildlife Species Search using the search criteria "Birds" and "Ontario" - available at: http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm) that exhibit possible breeding behaviour and have been spotted in the Study Area. However, none of the species are listed in Schedule 1 of the Species at Risk Act. Ontario Breeding Atlas records of COSEWIC-listed species are provided in **Table 4.3** below.

Table 4.3 Ontario Breeding Bird Atlas Record of COSEWIC-listed Species

Region	Square	Species	Breeding Evidence Category	No. of Records	COSEWIC Status
42	17MQ65	Rusty Blackbird	POSS	1	Special Concern
42	17MQ40	Short-eared Owl	POSS	1	Special Concern
42	17MQ65	Canada Warbler	POSS	2	Threatened
42	17MQ40	Common Nighthawk	POSS	1	Threatened
42	17MQ65	Olive-sided Flycatcher	POSS	2	Threatened

The breeding habitat of the Rusty Blackbird consists primarily of conifer forests and muskeg. The species may be found near shorelines of slow-moving water bodies, wetlands, flooded forests, and beaver ponds during migratory and wintering seasons (ROM, 2008).

Short-eared owl habitat consists of grasslands, marshes and tundra (ROM, 2005).

Canada Warbler habitat consists of forests primarily in swamp and riparian areas. They prefer tall trees and require dense understory under the forest canopy, forest edges, or clearings (James, 1984).

The Common Nighthawk utilizes many habitat types, including farmland, open woodlands, clearcuts, burns, outcrops, bogs, fens, prairies, gravel pits, and rooftops (ROM, 2008).

The Olive-sided Flycatcher prefers boreal forests near openings, burns, ponds, and bogs (Boreal Songbird Initiative, 2008).

4.5.4.4 Species of Conservation Concern

Two species of conservation concern were sighted during wildlife surveys. The monarch butterfly has a provincial status of Special Concern, designated by COSSARO and a federal status of Species of Special Concern by COSEWIC. The Bald Eagle, also identified during wildlife surveys, is listed in northern Ontario as a species of Special Concern by COSSARO and Not at Risk of extinction in Canada by COSEWIC.

A search of the NHIC (2006) database indicated that two rare insect species, the Red-disked Alpine (*Erebia discoidalis*), a butterfly species that is ranked as S3 and the Lake Emerald (*Somatochlora cingulata*), a dragonfly species that is ranked as S2S3, have historically been present in the Study Area, however none were observed. Neither insect is listed as being at risk by COSEWIC or COSSARO nor were the insects sighted during field surveys.

4.5.5 Aquatic Environment

A fish sanctuary has been designated by the MNR from Lower Sturgeon GS to the northern boundary of Mahaffy Township (see **Figure F2-7**) due to recreational angling during walleye spawning season. No fishing is allowed from 1 April to 14 June (MNR, 2005; 2006a)

A preliminary survey was conducted in autumn 2005 and a detailed aquatic field sampling program was completed during spring, summer, and fall 2006 by Stantec. Golder Associates Ltd. (“Golder”) conducted additional detailed sampling in spring and summer of 2007. Technical reports regarding the aquatic environment are provided in **Appendix G**.

The study included sections of the Mattagami River that are potentially affected by the Project. Three areas were delineated for sampling programs (**Figure 4.3**):

- **Area A**: defined as the stretch of river between Smooth Rock Falls and Island Falls with focus on the 500 m reach immediately downstream of Island Falls

- **Area B**: defined as the approximately 2 km stretch of river between Island Falls and Yellow Falls. Area B has two inflowing tributaries (Tributaries A and B), which were included in the fisheries inventory.

- **Area C**: defined as the approximately 7 km stretch of river between Yellow Falls and 100 m upstream of Loon Rapids, the upper extent of the proposed headpond area. Rat Creek drains to the Mattagami River within Area C and was included in the fisheries inventory.

Four target fish species were used to focus sampling efforts and subsequent data analysis and assessment. Lake sturgeon (*Acipenser fulvescens*), walleye (*Sander vitreus*), northern pike (*Esox lucius*) and white sucker (*Catostomus commersoni*) were selected using feedback from Fisheries and Oceans Canada ("DFO") and MNR on the proposed 2006 Aquatic Sampling Plan (**Appendix G1-VII**). Selection was based on ecological and economic importance, as well as numerical dominance within the vicinity of the proposed Project. As outlined in **Appendix G1**, a single Catostomid (sucker) species was to be selected as one of the target species prior to spring 2006 sampling. White sucker and longnose sucker (*Catostomus catostomus*) were both considered due to their similar habitat requirements and life history characteristics. White sucker was chosen due to its significantly higher abundance in the Study Area. Brook trout was also initially considered for inclusion as a target species, but preliminary sampling results showed that brook trout were absent in areas of interest. Thus, this species was excluded from further study.

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Area A

Area B

Area C

PREPARED FOR:

YELLOW FALLS POWER LP
ENVIRONMENTAL ASSESSMENT REPORT

FIGURE NO. 4.3

AQUATIC ASSESSMENT STUDY AREA

Stantec

N
W E
S

0 250 500 750 1,000
Meters

1:21,500

Initiated: October, 2007
Revised: October, 2008

4.5.5.1 Aquatic Habitat

Morphological features such as riffle, run, pool, falls, and substrate (bottom of the river) types such as boulder, rubble, sand, gravel, and clay can be used to characterize the various fish habitats present in the Study Area.

Pool and run habitats dominate the area between impoundments at Smooth Rock Falls (downstream) and Lower Sturgeon Falls (upstream). Abundances of these morphological features within the Study Area are generally similar to occurrences elsewhere in the middle reaches of the Mattagami River. Pools and runs, being relatively low-velocity habitat, are the most common morphological types in most river systems. Five areas of high-velocity morphology (riffles or falls) occur in this approximately 60 km reach, four of which fall within the Project footprint. The fifth occurs at the base of Lower Sturgeon GS. The four riffles and falls within the Study Area make up approximately 23% of the morphology of the Study Area. The remaining 77% of morphology is a mix of run (46%), pool (20%) and shallows (11%).

Target fish utilization of Areas A, B, and C are detailed below by species and summarized in **Table 4.4**.

Area A

All of the four target species were captured during all seasons of sampling in Area A in 2006 and 2007. Large numbers of white sucker were caught at the base of Island Falls during the spring spawning season. In 2006, fifty-one percent of the adults appeared to be actively spawning, as indicated by the presence of mating colours or a high number of tubercles covering male bodies.

In 2006, lake sturgeon moved into the area beginning in mid May, with only 11% of the 35 fish captured showing signs of sexual ripeness. The lack of reproductive sturgeon may be attributed to the relatively small numbers existing between the natural barrier at Island Falls and the hydroelectric facility at Smooth Rock Falls. Also the fact that sturgeons do not spawn annually may contribute to their low reproductive numbers. Previous radio-telemetry work by Ontario Hydro similarly demonstrated sturgeon moving to and staying near the base of Island Falls during their spawning period (McKinley and Sheehan, 1990).

Northern pike were caught in Area A during 2006 and 2007 spring pike spawning periods. In 2006, the majority of fish caught were spent (had already spawned), 27% of mature adults caught were still sexually ripe, suggesting that this area provides the appropriate conditions for pike spawning. 2007 data confirmed northern pike spawning activity in the area. Although it is not apparent that the base of Island Falls provides suitable northern pike spawning habitat (e.g. submerged vegetation), ripe male and female northern pike were captured, and several egg mats collected northern pike eggs.

Spawning condition adult walleye were numerous at the base of Island Falls during the spring of 2006 and 2007. Two small shoals located adjacent to chutes on the east side of Island Falls in Area A present suitable spawning habitat (based on spawning habitat descriptions in Scott and Crossman, 1973). The high percentage of sexually ripe walleye congregating in the area during 2006 and 2007 sampling indicates that these fish utilize the shoals for spawning since there are no other significant areas between the Town of Smooth Rock Falls and Island Falls in the main channel of the Mattagami River that contain the same desirable morphological and substrate characteristics. If other areas with suitable substrates were present within Area A, the two small shoals would likely not be utilized for spawning to the same extent.

Foraging suitability for fish in Area A varies by species. The large pool within 500 m downstream of Island Falls, in addition to the two slower moving areas immediately downstream of the falls, provide ideal resting and foraging areas for adult white sucker and adult and juvenile pike feeding habitat later in the season. Although the area represents suitable feeding grounds for all species tested, population numbers as well as the sizes of individual fish are limited due to the generally low biological productivity of the Mattagami River (Brousseau and Goodchild, 1987; Chiasson *et. al*, 1997).

In 2007, tributaries in Area A (Bradburn Creek, Pullen Creek, and the North Muskego River) were sampled by Golder. Large areas of suitable northern pike spawning habitat were observed in the lower reach of Bradburn Creek, and spent male and female pike were captured in the surveyed section. Although ripe white sucker were captured, no suitable spawning habitat was observed. Walleye and lake sturgeon were not captured in Bradburn Creek and it is unlikely that these species utilize the Creek for spawning.

The lower reach of Pullen Creek is characterized by flat, slow moving water. Backwater bays and pockets of open water marsh likely provide suitable spawning and seasonal nursery/rearing habitat for northern pike. These areas may also provide nursery/rearing habitat for walleye and white sucker. No suitable spawning habitat for white sucker, walleye, or lake sturgeon was observed. Further upstream, Pullen Creek becomes a meandering channel with restricted flow that is frequently obstructed by log jams, woody debris and root wads. Fine-grained soil may produce elevated levels of silt in the water column.

Survey data suggests that much of the North Muskego River is suitable for northern pike spawning. The outwash of a falls located approximately 4 km upstream provides suitable spawning habitat for white sucker, walleye, and lake sturgeon. Ripe white sucker and walleye eggs were captured below the falls. No lake sturgeon or lake sturgeon eggs were captured.

Area B

Only two target species (walleye and white sucker) were captured in Area B during both 2006 sampling periods. During 2007 sampling, only white sucker was captured. The catch results for the summer/fall period included northern pike, as well as walleye and white sucker. No lake sturgeon were captured in Area B during any season of the 2006 or 2007 sampling.

The boulder dominated riffle and run morphology associated with the majority of Area B possesses characteristics that make the reach sub-optimal for spawning of all species except lake sturgeon, which were not present. The swift current over large substrate material creates suitable spawning conditions for sturgeon, but less than optimal spawning habitat for walleye and non-suitable habitat for pike. White sucker showing sexual ripeness were also captured in Area B, suggesting that this area is used for spawning.

Despite the high suitability of the Area B habitat for lake sturgeon spawning, no sturgeon were caught in this reach during 2007 and 2006 sampling or previous studies (see **Appendices G1** and **G2**). The absence of sturgeon in this area is considered a function of the difficulty for sturgeon to ascend Island Falls, and the possibility that extensive larval drift, occurring over several spawning cycles, has effectively limited the population to the base of Island Falls (Nowak and Hortiguela, 1986; Nowak and Jessop, 1987; Acres, 1990).

Foraging habitat in Area B is present for all species; however high flow velocities limit foraging areas for northern pike to deeper pools and slower moving waters at the periphery of the river. Low numbers of walleye were caught in Area B, suggesting that this habitat is not used extensively by walleye for any life stage. Presence of both adult and juvenile white sucker indicates that the area provides habitat for both life stages at this time of year. Additionally, unsuitable substrates for lake sturgeon foraging exist in this area. No lake sturgeon were caught in Area B during the summer/fall sampling period.

Tributaries A and B enter the Mattagami River immediately upstream of Island Falls. Both these tributaries exhibit restricted flow, shallow depths, and instream obstructions which limit fish passage to the initial 10 – 20 m. Heavy amounts of sediment were observed in both tributaries. In 2006, discharge was sufficient to bypass some obstructions and some juvenile white sucker and cyprinids were captured in Tributary B. However, it is highly unlikely that target species spawn in Tributaries A and B based on these observations.

Area C

Three of the four target species (walleye, white sucker and northern pike) were captured in Area C during all sampling periods. No lake sturgeon were found in Area C during 2006 or 2007 fieldwork.

Morphology and substrate vary significantly within Area C, providing a diversity of riverine habitat types that are suitable, but not optimal, for life functions of all target species through all seasons. Habitats in Area C are highly suitable for walleye spawning, moderate for lake sturgeon spawning, and poor for white sucker and northern pike spawning. Despite apparently suitable spawning habitat for walleye, few were captured during the spawning season in 2006 or 2007, indicating that the resident population spawns outside of Area C, or in Rat Creek. Despite apparently suitable spawning habitat for lake sturgeon, none were captured during the spawning season. White suckers, in contrast, were caught in large numbers during the spring despite the habitat being non-suitable for sucker spawning. The data indicate that white sucker stage in the

Mattagami River in preparation for spawning in Rat Creek where numerous adults and young-of-the-year were caught.

Foraging habitat is of moderate suitability for white suckers, walleye, and northern pike, and poor for lake sturgeon (**Appendices G1** and **G2**).

Table 4.4 Summary of Habitat Use in Areas A, B, and C

Species and Life Stage	Area		
	A	B	C
Northern Pike			
Spring spawning	✓	No catch	✓
Summer/Fall - Adult	✓	✓	✓
Summer/Fall - Juvenile	✓	✓	✓
Summer/Fall – Young of the year	No catch	✓	✓
Walleye			
Spring spawning	✓	✓	✓
Summer/Fall - Adult	✓	✓	✓
Summer/Fall - Juvenile	✓	✓	✓
Summer/Fall - Young of the year	✓	✓	✓
White sucker			
Spring spawning	✓	✓	✓
Summer/Fall - Adult	✓	✓	✓
Summer/Fall - Juvenile	No catch	✓	✓
Summer/Fall - Young of the year	No catch	No catch	✓
Lake sturgeon			
Spring spawning	✓	No catch	No catch
Summer/Fall - Adult	✓	No catch	No catch
Summer/Fall - Juvenile	✓	No catch	No catch
Summer/Fall - Young of the year	No catch	No catch	No catch

4.5.5.2 Fisheries

Sampling efforts in 2005, 2006, and 2007 indicate the presence of 29 species of fish in Areas A, B and C, including Rat Creek and Tributaries A and B. Overall, 10 large-bodied fish species and 19 small-bodied fish species were captured (**Appendices G1** and **G2**). Three of the four target species (northern pike, walleye and white sucker) are present in all three areas, although numbers vary by species, as well as seasonally. Lake sturgeon were caught in Area A only, and this finding is consistent with other studies (McKinley and Sheehan, 1990; Payne, 1987). Age data for white sucker, northern pike and walleye indicate healthy populations, while lake sturgeon age data indicate an aging population, with poor recruitment.

Suitable habitat for northern pike is limited in the Study Area; therefore the small number of fish caught relative to the other target species was anticipated. The numbers of white sucker and walleye in the mainstem and tributaries were also consistent with previous studies (Stantec,

2004 and 2007). The absence of lake sturgeon in Areas B and C is attributable to a number of factors, including historic natural and anthropogenic fragmentation of the river, combined with commercial over-fishing, which has caused a significant decline in lake sturgeon populations throughout the Moose River Basin.

From the fish survey, it was determined that adults and juveniles of all target species during all seasons utilize Area A. Walleye was the only target species in Area A for which young of the year ("YOY") were captured during summer/fall sampling.

During spring sampling in Area B, walleye was the only target species for which both adult and juvenile fish were captured. A small number of adult white suckers were also caught, but there was a complete absence of lake sturgeon and northern pike in Area B during the spring. Summer/fall sampling results indicate that northern pike, walleye and white sucker use Area B during these seasons. Consistent with previous studies (Acres, 1990; McKinley et. al., 1990), lake sturgeon were also absent during summer/fall sampling.

Walleye and white sucker adults and juveniles were present in Area C spring catch results, whereas only adult northern pike were captured. Similar to Area A, it is likely that low habitat suitability prevents large numbers of northern pike of varying life stages from using Area C in the spring. Summer/fall sampling showed the presence of all life stages of northern pike, walleye and white sucker as expected, given the life history requirements of the species. As in Area B, no life stages of lake sturgeon were present in Area C during any sampling period, which is consistent with the findings of previous studies (Acres, 1990; McKinley et. al., 1990).

Lake sturgeon are restricted to Area A due to the impassable physical barrier imposed by Yellow Falls, in addition to their unwillingness or inability to ascend Island Falls. Also, there is no indication that lake sturgeon migrate from upstream of the Study Area for critical life processes such as spawning.

Species of Conservation Concern

Lake sturgeon are listed in COSEWIC as a species of special concern in the Southern Hudson Bay/James Bay area (COSEWIC, 2007), but have not yet been listed under the Species at Risk Act ("SARA"). NHIC ranks lake sturgeon as vulnerable (S3), but the species is considered to be "not at risk" by COSSARO since a risk category has yet to be assigned by the MNR (MNR, 2006).

4.5.6 Designated Natural Areas

No Areas of Natural and Scientific Interest ("ANSIs") exist in the Study Area (NHIC, 2006). There are three conservation reserves and one forest reserve in the Study Area as identified by the MNR (NHIC, 2006). The conservation reserve designation limits the permitted uses within the designated area. The locations of these reserves are shown in **Figure F2-7**.

Practices that are not permitted in a conservation reserve include aggregate extraction, commercial power generation development, commercial timber harvesting, new energy transmission and communication corridors, mineral exploration and development, peat extraction, off trail ATV and snowmobile use, collecting for science, education or heritage appreciation or the establishment of new private recreation camping or non-resident guided bear hunting. Depending on certain conditions, there may be other practices that are not permitted in conservation reserves.

Practices that are not permitted in a forest reserve include aggregate extraction, commercial power generation development, commercial timber harvesting, peat extraction, Crown Land disposition for agriculture, cottaging, rural residential or urban development, and new road development and maintenance.

The Geary Township Shoreline Bluff is a 610-hectare Conservation Reserve in the south end of the Study Area in the District of Timmins. It is a shoreline bluff cut into a till covered upland area, which represents an historic water level of Glacial Lake Barlow-Ojibway. The Bluff was designated as a conservation reserve because it is a good example of a raised erosional shoreline (MNR, 2006e).

The Mahaffy Township Ground Moraine is a 640-hectare conservation reserve in the south end of the Study Area within Mahaffy Township, approximately 2 km north of Sturgeon Falls GS on the Mattagami River. It was approved as a Conservation Reserve in 2004 because it contains locally significant broken ground moraine, glaciolacustrine, and organic deposits supporting complex vegetation including old growth spruce, alder, and treed muskeg (MNR, 2004).

The North Muskego River Mixed Forest Conservation Reserve is a 3,823-hectare conservation reserve in the southwest section of the Study Area in Cochrane District. This conservation reserve contains areas designated as old growth forest with vegetation types such as old growth spruce, poplar and white birch stands.

The North Muskego River Mixed Forest is a 6-hectare forest located on the eastern boundary of the North Muskego River Mixed Forest Conservation Reserve.

4.6 RESOURCES

4.6.1 Minerals, Aggregates, and Hydrocarbons

No major productive mines or exploration projects for base metals, coal, ferrous, or precious metals exist in the Study Area (NRCan, 2004), and there are no abandoned mines in the Study Area (MNDM, 2004a). 18 areas have been identified by the MNDM Mineral Deposit Inventory ("MDI") as pits and quarries in the Study Area (MNDM, 2004a; **Figure F2-8**). No hydrocarbon resources are known to be present in the Study Area.

There are six areas identified as land withdrawals and notifications (Crown land that is unavailable for resource extraction, exploration, or claims according to MNR policy) in the Study Area. The three largest areas, located in the southern portion of the Study Area, are the North Muskego Forest Conservation Reserve, Geary Township Shoreline Bluff Conservation Reserve and Mahaffy Township Ground Moraine Conservation Reserve.

4.6.2 Agriculture

The Canada Land Inventory ("CLI") categorizes land into seven classes that reflect the capability of soil to support agriculture. The four dominant CLI capability classes in the Study Area are Class 4 (29% or 55,279 ha), Class 3 (25% or 49,166 ha), Class 5 (9% or 16,736 ha), and Class 7 (1% or 1,926 ha) soils. Organic soils make up 36% (70,456 ha) of the Study Area (**Figure F2-9**). The dominant agricultural limitations of the soils within the Study Area are adverse climate (subclass c), and excess water (subclass w). Small portions of active agricultural land are located in the Departure Lake area (**Figure F2-9**). However, agriculture has not played a predominant role in the Study Area.

4.6.3 Forestry

A forest-dependent community is one that relies on forest resources for at least 50% of its total economy. In 2004, the Town of Smooth Rock Falls was a 75-100% Forest Dependent Community, and the remainder of the Study Area was a 50-75% Forest Dependent Community (NRCan, 2004b). In July 2006, the Tembec mill in Smooth Rock Falls discontinued operation. It is unknown what effect the closure of the Tembec Smooth Rock Falls Pulp and Paper Mill will have on forest resource use in the Study Area, and specifically the Town of Smooth Rock Falls.

Forest resources within the Study Area are located within the Smooth Rock Falls Forest, with a total area of 533,785 hectares (502,267 ha of which is Crown Land). The remainder is private land (4,917 ha), provincial parkland (1,803 ha), and land identified by the Ontario Living Legacy as future parks or conservation areas (24,798 ha, referred to as Crown non-Managed). The forest lies within 30 townships and three un-surveyed areas. Two major rivers, the Mattagami and the Abitibi, traverse the forest longitudinally (SmartWood, 2005). The administration of this forest is the responsibility of the Northeastern Ontario Forest Operations Forest Resource Management, Tembec, and the MNR under the Smooth Rock Falls Forest Management Plan (2005-2010).

The projected Available Harvest Area within the Smooth Rock Falls Forest for the current five-year term (2005-2010) of the plan is 17,184 ha. The planned harvest area is 2,450 ha less than this, at 14,735. An approved amendment initiated in 2006 will attempt to more closely approximate the available harvest area.

4.6.4 Forest Fire Management

The Study Area is located in the East Fire Region. The East Fire Region is one of two provincial forest fire regions under the Forest Fire Management Unit of the MNR. From January 2006 to October 2006, 43 forest fires had occurred in the MNR's Cochrane District, consuming over 2,000 hectares. Over the last ten years, 44% of forest fires in the District were caused by people (MNR, 2005).

4.6.5 Game, Fish, and Wild Foods

Portions of 11 registered trap line areas (MNR Trap Line reference numbers CC32, CC61, CC63, CC64, CC66, CC67, CC68, CC69, CC117, CC121, and TI35) are located in the Study Area. Target animals for traps include beaver, muskrat, otter, weasel, marten, fisher, raccoon, badger, coyote, wolf, lynx and bobcat (Fur Trade Institute of Canada, 2004). Trapping is encouraged in the area to meet quota levels. Requests for new trap lines are assessed by the MNR on a case-by-case basis. Trap line areas are shown in **Figure F2-10**.

More than 30 species of fish are present in the Study Area including three common game species: walleye, pike, and whitefish. Proposed commercial fishing operations are considered by the MNR for only coarse (non-game) fish species (MNR, 2005b).

Under the Crown Land Use Policy Atlas, wild rice harvesting is permitted in the Study Area. Wild rice stands have been identified in the Study Area, however no commercial areas exist. Wild rice stands within the Study Area are shown in **Figure F2-10**.

4.7 SOCIO-ECONOMIC FEATURES

4.7.1 Municipal Structure

The Study Area is located in the District of Cochrane and includes the Town of Smooth Rock Falls. Most of the Study Area is comprised of Crown Land. MNR policies determine which activities may occur on Crown Land.

The Town of Smooth Rock Falls provides services within the municipal boundaries of the town, including administration, public works, recreation and fire services. The Town Council is comprised of four councilors and the mayor, with a new council elected every four years. A committee system is also operated by the Council, including Administration and Finance, Public Works, Recreation, Planning, and By-law/Policies committees (Town of Smooth Rock Falls, 2006).

4.7.2 Population

The Town of Smooth Rock Falls and the communities of Departure Lake and Driftwood are population centres in the Study Area. Although Statistics Canada ("StatsCan") census data for

the entire Study Area is not available, census data trends for Smooth Rock Falls can be seen as representative of these population centres.

The population of Smooth Rock Falls has decreased significantly over the past 15 years. The population in 2001 was 1,830, a decrease of 7.7% since the 1996 Census when the population was 1,982. Between 2001 and 2006, the population decreased another 19.5% to 1,473 (StatsCan, 1996; 2001; 2006).

The population of Ontario has continually increased from the 1996 Census where the population was 10,753,573. At the time of the 2001 Census, the population had risen 6.1% to 11,410,046, and it rose another 6.6% to 12,160,282 according to the 2006 Census. From 1991 to 2001, the population decreased 10.4% in Smooth Rock Falls (Smooth Rock Falls Community Adjustment Committee, 2005).

Most of the people living in the Study Area (98%) were born in Canada. No visible minorities are represented (StatsCan, 2001). In 2006, all of the Smooth Rock Falls' population was Canadian citizens (StatsCan, 2006)

A slightly lower percentage of residents of Smooth Rock Falls and the District of Cochrane complete high school (24.5%) than within Ontario (27%). However, a greater percentage of the populations of Smooth Rock Falls and the District of Cochrane achieve a trade school diploma (18.5% compared to 10% within Ontario). A considerably smaller percentage (7.5%) has completed a university degree or diploma than the general Ontario population (24%). French is the mother tongue for 70% (1,005 people) of the Smooth Rock Falls population. English is the primary language for 28% (405 people), and 2% (15 people) of the population is bilingual or has another language as a mother tongue (StatsCan, 2006).

Approximately 70% of Smooth Rock Falls residents have knowledge of both English and French, while 17% speak English only and 13% speak French only (StatsCan, 2006).

4.7.3 Institutional Characteristics

Institutions include schools, hospitals, and libraries. Education is provided at three schools in the Study Area in both official languages, including L'Ecole Catholique Georges-Vanier, governed by the Conseil scolaire catholique du district des Grandes-Rivieres, (Kindergarten to Grade 12, French language), the Smooth Rock Falls Public School (Kindergarten to Grade 8, English language), and the Smooth Rock Falls Secondary School (Grade 9 to Grade 12, English language). Both English-speaking schools are housed at the Basil Merchant Education Centre and directed by the District School Board Ontario North East.

Primary health care is provided by the Smooth Rock Falls Hospital, which provides 24-hour emergency care along with 14 acute care beds and 20 long-term care beds. The local ambulance service is also located at the hospital. The North Cochrane Detoxification Centre,

funded by the Ontario Ministry of Health, provides services to people who are addicted to alcohol or drugs. Health services are shown in **Figure F2-10**.

The Public Library in Smooth Rock Falls offers reading and visual materials in both English and French, including video footage of historical events. There is a full time librarian and access to the internet is also available.

4.7.4 Social Services

The Town of Smooth Rock Falls provides fire services within its municipal boundaries (Smooth Rock Falls, 2006). The Ontario Provincial Police's Northeast Region is responsible for providing police services to the Study Area. A satellite detachment is located in Smooth Rock Falls with a host detachment in nearby Cochrane (Ontario Provincial Police, 2006).

4.7.5 Recreation and Tourism

In Smooth Rock Falls, the Reg Lamy Cultural Centre offers indoor hockey, curling and figure skating. The town also has an outdoor public swimming pool, movie theatre, baseball diamond, the Mattagami Ski Club, Liz McCafferty Park and a public golf course (Smooth Rock Falls, 2006). Recreational features are shown on **Figure F2-10**.

Outdoor recreation such as fishing, canoeing and snowmobiling are also extremely popular activities. Recreational fishing and hunting are some of the most popular and culturally important activities for residents within the Study Area. Numerous snowmobile and ATV trails exist throughout the Study Area. Cross-country skiing takes place at the volunteer-run Mattagami Ski Club and a 9-hole golf course is open during the summer months for both the public and members of the course. Both venues are located within Smooth Rock Falls.

The Mattagami River is a canoe route designated by the MNR. In 1990, the MNR published a brochure describing the route from Gogoma (south of Timmins) to Smooth Rock Falls. The brochure describes the route as a series of holding reservoirs and power generating dams which have formed a chain of long and deep lakes. Island Falls is identified as the best campsite in this reach. Through the Study Area, portages are required at Lower Sturgeon GS (250 m), Loon Rapids (135 m), Davis Rapids (135 m), Yellow Falls (185 m), and Island Falls (25 m) for a total portage length of 730 m (MNR, 1990).

Additionally, recognized tourist establishment locations in the general vicinity of the Study Area include outfitters and tour companies. Polar Bear Outfitters holds a land use permit for a commercial outpost camp upstream of Loon Rapids. A multi-use tourism facility has been proposed to promote private sector tourism investment in the community (Smooth Rock Falls Community Adjustment Committee, 2005). Two other businesses registered in October 2007 and based in Smooth Rock Falls (Howling Wolf Guide Services and Northern Spirit Adventure) indicate that they plan to offer guide services on the Mattagami River.

4.7.6 Economy and Employment

As of 2006, the industry category with the highest employment rate in the Study Area was manufacturing, comprising approximately 30% of the work force. Most of the people employed in this industry are assumed to have been involved in the manufacture of pulp and paper. The second largest industry by percentage of the workforce is other services, totaling 14%, followed by business services and heath and social services, both totaling 12% of the workforce (StatsCan, 2006).

Smooth Rock Falls' unemployment rate decreased to 7.5% according to 2006 Census data from 10.3% in 2001, but still remained higher than the unemployment rate of Ontario at 6.4% (StatsCan, 2006). On July 31, 2006, the Tembec Pulp and Paper Mill in Smooth Rock Falls closed. The mill employed 36% of the local labour force as recently as 2001 (Community Adjustment Committee, 2005). This employment loss would not be reflected in the 2006 Census.

Prior to the mill closure, average income per person was higher in Smooth Rock Falls than the provincial average. In 2001, the average annual income per person in Smooth Rock Falls was $39,050. In comparison, the average annual income per person in Ontario was $35,185. The median income for a family in Smooth Rock Falls was $66,957, and for comparison, in Ontario was $61,024 (StatsCan, 2001).

An increasing number of residents in Smooth Rock Falls are relying on some form of government contribution. Pensions and Old Age Security account for 20% of Smooth Rock Falls' $46.3 million annual income base. As a result, this limits labour pool growth and caps the volume of disposable income needed to induce economic change and growth within the community (Community Adjustment Committee, 2005).

4.8 LAND USE

4.8.1 Land Ownership

The majority of lands within the Study Area are Crown Lands owned by the Government of Ontario in trust for the people of Ontario (151,735 ha or 78%). The remainder (41,835 ha or 22%) is patent land (privately owned). Most patent land in the Study Area is found in the Abitibi Freehold in the geographic townships of Mabee, Dargavel, Aubin, Kingsmill, Lennox, Nesbitt, and Crawford. Patent land is also concentrated in the populated areas of Smooth Rock Falls, Departure Lake, and Driftwood (**Figure F2-12**).

4.8.2 Land Use Planning

The Town of Smooth Rock Falls administers land use planning within the town boundaries, and the MNR (through the Crown Land Use Policy Atlas) administers land use planning within the remainder of the Study Area.

Although Smooth Rock Falls is within the Study Area, the Town of Smooth Rock Falls Official Plan does not apply to the Project because the proposed locations of the generating station, access roads, and transmission line lie outside the boundaries of the Town of Smooth Rock Falls. The access road/transmission line corridor will cross Crown land. Utility and road corridors in natural resource areas are not excluded land uses in the Official Plan (Town of Smooth Rock Falls, 1979).

MNR Crown Land Use Policy determines land use on Crown Land throughout the Study Area. Seven policy areas are located in the Study Area (**Figure F2-11**):

- Policy G1744 (Mattagami River Area) determines land use within 120 m from each shore of the Mattagami River
- Policy G1745 (Southern Resource Area) determines land use throughout most of the Study Area and contains valuable mineral, forest, and recreational resources
- Portions of the Great Claybelt Agricultural Area (Policy G1760) are located near the Town of Smooth Rock Falls. This land use area is designed to promote the use and protection of agricultural land
- Small portions of Critical Aggregate Areas (Policy G1759) are located throughout the Study Area. The intent of this policy area is to promote protection and utilization of aggregate resources
- The Mahaffy Township Ground Moraine Conservation Reserve (Policy C1586), the Geary Township Shoreline Bluff Conservation Reserve (Policy C1581) and the North Muskego Mixed Forest Conservation Reserve (Policy C1578) are located in the Study Area. The land use policies for these reserves prevent activities that may harm locally significant natural features.

4.8.3 Infrastructure

The Ministry of Transportation (“MTO”) and MNDM are responsible for provincial highways in Northern Ontario. Major roadways within the Study Area include the North Branch of the TransCanada Highway (Highway 11), which crosses the Mattagami River in Smooth Rock Falls, Highway 655 along the eastern boundary of the Study Area, Highway 634, which travels north out of the Study Area from Smooth Rock Falls.

The Red Pine Road travels south from Highway 11, just west of the Town of Smooth Rock Falls. The Red Pine Road historically connected Highway 11 to Timmins, however several bridges have been removed and the road is not maintained. Most recent use of the road has been for hunting/recreation and forestry activities. Several trails and logging roads are also utilized by ATV and snowmobile operators during the year.

The Town of Smooth Rock Falls is responsible for the construction and maintenance of local roads within Town boundaries. Northern local roads outside of an organized municipality are

generally maintained through cost sharing agreements between the province, Local Roads Boards, Statute Labour Boards, cottagers and First Nation communities (MTO, 2005).

Within the Crown Land Use Policy Atlas, road development and maintenance is permitted for both new and existing roads. However, road development north of Smooth Rock Falls is discouraged while new road development south of Smooth Rock Falls is permitted.

TransCanada Pipelines Ltd. owns and operates a natural gas pipeline right-of-way bisecting the Study Area north of Island Falls. The pipeline right-of-way generally parallels the Canadian National Railway ("CN Rail") Line that also runs through the Study Area. Two pipelines enter Compressor Station 99 in the Town of Smooth Rock Falls from the west, while three pipelines, of 0.81 m, 0.76 m, and 1.07 m (36", 30" and 42") diameter, exit the compressor station to the east. The pipeline right-of-way crosses Red Pine Road south of Hwy 11 (TransCanada Pipelines, 1989). The pipeline right-of-way is shown in **Figure F2-11**.

Electricity distribution networks service residences and businesses in the area. Hydro One Networks Inc. ("Hydro One") also has an existing 115 kV transmission line (H9K) located along the north side of Highway 11. The Project will be connecting to the electrical system through line H9K.

The only operating railway in the Study Area crosses the Mattagami River approximately 3 km south of Highway 11. The rail line, owned and operated by Ontario Northland Transportation Commission, also crosses Red Pine Road just south of Hwy 11. The railway is shown in **Figure F2-10**.

4.8.4 Sewage and Waste Disposal

According to the MOE's 1991 Waste Disposal Site Inventory, four closed landfills and six active landfills are located within the Study Area. Inactive landfills were closed between 1973 and 1983 (MOE, 1991), and contain mostly rural municipal and domestic waste. Active landfills contain rural and urban domestic and municipal waste (MOE, 1991).

4.9 HERITAGE, CULTURE, LANDSCAPE AND ARCHAEOLOGICAL RESOURCES

No designated heritage, cultural, or landscape monuments or features exist in the Study Area (Ministry of Culture, 2006; Ontario Heritage Trust, 2006; Parks Canada, 2006). However, it is likely that First Nations used the Mattagami River over many generations for travel, food, and water. In the 17th and 18th centuries, the River was used for exploitation of fur resources. In the early 1900s, the river was heavily used by geologists, agricultural experts, and surveyors. Throughout the last century, the river has also been used by the timber industry to transport and mill logs (MNR, 1990).

Stage I, II and III Archaeological and Cultural Heritage Assessments were conducted by Woodland Heritage Services Limited in 2006. These assessments included preliminary

research of background materials followed by field inspections and excavations of the area surrounding the Mattagami River from approximately 1 km north of Island Falls to approximately 1 km south of Loon Rapids.

The Stage I Archaeological Assessment identified nine sites within 100 m of the Mattagami River as having high archaeological potential. During the Stage II Archaeological Assessment, six sites of interest were found during a surface check with subsurface testing of high potential cultural heritage areas along the Mattagami River within the Study Area. The Stage III assessment included sites at Loon Rapids and Yellow Falls and concluded that there was one significant archaeological site located at Yellow Falls. It is recommended that the site be protected from disturbance or erosion and a site protection plan and management protocol should be agreed upon with the Taykwa Tagamou Nation.

4.10 FIRST NATIONS

The Project is located within the traditional area of the Taykwa Tagamou Nation ("TTN"). During the EA process, the Mattagami First Nation, Flying Post First Nation, and the Wahgoshig First Nation also indicated an interest in the Project. YFP and the TTN are actively participating in discussions with these communities regarding the Project.

The Taykwa Tagamou Nation has a population of 333 (INAC, undated), with a reserve located between Cochrane and Moosonee. However, the reserve was never occupied due to isolation and resulting lack of employment opportunities. In the early 1980's initiatives were taken by the Chief and Council to find a new home for the Taykwa Tagamou Nation. In 1984, a new site was chosen which has become the current location for the Taykwa Tagamou Nation. The community is located at New Post, a 177-hectare site, approximately 20 km west of Cochrane on Highway 574 (Mushkegowuk Council, 2006).

Mattagami First Nation people are descendants of the Ojibway, a nomadic people. The First Nation community is located on a reserve located approximately 80 km south of Timmins, Ontario on the Northwest side of Lake Mattagami. The reserve was surveyed in 1909. However, hydroelectric development flooded the area in the 1920s. Subsequently, an additional 200 acres was added to the reserve for a new town site. In 2005, 116 people lived on the reserve (James Bay Frontier Travel Association, 2001; Chiefs of Ontario, 2005).

The Flying Post First Nation has a reserve located approximately 43 km southwest of Smooth Rock Falls. The 163 members of the First Nation live off reserve. Band council maintains a mailing address in Nipigon, Ontario (INAC, n.d.).

The Wahgoshig First Nation is located on Lake Abitibi, approximately 50 km west of Matheson, Ontario, a few kilometres from the Quebec border. Approximately 121 people live on the reserve, while a further 134 band members live off-reserve. The reserve contains a band office, health clinic, warehouse / fire hall, garage, and a storage garage which serves as the existing community hall (INAC, n.d.; Township of Black River-Matheson, 2007).

5.0 Consultation and Information Disclosure

The goal of consultation is to improve decision-making and build understanding by actively involving individuals, groups, and organizations with an interest in the Project. Such involvement is meant to increase the Project's long-term viability, foster good neighbour relationships, and enhance local benefits.

Consultation and information disclosure activities have been undertaken to provide Project stakeholders[5] and First Nations with meaningful opportunities to participate in the planning and development of the Project. Detailed correspondence is provided in **Appendix E**.

A concordance table providing public and interest group comments, Project Team responses, and locations where the EA Report addresses comments is provided in **Appendix E2**.

5.1 HISTORIC PERSPECTIVE

Development of the Yellow Falls Hydroelectric Project began in 1986. Since that time, extensive consultation and regulatory feedback have led to significant project design modifications in direct response to comments and concerns received from stakeholders.

Given the long history of the Yellow Falls Hydroelectric Project, there have been various consultations and disclosures of Project information. Since the conceptual stage of the Project in 1986, proponents initiated contact with the MNR, MOE, the Town of Smooth Rock Falls, the Ministry of Northern Development and Mines, Ontario Northland (railway), and local industry to clarify the approval process, identify potential concerns or constraints, and to initiate and maintain communications. Land use permit holders and trappers in the Study Area were also contacted in the earliest stages of Project development (**Appendix E3**).

A summary of communications is provided in **Table 5.1**. This summary describes the context for the Project as proposed. Stakeholder consultation during development of this EA Report has been most intensive between 2004 and 2009 as a result of the recent focus on increased renewable energy generation capacity in Ontario and award of a RES II contract in 2005. The current Project design is the result of input received during the consultation process.

Table 5.1 Key Consultation Activities

Year	Consultation Activity	Stakeholder Involvement
1986	Application for Location Approval for Yellow Falls and Island Falls Sites	MNR
August 1988	MNR indicates Location Approval would remain current pending receipt of a background information package	MNR

[5] Stakeholders are defined as: i) parties with an interest in the Yellow Falls Hydroelectric Project (e.g., neighbouring residents, ratepayer associations, and community and non-governmental organizations); and, ii) municipal, provincial, and federal agencies with a legislative mandate for any aspect of the Project's planning, construction, operation, and/or decommissioning.

Table 5.1 Key Consultation Activities

Year	Consultation Activity	Stakeholder Involvement
October 1988	Background information package prepared, including limited stakeholder consultation	MNR
December 1988	YFP receives confirmation that Location Approval remains current	MNR
May 1989	Yellow Falls Environmental Appraisal submitted to MNR	MNR
June 1989	MNR Response to Yellow Falls Environmental Appraisal indicating that the proposed study would address most of their concerns	MNR
May 1990	Environmental and Technical Appraisal prepared	MNR
August 1991	Receipt of comments on Environmental and Technical Appraisal	MNR
February 1999	Project Information Package submitted to MNR	MNR
October 2001	YFP receives confirmation of Applicant of Record status	MNR
January 2002`	YFP submits an updated Applicant Information Requirements package to the MNR	MNR
August 2005	Notice of Commencement issued for start of EA process (distributed via Canada Post unaddressed admail, local newspapers, direct mailings to government agencies, First Nations, and known stakeholders)	Government agencies, interest groups, the public, and First Nations
August 2005	Website, email address, mailing address, and collect call telephone number made available for duration of EA process	Government agencies, interest groups, the public, and First Nations
February 2006	Notice of First Open House (distributed via Canada Post unaddressed admail, local newspapers, direct mailings to government agencies, First Nations, and known stakeholders)	Government agencies, interest groups, the public, and First Nations
March 2006	First Open House	Government agencies, interest groups, the public, and First Nations
March 2006	Presentation to Town of Smooth Rock Falls Council	Smooth Rock Falls
March 2006	TTN Community Meeting	TTN
Summer 2006	Project Newsletter issued (distributed via Canada Post unaddressed admail, direct mailings to government agencies, First Nations, and known stakeholders)	Government agencies, interest groups, the public, and First Nations
September 2006	TTN Community Meeting	TTN
Winter 2007	Project Newsletter issued (distributed via Canada Post unaddressed admail, direct mailings to government agencies, First Nations, and known stakeholders)	Government agencies, interest groups, the public, and First Nations
March 2007	Presentation to Town of Smooth Rock Falls Council	Smooth Rock Falls
May 2007	Notice of Second Open House (distributed via Canada Post unaddressed admail, local newspapers, direct mailings to	Government agencies, interest groups, the public, and First

Table 5.1 Key Consultation Activities

Year	Consultation Activity	Stakeholder Involvement
	government agencies, First Nations, and known stakeholders)	Nations
May 2007	Second Open House	Government agencies, interest groups, the public, and First Nations
May 2007	TTN Community Meeting	TTN
May 2007	Mattagami First Nation Community Meeting	Mattagami First Nation
August 2007	Town of Smooth Rock Falls Community Meeting	Government agencies, interest groups, the public, and First Nations
November 2007	Notice of Draft EA Report House (distributed via Canada Post unaddressed admail, local newspapers, direct mailings to government agencies, First Nations, and known stakeholders)	Government agencies, interest groups, the public, and First Nations
November 2007	Draft EA Report released for review. Draft EA Report distributed to First nations, Agencies, and public viewing locations.	Government agencies, interest groups, the public, and First Nations
December 2007	Draft EA Report review period extended at the request of stakeholders (notice distributed via local newspapers, and direct correspondence with interested stakeholders)	Government agencies, interest groups, the public, and First Nations
January 2008	Smooth Rock Falls Recreation Committee proposed by YFP in response to recreation-related comments received during August 2007 Council Meeting	
January 2008	Meeting held between YFP and Smooth Rock Falls Recreation Committee	Smooth Rock Falls Recreation Committee
February 2008	Meeting held between YFP and Smooth Rock Falls Recreation Committee	Smooth Rock Falls Recreation Committee
March 2008	Meeting held between YFP and the Friends of the Mattagami River	Friends of the Mattagami River
March 2008	Meeting held between YFP and the Friends of the Mattagami River regarding the Project location change from Island Falls to Yellow Falls as a result of comments from the Friends of the Mattagami and government agencies	Friends of the Mattagami River
Spring 2008	Project Newsletter issued advising stakeholders of Project location change to Yellow Falls and inviting stakeholder comments (distributed via Canada Post unaddressed admail, local newspapers, direct mailings to government agencies, First Nations, and known stakeholders)	Government agencies, interest groups, the public, and First Nations
April 2008	Presentation to Smooth Rock Falls Town Council describing the Project location change from Island Falls to Yellow Falls	Town of Smooth Rock Falls
May 2008	Letter sent to agencies describing Project location change as well as addressing agency comments on the Draft EA sent to agencies	Government agencies

Table 5.1 Key Consultation Activities

Year	Consultation Activity	Stakeholder Involvement
October 2008	Community Meeting – Wahgoshig First Nation	MNR, Wahgoshig First Nation
November 2008 and January 2009	Site Visits to Yellow Falls	MNR, Taykwa Tagamou Nation, Wahgoshig First Nation, Flying Post First Nation, Matachewan First Nation, Mattagami First Nation

5.2 DEFINING THE TERMS

5.2.1 Consultation

Consultation is a tool for encouraging and managing communication flow between the proponent, First Nations, and a variety of interested parties such as members of the community, government agencies, and interest groups. It provides an avenue for improvement of the decision-making process, while fostering an environment of understanding by actively involving government and non-government organizations, groups, and individuals directly affected by, or involved in, the Project.

5.2.2 Information Disclosure

Effective consultation is driven in part by adequate and appropriate disclosure of information to stakeholders in a timely fashion. Disclosure of information is critical if stakeholders are to have meaningful input and participation early in the decision-making process. Exchange of information also allows stakeholders and First Nations to better understand the trade-offs between the Project's advantages and disadvantages.

5.2.3 Traditional Knowledge

Community and Aboriginal knowledge, also known as Traditional Knowledge ("TK"), is a body of knowledge acquired by a group of people through generations of living in close contact with the local natural environment in the vicinity of the Project. TK is both cumulative and dynamic, building upon the historic experiences of a people, and adapting to social, economic, environmental, spiritual and political change (CEA Agency, 2004).

There is growing appreciation and recognition that communities and Aboriginal peoples have a unique knowledge about the local environment, how it functions, and its characteristic ecological relationships. This type of knowledge is an important part of project planning and the environmental screening process, and is therefore incorporated into the consultation program where appropriate and available.

5.3 REGULATORY REQUIREMENTS

Essential requirements of the Yellow Falls Hydroelectric Project's consultation plan are outlined in three key documents: the CEA Act, O. Reg. 116/01 under the OEAA, and the WPPG. These three documents were used to develop the Consultation Plan for the Project. Key sections are described as follows:

5.3.1 Canadian Environmental Assessment Act

Various methods exist for stakeholders to be part of the federal environmental assessment, through the *Canadian Environmental Assessment Act* ("CEAA"). Projects undergoing a federal environmental screening are posted in the Canadian Environmental Assessment Registry ("CEAR"). The CEAR (http://www.ceaa-acee.gc.ca/050/index_e.cfm) is a government mechanism that enables stakeholders access to records related to screenings conducted under the CEA Act. Specifically, the CEAR provides information on the conduct of screenings and of opportunities for stakeholder participation. For screening assessments, there is no mandatory requirement for an RA to provide public consultation opportunities. However, members of the public can request a copy of the screening report and provide comments. The RA may also determine that consultation is necessary, at which point a minimum requirement would be to provide an opportunity for the public to comment on the screening report.

The Canadian Environmental Assessment Agency ("CEA Agency") notes that a stakeholder involvement program should go beyond allowing the public to comment on a completed screening report. Rather, it should seek to provide stakeholders with a variety of opportunities to be informed early, and at all stages of the screening process, to offer ideas and information, to react to proposals in order to influence recommendations and decisions, and to be informed of all decisions (CEA Agency, 2007).

The CEA Agency also advises that communication needs may change over the course of a screening, and as such, the proponent should:

- Provide information so that people can be informed and participate effectively
- Receive information and comments from the public
- Discuss issues and clarify positions and concerns
- Give the opportunity to examine and comment on the screening report, and on any record relating to the Project
- Build consensus among key groups or individuals particularly affected by the project
- Inform participants of results or decisions (CEA Agency, 2007).

The CEA Act also states that all EA projects must consider the effects of the Project on Aboriginal peoples. These effects can include environmental changes to land or resources currently used by Aboriginal peoples as a result of the project (CEA Agency, 2006).

5.3.2 Ontario Environmental Assessment Act - Electricity Projects Regulation

The *Electricity Projects Regulation* (O. Reg. 116/01) notes that consultation is required for all projects that are subject to the Environmental Screening Process ("ESP"). It is the proponent's responsibility to design and implement an appropriate consultation program for the Project that meets the requirements of the EA Act. The consultation program must provide appropriate opportunities and forums for stakeholders to participate in the screening process. The Electricity Projects Regulation breaks out consultation into three distinct streams - Public, Regulatory Agencies, and First Nations which are discussed below. Collectively, members of the public and regulatory agencies are referred to as stakeholders.

5.3.2.1 Public

The purpose of stakeholder consultation in the ESP is to allow the proponent to identify and address concerns and issues. Consultation also provides stakeholders with an opportunity to receive information about and make meaningful input into the project review and development. Stakeholder consultation also refers to private individuals directly or indirectly affected by the Project as well as non-government organizations such as ratepayer associations and groups formed specifically as a result of the proposed project.

5.3.2.2 Regulatory Agencies

The purpose of agency consultation is to inform and receive input from all government agencies with jurisdiction or a program interest related to the electricity project. This may include federal and provincial ministries and agencies, as well as municipalities.

To improve efficiency in the consultation process, the Electricity Projects Regulation encourages proponents to combine or coordinate (harmonize) agency consultation required for other approvals with that undertaken as part of the EA process. It is noted that the EA can compliment and contribute to other agency processes that may apply to the project.

5.3.2.3 First Nations

The Electricity Projects Regulation notes that proponents should give particular consideration to the concerns of First Nations and other Aboriginal communities located in the vicinity of, or having a potential interest, in the project. The Regulation also notes that First Nations and Aboriginal communities are to be identified, notified, consulted, and involved in an appropriate manner.

5.3.3 Waterpower Program Guidelines

The WPPG define stakeholder involvement to include notification, consultation, and contribution opportunities. The WPPG notes that the proponent must include a summary showing that stakeholders have been contacted and that any concerns identified have been addressed.

The involvement of interested parties is solely the proponent's responsibility, but the specific consultation plan must receive confirmation from MNR district staff before the project proceeds. The MNR may also play a direct role in consultation and information disclosure processes, since the MNR has the mandate to manage the Crown's land in a responsible fashion. It is important to note that any First Nation engagement undertaken by YFP is separate from that to be undertaken by the Crown.

5.3.4 The Crown and First Nations

Consistent with Section 35 of the *Constitution Act, 1982*, as interpreted by recent court decisions, the proponent recognizes that the duty to consult with First Nations rests with the Crown. Notwithstanding their ultimate responsibility for consultation, the Crown does delegate procedural aspects of this consultation to Project proponents.

Consultation with any First Nation or Aboriginal community by the proponent does not abrogate or derogate any Aboriginal or Treaty Rights a participating Nation may be afforded under the *Constitution Act, 1982*.

5.4 METHODOLOGY

Stakeholder consultation is not viewed by YFP as a one-time activity. It is an on-going and interactive process that began during the conceptual design of the Project and will continue throughout construction and operation. A key consideration when developing a methodology for a consultation and information disclosure program is to understand the extent to which stakeholders may be interested in the Project based on their perceptions and issues.

Another key consideration is to develop a representative understanding of the views of stakeholders and First Nations about the area in which they live, community characteristics, and environmental resources that are important to them. The extent to which they have local or traditional knowledge about certain issues or the environment is also important to identify.

Since many of the issues addressed within the EA are of public relevance, or are matters that would benefit from public review and comment, a framework that facilitates greater or more substantial stakeholder participation is important. Such a framework should contain mechanisms to monitor consultation and disclosure activities on a continuous basis during the Project's planning, construction and operational activities (as required).

In order to incorporate stakeholder and First Nations input from the earliest stage in the planning process, Yellow Falls Power developed a Stakeholder Consultation and Information Disclosure Plan (SCID) in March, 2006 and a Consultation and Information Disclosure Plan for the Taykwa Tagamou Nation (TTN CID) in May 2006. The SCID was provided to the MNR for review, and the TTN CID was reviewed and accepted by the TTN community.

The SCID and TTN CID are available for review in **Appendix E1**. These documents do not differ substantially, but reflect the individual needs of each group of potential stakeholders.

These documents outline the general process for consultation in a program designed to be iterative and adaptable to changing community and Project requirements throughout the planning process.

The general process outlined in these documents is provided below.

5.4.1 Phased Approach

Building on the above considerations and applicable regulatory requirements, the following consultation and information disclosure methodology was developed and implemented for the Project. The methodology contained three distinct phases:

Phase 1

- Identify and inform the public, First Nations, regulatory agencies, and other stakeholders about the Project
- Determine how best to involve First Nations and stakeholders
- Identify the nature of interests, concerns, or issues
- Solicit input regarding the Project concept

Phase 2

- Provide more detailed information about the Project, including the preliminary layout
- Identify and respond to interests expressed to date
- Raise awareness of response to stakeholder interests (e.g., detailed studies)
- Incorporate known interests into preliminary Project design

Phase 3

- Present the draft and final EA in its entirety for review by agencies, First Nations, and stakeholders
- Respond to stakeholder and First Nations interests expressed during the review of the EA, as necessary.

This phased methodology was utilized to ensure that information was:

- Disclosed early in the planning process
- Presented in a meaningful way
- Used to actively and transparently engage stakeholders and First Nations
- Compliant with regulatory requirements.

5.4.2 First Nations

Building upon the above consultation and disclosure methodology, an emphasis was put on actively involving First Nation group(s) with an interest in the Project in the EA process. Key considerations for First Nation engagement included consideration of the following:

- Aboriginal communities with a potential interest in the Project
- Reserves, treaty rights, or treaty areas
- Other lands owned by aboriginal communities
- Land claims
- Ongoing litigation
- Potential adverse effects on aboriginal interests
- Mitigation measures to avoid adverse effects on aboriginal interests.

5.4.3 Stakeholder Identification

Stakeholder identification determines who may be potentially affected by the Project or who can contribute to the decision-making process. Identification of stakeholders is an on-going process has been refined during each stage of the process. Project stakeholders include a number of target audiences, listed below:

Community Members

- Residents and landowners of the Town of Smooth Rock Falls and throughout the study area

Government Regulators, Agencies, Ministries, and Politicians

- Town of Smooth Rock Falls
- Ministry of Natural Resources
- Ministry of the Environment
- Ministry of Energy
- Ministry of Culture
- Ministry of Tourism and Recreation
- Ontario Energy Board
- Member of Provincial Parliament
- Ontario Secretariat for Aboriginal Affairs
- Ministry of the Governor General
- Ontario Ministry of Citizenship and Immigration

- Ontario Ministry of Municipal Affairs and Housing
- Ontario Ministry of Natural Resources
- Ontario Ministry of Northern Development and Mines
- Ontario Ministry of Transpiration
- Technical Standards and Safety Association
- Canadian Environmental Assessment Agency
- Department of Fisheries and Oceans
- Environment Canada
- Indian and Northern Affairs Canada
- Canadian Coast Guard
- Natural Resources Canada
- Transport Canada
- Member of Parliament (MP)

First Nations & Organizations

- Taykwa Tagamou Nation
- Mattagami First Nation
- Wahgoshig First Nation
- Flying Post First Nation
- Matachewan First Nation
- Nishnawbe-Aski Nation
- Wabun Tribal Council
- Mushkegowuk Council
- Union of Ontario Indians

Other Interested Parties

- Aquatic Conservation Network
- Arctic Riders Snowmobile Club
- Federation of Northern Ontario Municipalities
- Federation of Ontario Cottagers Association
- Friends of the Mattagami River
- McLeod Wood and Associates (First Nations representatives)

- Northern Expeditions
- Northern Ontario Tourist Outfitters Association
- Ontario Federation of Anglers and Hunters
- Ontario Power Generation
- Ontario Waterpower Association
- Polar Bear Outfitters
- Registered trappers / other land users (confidential MNR list)
- Smooth Rock Falls Anglers and Hunters
- Tembec Industries Incorporated
- Tri-Town and District Chamber of Commerce

5.4.4 Communication Tools

The strategic planning undertaken for the Project's consultation and disclosure activities included recognition of the diversity among stakeholder groups and understanding their specific characteristics / mandates, areas of interest, and expertise. It is acknowledged that in certain instances there can be differences of power, opinion, and knowledge between more established groups and newer, less organized groups, project-specific groups, or individuals.

When communicating with stakeholders it was important for the proponent to select methods of consultation and disclosure appropriate to cover the wide range of stakeholder groups. Communication tools utilized for the Project included:

- Public open houses
- Community meetings
- Comment cards/questionnaires
- Individual meetings
- Direct and mass (e.g. Admail) mailings
- Newspaper ads / notices
- Press releases
- Meetings with stakeholder groups
- MNR confidential mailing list (including individuals with tenure)
- Written correspondence
- Collect call telephone line
- Fax service
- Project specific e-mail address

- Mailing addresses for both YFP and Stantec
- Project briefing notes
- Project website
- Draft EA release and public review
- Final EA release and public review

Communication points (e.g., contact numbers and addresses of proponent representatives) were included on information provided to stakeholders.

5.5 ENVIRONMENTAL ASSESSMENT CONSULTATION ACTIVITIES

5.5.1 Stakeholder Engagement

Stakeholders were encouraged to participate in the development and planning of the EA through the following means:

- Letters of invitation to participate in the Project
- Public notices
- Stakeholder and interest group meetings
- First Nations meetings
- Public open houses and community meetings
- Site Visits to Yellow Falls
- Comment cards and questionnaires
- Notice of 30-calendar day Draft EA Review period
- Public Review of the Draft EA
- Notice of extension of 30-calendar day Draft EA Review period
- Notice of 30-calendar day stakeholder review period (Final EA)

Additional opportunities for stakeholders to become engaged in the Project were provided through the telephone, facsimile, email, and Project website.

5.5.2 Project Notices

5.5.2.1 Notice of Commencement

A Notice of Commencement for the Yellow Falls Hydroelectric Project, as required under the ESP, was mailed to known Project stakeholders and published in English in the *Cochrane Times-Post* (August 5, 2005) and *The Northern Times* (August 3, 2005), in French in *L'horizon* (August 10, 2005), and in both official languages in *The Weekender* (August 3, 2005) (**Appendix E4**).

The Notice of Commencement was also posted on the Project website and distributed to residents in the Smooth Rock Falls area through Canada Post's Unaddressed Admail system. Direct mailouts were sent to municipal, provincial, and federal agencies, as well as non-government organizations identified on the Project mailing list. YFP also distributed the Notice of Commencement to the TTN as the Project is proposed within their traditional territory.

The MNR distributed the Notice of Commencement on behalf of YFP to private/confidential stakeholders within the study area on their mailing list. Such stakeholders included trappers, hunters, and other persons with some interest in the lands and/or waters of the Project area.

The Notice of Commencement provided a brief Project description, a map of the study area, the importance of receiving feedback and, ways to provide feedback. The Notice of Commencement also included: telephone numbers (participants were given the option to call collect), contact information for Stantec and YFP, the Project email address, website, and fax number, and where participants could find current Project information and updates (such as the Project website, and local newspapers).

5.5.2.2 Notice of the First Public Open House

A Notice of the First Public Open House (**Appendix E5**) was posted on the Project website and distributed to residents in the Smooth Rock Falls area through Canada Post's Admail system. Direct mailouts were sent to municipal, provincial, and federal agencies, as well as non-government organizations identified on the Project mailing list. The MNR also distributed the Notice of Public Open House on behalf of YFP to private/ confidential stakeholders on their mailing list. Lastly, a Notice of Public Open House was published in English in *The Cochrane Times-Post* (February 24, 2006), and *The Northern Times* (February 22, 2006), in French in *L'horizon* (February 22, 2006), and in both official languages in *The Weekender* (February 25, 2006).

5.5.2.3 Notice of Second Public Open House

A Notice of Second Public Open House (**Appendix E6**) was posted on the Project website and distributed to residents in the Smooth Rock Falls area through Canada Post's unaddressed Admail system. Direct mailouts were sent to municipal, provincial, and federal agencies, as well as non-government organizations identified on the Project mailing list. The MNR also distributed the Notice of Public Open House on behalf of YFP to private/confidential stakeholders within the study area on their mailing list. Lastly, a Notice of the Public Open House was published in English in *The Cochrane Times-Post* (May 11, 2007) and *The Northern Times* (May 9, 2007), in French in *L'horizon* (09 May 2007), and in both official languages in *The Weekender* (May 12, 2007).

5.5.2.4 Notice of First Nation Community Meetings

Notification for all TTN Community Meetings was distributed to community members by TTN representatives in advance of meetings held for TTN on 08 and 20 March 2006 (New Post and Moosonee), September 18 and 19, 2006 (New Post and Moosonee), and May 23 and 24, 2007 (New Post and Moosonee).

Community meetings in the Mattagami First Nation (25 May 2007) and Wahgoshig First Nation (October 21, 2008) communities were coordinated and facilitated by the MNR District Office staff through their First Nation community contacts. Notification was distributed to community members by community representatives.

5.5.2.5 Notice of Release of Draft EA Report for Comment

On November 7, 2007, YFP issued the Draft Island Falls Hydroelectric Project Environmental Assessment Report. A notice of release of the Draft EA Report for comment was placed in the Kapuskasing Northern Times (November 7, 2007), L'Horizon (November 7, 2007), The Weekender (November 2, 2007), and the Cochrane Times (November 2, 2007) in both official languages (**Appendix E11**). The notice was also posted to the Project website and distributed to First Nations, agencies, organizations, individuals on the Project mailing list, and Canada Post unaddressed admail. The notice gave contact information to provide comments or request a copy of the Draft EA Report, as well as locations where the Draft EA Report was made available. Comments were requested by December 7, 2007.

The following locations kindly hosted copies of the Draft EA Report for viewing by interested parties:

- Smooth Rock Falls Town Hall (142 First Avenue, Smooth Rock Falls, Ontario)
- Smooth Rock Falls Public Library (120 Ross Road, Smooth Rock Falls, Ontario)
- Kapuskasing Civic Centre Town Hall Clerk's Department (88 Riverside Drive, Kapuskasing, Ontario)
- Kapuskasing Public Library (24 Mundy Avenue, Kapuskasing, Ontario)
- Timmins City Hall Clerk's Department (220 Algonquin Blvd. East, Timmins, Ontario)
- Timmins Public Library (320 Second Avenue, Timmins, Ontario)
- C.M. Shields Library (99 Bloor Street, South Porcupine, Ontario)
- Ministry of Natural Resources Cochrane District Office (2 Third Avenue, Cochrane, Ontario)

5.5.2.6 Notice of Extension of Draft EA Report Review Period

Following release of the Draft EA Report for comment, local interested parties requested an extension of the deadline for comments. Subsequently, the Notice of Review Extension was

posted in the same papers, extending the review and comment period from December 7, 2007 to January 7, 2008 (**Appendix E11**). The Notification was also posted on the Project website.

5.5.2.7 Notice of Completion

The Notice of Completion (**Appendix E12**) was published on February 18, 2009 in the Kapuskasing Northern Times, L'Horizon, The Weekender, and the Cochrane Times in both official languages. The notice was also posted to the Project website and distributed to First Nations, Agencies, organizations, individuals on the Project mailing list and through Canada Post unaddressed admail.

This Notice advised that the Final EA Report was completed on **February 18, 2009** and available for the formal 30-day stakeholder review period (see **Section 5.8)**.

The Notices gave contact information to provide comments or request a copy of the Final EA Report, as well as locations where the Final EA Report was made available. Comments are requested by **March 20, 2009 no later than 4:30 pm** (see **Section 5.8**).

5.5.3 Stakeholder Meetings

5.5.3.1 March 6, 2006 Presentation to Smooth Rock Falls Council

In advance of the first Open House representatives from YFP presented an overview of the Project to the Smooth Rock Falls Town Council. The presentation was made on the evening of March 6, 2006 at the regularly scheduled Council meeting and was followed by a question and answer period. The presentation provided the Mayor and Council with information on the Project concept, communications tools, the EA process, and general planning constraints.

5.5.3.2 March 7, 2006 Open House

The first Open House was held on March 7, 2006 from 4:00 to 8:00 p.m. at the Smooth Rock Falls Royal Canadian Legion. The intention of the Public Open House was to provide interested parties with an opportunity to review the Project concept, and inform interested parties of the EA process and general planning constraints. The forum provided an opportunity for interested parties to provide their comments to the Study Team and participate in open dialogue with representatives from Stantec and YFP.

Representatives from YFP and Stantec were available to answer questions and collect stakeholder information from the 51 people who registered their attendance via a sign-in sheet. Comment cards were provided for attendees to submit input on the Project. 33 comment cards were returned (**Appendix E5**).

5.5.3.3 March 5, 2007 Presentation to Smooth Rock Falls Council

During the regular Council meeting on the evening of March 5, 2007, YFP representatives made a presentation to the Town of Smooth Rock Falls Mayor and Council. Since a municipal election had occurred in the preceding months (October 2006), many of the Council members were new, and had not attended the previous presentation to Council in March 2006.

The presentation reviewed the Project history and introductory information provided in the March 2006 presentation to Council, as well as an update on the Project design, construction schedule, and labour expectations.

5.5.3.4 May 22, 2007 Open House

The second Public Open House was held on May 22, 2007, from 5:00 to 9:00 p.m. at the Smooth Rock Falls' Royal Canadian Legion. At the request of local stakeholders, the second Open House included a formal presentation by members of the Study Team, followed by a one-hour moderated question and answer session. The second Public Open House provided the community with the final Project concept, and presented the findings of the EA process and field work conducted to date. The Open House provided a forum for interested parties to express their comments to the Study Team and to participate in open dialogue with representatives from Stantec and YFP.

Fifty-nine people registered their attendance at the second Public Open House. Each attendee was provided with an Open House Questionnaire with which they could submit their comments, concerns, and questions to the Study Team. 13 questionnaires were returned (**Appendix E6**).

5.5.3.5 August 28, 2007 Town of Smooth Rock Falls Public Meeting

A Public Meeting organized by the Town of Smooth Rock Falls was held at Smooth Rock Falls Curling Club Lounge on August 28, 2007 starting at 7:00 pm. YFP accepted the Town's invitation to participate in the meeting. The Town of Smooth Rock Falls issued a public notice to make the community aware of the meeting (**Appendix E9**). The community meeting included presentations by the Friends of the Mattagami and YFP (**Appendix E9**). These presentations were followed by questions from the audience for both parties. The notice that was provided to SRF residents is also attached in **Appendix E9**.

A number of questions were raised during the question and answer session that followed the presentations by the Friends of the Mattagami and YFP. A common theme among these comments was the importance of the Mattagami River, including Island Falls, for recreational activities for some community members.

Following the meeting, a resolution was passed by Council to "support the Friends of the Mattagami in their quest to halt the Yellow Falls Hydro Dam Power Project [the Island Falls Hydroelectric Project] on the Mattagami River" on September 10, 2007.

YFP made a presentation to Smooth Rock Falls Council on October 10, 2007 at 7:00 pm. In response to the tourism and recreation-related concerns identified during the August, YFP offered to host a tourism/recreation workshop for the Town (**Appendix E9**) in order to identify recreational opportunities that might be realized in association with the Project. This proposal was made to address the recreational comments that were figured prominently in the Community Meeting.

The Smooth Rock Falls Town Council committed to identify local residents for participation in the recreation committee.

5.5.3.6 January 15 and February 22, 2008 Town of Smooth Rock Falls Recreation Committee Meeting

Community representatives for the Recreation Committee were identified and selected by the Town via a written invitation to participate sent to all community members (**Appendix E9**).On January 15 and February 22, 2008, meetings for the newly-formed Recreation Committee were held in the Town of Smooth Rock Falls Town Hall. The committee included a representative from YFP, Town staff and Council members, as well as community representatives.

The meeting included general discussions regarding recreational opportunities in the Town, opportunities to obtain additional funding to support recreational endeavours, as well as tourism goals and concepts. Several tourism/recreation concepts were discussed, including discussion of the current use of Island Falls.

5.5.3.7 April 21, 2008 Town of Smooth Rock Falls Council Meeting

A presentation by YFP was made to the Town of Smooth Rock Falls Council following receipt of comments on the Draft EA Report and discussions with the Recreation Committee. The presentation outlined the proposed Project location change from Island Falls, 2 km upstream to Yellow Falls as a direct response to public and agency comments received during Public review of the Draft EA.

Following the meeting, a resolution was passed by Council to support the Project at the Yellow Falls location and to rescind the September 10, 2007 resolution (**Appendix E9**).

5.5.4 First Nations Meetings

Community meetings/Project presentations were offered by YFP to all First Nations communities who expressed an interest in the Project. The TTN MFN, WFN invited YFP to their communities to discuss the Project.

5.5.4.1 Taykwa Tagamou Nation

Notification of community members was provided by community representatives. Community meetings for the TTN were hosted in both New Post and Moosonee since members of the TTN community are split between both locations. Three rounds of community meetings, each consisting of one open house in Moosonee and New Post were undertaken. For consistency the same information was presented at each meeting location.

TTN and YFP hosted the first round of community meetings for members of the TTN community on March 8, and March 20, 2006. The March 8 meeting was held at New Post with 14 community members registering their attendance. The meeting on March 20 was held in Moosonee, with three attendees. Copies of the Application Information Requirements ("AIR") package were made available by TTN to their members. The community meetings provided information on the Project concept, environmental screening process, general planning constraints, and how TTN and YFP are working together. TTN and YFP representatives were available to answer questions and collect member information.

The second round of TTN community meetings was held on September 18, 2006 at New Post (5 attendees), and on September 19, 2006 in Moosonee (10 attendees). The second round of community meetings focused on discussions of the benefits of the Project and the status of ongoing business-to-business discussions between the TTN and YFP.

The third round of community meetings was held on May 23, 2007 at New Post (8 attendees), and on May 24, 2007 in Moosonee (1 attendee). This round of community meetings provided information on the preferred design for the Project, the results of environmental field assessments, and an update on the business-to-business discussions between TTN and YFP.

Throughout 2006, a number of business-to-business meetings were held between YFP and the TTN. Resulting from these agreements was the execution of an agreement between the two parties outlining the flow of benefits to the TTN community as a result of the Project.

5.5.4.2 Mattagami First Nation

An introductory meeting between the Chief and Council of Mattagami First Nation ("MFN"), YFP, the MNR, and Aboriginal Resource Technical staff was held on May 10, 2007. The meeting included an introduction to the Project design, the Project history, and anticipated timelines. The MFN indicated that they had expressed an interest in the Project in 2004 via email to the MNR and were surprised that they weren't consulted earlier. YFP confirmed that they did not receive any indication that the MFN had an interest in the Project until December 2006, following execution of a business-to-business agreement with the TTN. During this meeting, it was also determined that a community meeting on the Project was required for the MFN community.

The community meeting was held at Mattagami First Nation ("MFN") on May 25, 2007, with 14 attendees. The community meeting included a description of the Project history, location, the Proponent, and a discussion of the approvals processes associated with the Project. YFP also presented their preferred Project design.

A meeting was held on October 14, 2008 with MNR, MFN, and Wabun Tribal Council representatives at the MNR offices in South Porcupine. YFP provided an update on the Project modifications following review of the Draft EA, including relocation of the dam and powerhouse, reduction in Project capacity, and dam design changes.

During the meeting, the MFN representative indicated interest in the archaeological resources at the Project site, and their desire to have community members visit the site with the archaeologist that completed the archaeological studies for the Project. The MFN was directed to the Draft EA provided to them in November 2007, which included a copy of the archaeological reporting. Mattagami First Nation members visited the Project site on January 20, 2009 with Woodland Heritage Services, the consulting archaeologist for the Project (**Section 5.5.4.4**).

5.5.4.3 Wahgoshig First Nation

A community meeting was held at the Wahgoshig First Nation ("WFN") on October 21, 2008. Approximately 10 First Nation community members attended the meeting, with five individuals signing the sign-in book. The community meeting included display boards depicting the Project design, location, and key studies undertaken. Environment-related comments received from the community focussed on the potential effect of the Project on Lake Sturgeon as a result of the Project and potential cumulative effects on Lake Sturgeon from all of the dams on the Mattagami River system. Attendees also expressed an interest in understanding how the WFN would be involved in the Project, and how their community would benefit.

5.5.4.4 First Nation Site Visits – Yellow Falls

YFP facilitated a number of visits to Yellow Falls by First Nations representatives. The site visits occurred on three separate occasions. On November 6, 2006, the MNR, TTN, and Mr. William Iserhoff visited Yellow Falls to investigate potential archaeological resources. No specific archaeological resources were identified as a result of the visit, however additional clarification was provided to Mr. Iserhoff regarding the future archaeological works that would be required prior to construction (i.e. Stage IV investigations).

A second First Nations site visit was carried out on November 18, 2008. This site visit was attended by representatives from the Wahgoshig First Nation, Flying Post First Nation, Matachewan First Nation, Woodland Heritage Services (consultant archaeologist), MNR, and YFP. The visit included a walking tour of the site, and a traditional First Nations ceremony, led by representatives from the Wahgoshig First Nation, and participated in by all attendees.

The third First Nations site visit was carried out on January 20, 2009. This site visit was attended by Chief and Councillors from the Mattagami First Nation, Woodland Heritage Services (consultant archaeologist), MNR, and YFP. The visit included a walking tour of the site, discussion of the Project plans, as well as archaeological works that had been conducted to-

date, as well as those planned prior to construction. Chief Walter Naveau conducted a ceremony at the site.

5.5.5 Website

The Project's website is designed to provide interested parties with a means of receiving current and timely Project updates. The website is updated on a regular basis as soon as new information becomes available. It is also used to inform the public of any upcoming events, such as Public Open Houses. Furthermore, any display boards shown at the Public Open Houses are posted on the website to ensure that anyone unable to attend is still informed and has an opportunity to provide feedback. The various Notices provided on the Project website are available in both English and French as there is a large French-speaking population in the area. The Project website also provides contact information for the Study Team.

5.5.6 Newsletters

Three newsletters were sent to the government agencies, interested parties, and First Nations (**Appendix E7**). The intention of the newsletters was to provide readers with an update on Project status, schedule, and ongoing consultation activities. The first newsletter was distributed in the summer of 2006, the second in the winter of 2007, and the third in the spring of 2008. The newsletters provided contact information for the Study Team for further information or to provide comments.

5.5.7 Stakeholder Review of the DRAFT EA Report

First Nations and stakeholders, including the public and agencies, were provided the opportunity to review the Draft EA Report for a 60-calendar day period from November 7, 2007 to December 7, 2007. Following issuance of the Draft EA Report for public review, some stakeholders requested that additional time be provided to evaluate and respond to the Report. Subsequently, a notice was issued in local papers providing an additional 30 day review period from December 7, 2007 to January 7, 2008. Notices were published in both official languages (see **Appendix E11**) and were also posted on the Project website.

Electronic and/or paper copies of Draft EA Report were distributed to:

Agencies

- Canadian Environmental Assessment Agency
- Department of Fisheries and Oceans
- Environment Canada
- Health Canada
- Ministry of Natural Resources
- Ministry of the Environment
- Natural Resources Canada

- Town of Smooth Rock Falls
- Transport Canada
- Transport Canada Marine

First Nations

- Taykwa Tagamou Nation
- Mattagami First Nation
- Matachewan First Nation
- Wahgoshig First Nation
- Flying Post Nation
- Wabun Tribal Council
- Nishnawbe-Aski Nation

Stakeholders

- Friends of the Mattagami River
- Ontario Power Generation

Comments received during the review period were considered in the Final EA Report (see **Appendix E2**).

5.5.8 Project Modifications

Since the release of the Draft EA, YFP, the Town of Smooth Rock Falls, and interested members of the community were engaged in discussions regarding community goals, recreational benefits, and stakeholder interests. Through these discussions with community leaders and interested community members, a potential solution was identified that addressed many of the community and agency concerns brought forward during review of the Draft EA Report. This solution involved modification of the project concept.

The modified project concept includes:

- Relocation of the dam and powerhouse to Yellow Falls, approximately 2 km upstream from its originally proposed location at Island Falls
- Realignment of the access road and powerline to Yellow Falls
- Reduction in the capacity of the Project from 20 MW to 16 MW (resulting from the reduced head available at Yellow Falls).

YFP undertook an extensive and detailed internal evaluation of the proposed alternative, including economic analyses, legal analyses, discussions with key commenting agencies (i.e. DFO, MNR), and extensive discussions with the Friends of the Mattagami River and the Town

of Smooth Rock Falls. Ultimately, the revised project design was adopted by YFP and is assessed in detail through this Final EA Report.

Stakeholders were informed of the modifications to the Project design through several means:

- Two meetings of the Smooth Rock Falls Recreation Committee on January 15 and February 22, 2008. The creation of the Recreation Committee was proposed by YFP in response to recreation-related comments received during the August 2007 community meeting in Smooth Rock Falls. Committee membership included a representative from YFP, Town staff and council members, as well as members of the Smooth Rock Falls Community. Community representatives were identified and selected by the Town of Smooth Rock Falls via written invitation to participate sent to all community members.

- Two meetings between YFP and the Friends of the Mattagami River on March 5, and March 18, 2008

- Distribution of the Spring 2008 newsletter, distributed to the local community, First Nations, as well as to all persons on the Project mailing list

- Posting of the Spring 2008 newsletter to the project website (www.yellowfallshydro.com)

- Public presentation by YFP to Smooth Rock Falls Town Council Committee of the Whole on April 21, 2008

- Letter from Stantec to government agencies outlining the modifications to the Project (30 May 2008)

- First Nation site visits to Yellow Falls (November 2008, January 2009)

The relocation of the dam and powerhouse preserves Island Falls in its present state and recognizes the value of Island Falls to the local community as noted. In addition to the recreational benefits associated with the continued use of Island Falls by the local community, funding has also been provided to the Town of Smooth Rock Falls by YFP for recreational purposes.

As a result of the extensive consultation undertaken between YFP, the Town of Smooth Rock Falls and interested community members, and the adoption of the modified project design by Yellow Falls Power, several positive developments have occurred:

- The Friends of the Mattagami River have accepted the new project design and location as described in their letter in the Spring 2008 Project Newsletter provided in **Appendix E7**, and their presentation to Smooth Rock Falls Council Committee of the Whole on April 21, 2008

- The Town of Smooth Rock Falls has passed a Council Resolution supporting the project at Yellow Falls as provided in **Appendix E9**.

In addition to the above noted consultation activities, the relocation of the dam and powerhouse to Yellow Falls maintains Island Falls and the flow conditions immediately downstream of Island Falls. The area immediately downstream of Island Falls was identified as the area demonstrating the greatest utilization by the target fish species in the study area during 2006 and 2007 fisheries surveys and preservation of this area assists in maintaining diversity of river conditions in this reach of the Mattagami River. The headpond length has also been reduced by 2 km, reducing the extent of the change to river conditions.

5.6 CONSULTATION AND INFORMATION DISCLOSURE RESULTS

Throughout the consultation and information disclosure program, YFP has actively provided forums for stakeholder and First Nations input, and integrated this input into Project planning and development where possible. Many comments have influenced project planning; the most significant Project modification resulting from stakeholder comments is the relocation of the proposed dam and powerhouse to Yellow Falls.

The following subsections indicate stakeholder use of communication tools outlined above and provide the key results for each of the three key groups: public, First Nations, and regulatory agencies. A table within each subsection lists the key interests raised and the specific studies, project design considerations and/or actions taken in response to the interest.

5.6.1 Stakeholder Use of Communication Tools

Based upon the consultation and disclosure activities during the period spanning from issuance of the Notice of Commencement on August 18, 2005 to the release of the Draft EA for public review on November 7, 2007, YFP has received the following feedback:

- The Integrated Screening Checklist was provided to the MNR for comment in 2006. The checklist provided an overview of key considerations for the environmental assessment. Comments received from the MNR have been incorporated into the EA Report (**Appendix E2**).
- The Draft Aquatic Assessment was provided to the MNR and DFO for comment. Comments received from the MNR and DFO were addressed in the Final Aquatic Assessment and in subsequent reports (**Appendix G**).
- 13 stakeholders had used the Project email address
- 33 had sent in comment cards from first Public Open House
- 13 stakeholders had sent in questionnaires from the second Public Open House
- 3 stakeholders had sent a written letter
- Approximately 11 stakeholders had also used the collect-call telephone and fax line
- 79 local residents and businesses signed a letter in support of the Project

YFP received the following correspondence following release of the Draft EA for public and agency review on November 7, 2007. The majority of comments were received prior to the end of the extended Draft EA Review period on January 7, 2008:

- 7 stakeholders had used the Project email address, 3 of which are members of Friends of the Mattagami; in total, 58 emails were received commenting on the Draft EA Report, 52 of which were from the Friends of the Mattagami.
- 1 stakeholder sent a fax
- 1 petition opposing the Project at the Island Falls location was received from the Friends of the Mattagami which contained 318 signatures
- Comments on the Draft EA Report were received and responded to from the Cochrane District MNR Office, the Northeast Region MNR Office, the DFO, EC, MOE, and TC
- The Friends of the Mattagami River provided a letter to include in the Spring 2008 Project Newsletter stating acceptance of the Project at the Yellow Falls location
- The Town of Smooth Rock Falls issued a resolution supporting the Project at the Yellow Falls location and rescinding a previous Council resolution dated September 10, 2007 opposing the Project at the Island Falls location

All names, phone numbers, addresses, and comments received were entered into a project database for tracking, responding to questions, and future mailings.

A concordance table providing public and interest group comments, Project Team responses, and locations where the EA Report addresses comments is provided in **Appendix E2**

5.6.2 Public and Interest Groups

Stakeholder comments have been encouraged throughout the process, and were received from multiple communication pathways, including webmail, telephone, fax, written letter, and comment cards/questionnaires from Public Open Houses. Prompt responses were provided to stakeholder comments received (**Appendix E9**).

The key interests identified by stakeholders and interest groups during the consultation and disclosure program for the Project, and specific project activities and actions completed in response to the interests, are summarized in **Table 5.2**.

In particular, the Friends of the Mattagami have been heavily involved in the Project since commencement and provided numerous comments through the Project e-mail address, Project Open Houses, and the Smooth Rock Falls community meeting. The Friends of the Mattagami stated that they were also acting as spokespeople for some members of the local community, and brought forward concerns raised by these persons to the Study Team. The correspondence from the Friends of the Mattagami is included in **Appendix E7**. Their concerns included:

- Effects on the natural environment and losses for future generations
- Social effects within the Smooth Rock Falls Community
- Effects on fish habitat
- Effects on recreation and future tourism opportunities

- Loss of Island Falls section, along with the benefits it provides to the Smooth Rock Falls community.

The Friends of the Mattagami, as well as the recreation committee and the Smooth Rock Falls Council were instrumental in discussions that resulted in the decision to relocate the powerhouse/dam structure from Island Falls to Yellow Falls. As a result of this Project change, the Friends of the Mattagami are in agreement that this action provides a mutually acceptable balance between the community's desire to preserve the Island Falls Site and providing new renewable energy sources for all Ontarians.

Following release of the Draft EA, the MNR was contacted by a local First Nation community member, William Iserhoff, who has experience related to the management of First Nation burial sites. Mr. Iserhoff indicated his interest in discussing and participating in additional investigations of potential burial sites that may be affected by the Project.

In response to this request for involvement, a meeting was held on June 24, 2008 between YFP, TTN, MNR, Woodland Heritage Services (archaeologist), and Mr. Iserhoff. During the meeting, YFP provided additional detail on the Project. An overview of the MOC assessment process and other regulatory requirements was provided by Woodland Heritage Services and the MNR.

As a result of that meeting, a site visit was undertaken on November 6, 2008 with the TTN and Mr. Iserhoff. No specific archaeological resources were identified as a result of the visit, however additional clarification was provided to Mr. Iserhoff regarding the future archaeological works that would be required prior to construction (i.e. Stage IV investigations).

Table 5.2 Key Public and Interest Group Issues and Project Responses

Public Interest	Project Response and Relevant EA section
Potential effects on recreational opportunities	• The dam and powerhouse were relocated from Island Falls to Yellow Falls in part to avoid effects to recreational activities at Island Falls. • Recreation activities such as fishing and hunting will be maintained in the area for local users and tourists, a priority expressed by many members of the community • YFP and the Arctic Rider Snowmobile Club signed a memorandum of understanding. This memorandum of understanding provided the Arctic Riders with financial assistance to complete their in-progress new trail, and also clarified how YFP and the Arctic Riders would work together to avoid potential effects on each others' operations during construction and operation of the Project See EA Sections 6.7, 6.8, 6.9, and Appendices
Potential effects on the beauty and natural resources of the area	• As with most large projects, effects to viewscape will occur • Viewscape effects will be reported in the EA and appropriate mitigation measures will be outlined See EA Sections 6.7, 6.8, 6.9, and Appendices

Table 5.2 Key Public and Interest Group Issues and Project Responses

Public Interest	Project Response and Relevant EA section
Potential effects to fish and habitat in the vicinity of Island Falls	• The dam and powerhouse were relocated from Island Falls to Yellow Falls in part to remove any potential for effects to a spawning location at the base of Island Falls used by several fish species, and potentially sturgeon • All in water works will follow DFO Operational Statements to minimize potential effects to surface water • All in-water work will be done while adhering to any specific DFO and MNR fisheries timing requirements to protect local fish populations during their spawning and nursery periods • Measures have been developed to compensate for reduction in riffle habitat in accordance with DFO's "no net loss" policy. • YFP will obtain a Work Permit and Land Use Permit from the MNR in advance of construction See EA Sections 6.2, 6.5, and Appendices
Project will result in a lack of habitat diversity in the reach of the Mattagami River between Lower Sturgeon GS and Smooth Rock Falls GS	• The dam and powerhouse were relocated from Island Falls to Yellow Falls in part to preserve fast-moving water habitat between Lower Sturgeon GS and Smooth Rock Falls GS See EA Section 6.5 and Appendices
Local economic benefits of the Project	• An Economic Benefits Assessment was undertaken to determine the economic effects of the Project. • Local benefits to the community from the Project will include, among others: the creation of jobs; monies spent locally during construction and operations • A new source of provincial and federal taxation See EA Section 6.8 and Appendices
Design of the aquatic studies	• Methodology to be used in the fisheries assessment was developed in close consultation with DFO and the MNR, and is documented in the fisheries assessment report • The goal was to arrive at a mutually acceptable work plan to be confident that the field work fully meets the needs of MNR and DFO • Detailed aquatic studies were undertaken in 2006 and 2007 and will be continued during construction and operation as per an Environmental Inspection and Monitoring Plan See EA Section 6.5, 9.0, and Appendices
Potential effects to local drinking water, particularly during construction and with increased mercury levels	• Standard mitigation measures will be used to limit the amount of sediment entering the water column during construction • Mercury methylation will occur in the headpond area, but increases in mercury levels downstream are unlikely to be significant • Mercury binds to particles in water which are typically removed by primary water treatment or boiling. • Communications will be maintained between the Construction Manager and the operator of the Smooth Rock Falls water treatment facility. See EA Section 6.2 and Appendices

Table 5.2 Key Public and Interest Group Issues and Project Responses

Public Interest	Project Response and Relevant EA section
Timing for construction	• Throughout the EA process, the Project schedule was updated regularly to reflect current timelines.
Potential impacts to tourism outfitters	• Polar Bear Outfitters holds a Land Use Permit south of Loon Rapids • The Project will not affect the Land Use Permit area. See EA Sections 6.7, 6.8, and Appendices
Locations of access roads and availability for public use	• Access will be improved along the existing Red Pine Road due to the installation of former bridges and road widening and improvements. • A boat ramp and access point will be accessible immediately upstream of Yellow Falls See EA Sections 6.7, 6.8, 6.9, and Appendices
Kayaking and canoeing on the River – how will the project change flow	• Construction and operation will result in the inundation of approximately 71 ha of land over an 6 km stretch of the Mattagami River from the Project site at Yellow Falls upstream to Loon Rapids • The tail-waters of Rat Creek, two large unnamed tributaries, and several ephemeral tributaries will be inundated. • The Project will significantly alter water velocity and depth through creation of the headpond. • Improved navigability in headpond due to greater water depths. • Portage route in design. See EA Sections 6.7, 6.8, 6.9, and Appendices
Effect of project on wildlife	• To the greatest extent possible, dam structures, access roads, and transmission lines have been sited to reduce potential effects on natural areas including wetlands and forested areas • Access roads have been located on existing roads and trails to minimize fragmentation and disturbance effects of construction • Wildlife studies conducted for the Project included field surveys for amphibians, fish and fish habitat, and vegetation communities See EA Section 6.4 and Appendices
Job availability, agreements made with First Nations	• An Economic Benefits Assessment was completed for the Project • Construction of the Project is expected to generate over 100,000 person-hours of employment. • Operation activities will create 2 full-time jobs • YFP places a strong preference on local labour and materials when they are available in sufficient quality and quantity at a competitive price. • YFP and the TTN have executed a business to business agreement. The details of the agreement are confidential; however the overall intent of the agreement is to describe how benefits associated with the Project will flow to the TTN. See EA Section 6.8 and Appendices

Table 5.2 Key Public and Interest Group Issues and Project Responses

Public Interest	Project Response and Relevant EA section
Open House should be changed to include question and answer and presentation formats	• YFP has responded to this request for the May 22, 2007 Open House – a 30-minute presentation was followed by a 60-minute question and answer session. Members of the study team were also available for one hour before and one hour after the presentation to speak one-on-one with members of the community. See EA Section 5.0 and Appendices
Methods to be used in fisheries assessment – netting, timing. Stantec's netting methods for catching Sturgeon. Impartiality of study team and proponent driven process.	• Methodology to be used in the fisheries assessment was developed using feedback from the DFO and the MNR on the 2006 Aquatic Sampling Plan (Appendix G1-VII) • We believe that we have a comprehensive field sampling program designed to address fisheries work required for this project • Additional information was provided to stakeholders on the proponent-driven process and the role of the provincial and federal agencies in the Project. Links to the EA Guide and additional information on O. Reg. 116/01 were provided to stakeholders. Discussions were also held between interested stakeholders and the provincial and federal agencies directly. See EA Section 6.5 and Appendices

5.6.3 First Nations

As part of its consultation and disclosure program, YFP actively engaged the Taykwa Tagamou Nation in the Project following award of the RES II contract. More recently, YFP has engaged the Mattagami First Nation, Flying Post First Nation, Wahgoshig First Nation, and Matachewan First Nation, at the request of federal and provincial agencies. A chronological summary of contact with First Nations and pertinent agencies is provided in **Table 5.3**.

Table 5.3 Summary of Contact with First Nations and Agencies

Contact Direction	Date	Method of Contact
Taykwa Tagamou Nation and YFP	28-Sep-05	Meeting
MNR to YFP	09-Nov-05	Phone
Taykwa Tagamou Nation to YFP	09-Nov-05	Email
MNR to YFP	24-Nov-05	Email
Taykwa Tagamou Nation and YFP	22-Feb-06	Meeting
YFP to Taykwa Tagamou Nation	08-Mar-06	Community Meeting
Stantec to Taykwa Tagamou Nation	09-Mar-06	Letter
YFP to Taykwa Tagamou Nation	20-Mar-06	Community Meeting
MNR to YFP	29-Mar-06	Letter
MNR to YFP	07-Apr-06	Letter
Taykwa Tagamou Nation and YFP	07-Apr-06	Meeting

Table 5.3 Summary of Contact with First Nations and Agencies

Contact Direction	Date	Method of Contact
Stantec to Taykwa Tagamou Nation	28-Apr-06	Letter
MNR to Taykwa Tagamou Nation	10-May-06	Letter
Taykwa Tagamou Nation and YFP	24-May-06	Meeting
Stantec to INAC Comprehensive Claims Branch	15-Jun-06	Letter
Stantec to INAC Specific Claims Branch	15-Jun-06	Letter
Stantec to Ontario Secretariat of Aboriginal Affairs	15-Jun-06	Letter
Taykwa Tagamou Nation and YFP	20-Jun-06	Meetings
Taykwa Tagamou Nation and YFP	21-Jun-06	Meetings
INAC Specific Claims Branch to Stantec	23-Jun-06	Letter
Stantec to INAC Litigation Management and Resolution Branch	27-Jun-06	Letter
Stantec to INAC Comprehensive Claims Branch	29-Jun-06	Phone
INAC Litigation and MRB to Stantec	18-Jul-06	Letter
INAC Specific Claims Branch to Stantec	21-Jul-06	Letter
Taykwa Tagamou Nation to Mattagami First Nation	03-Aug-06	Letter
Taykwa Tagamou Nation and YFP	19-Aug-06	Meeting
YFP and	18-Sep-06	Community Meeting
YFP	19-Sep-06	Community Meetings
Taykwa Tagamou Nation and YFP	13-Dec-06	Meeting
Ontario Secretariat of Aboriginal Affairs to Stantec	25-Jan-07	Letter
INAC Comprehensive Claims Branch to Stantec	02-Feb-07	Phone
Stantec to INAC Comprehensive Claims Branch	02-Feb-07	Fax
Stantec to INAC Comprehensive Claims Branch	02-Feb-07	Phone
Stantec to Ontario Secretariat of Aboriginal Affairs	02-Feb-07	Phone
Stantec to Ontario Secretariat of Aboriginal Affairs	02-Feb-07	Phone
Stantec to Ontario Secretariat of Aboriginal Affairs	06-Feb-07	Phone
Stantec to Ontario Secretariat of Aboriginal Affairs	07-Feb-07	Phone
Stantec to INAC Comprehensive Claims Branch	12-Feb-07	Phone
Stantec to Ontario Secretariat of Aboriginal Affairs	12-Feb-07	Phone
Stantec to Ontario Secretariat of Aboriginal Affairs	19-Feb-07	Phone
INAC Comprehensive Claims Branch to Stantec	23-Feb-07	Fax/letter
INAC Comprehensive Claims Branch to Stantec	23-Feb-07	Letter
MNR to YFP	23-Feb-07	Phone
Ontario Secretariat of Aboriginal Affairs to Stantec	28-Feb-07	Email
Stantec to Ontario Secretariat of Aboriginal Affairs	28-Feb-07	Phone
Ontario Secretariat of Aboriginal Affairs to Stantec	16-Mar-07	Letter (dated Feb 6 2007)
Ontario Secretariat of Aboriginal Affairs to YFP	17-Mar-07	Phone

Table 5.3 Summary of Contact with First Nations and Agencies

Contact Direction	Date	Method of Contact
YFP to Ontario Secretariat of Aboriginal Affairs	19-Mar-07	Phone
Stantec to Flying Post First Nation	17-Apr-07	Letter
Stantec to Mattagami First Nation	17-Apr-07	Letter
Stantec to Nishnawbe-Aski Nation	17-Apr-07	Letter
Stantec to Wahgoshig First Nation	17-Apr-07	Letter
YFP to Mattagami First Nation	20-Apr-07	Letter
MNR to YFP	03-May-07	Phone
YFP & Mattagami First Nation	10-May-07	Meeting
YFP and Taykwa Tagamou Nation	23-May-07	Community Meeting
YFP and Taykwa Tagamou Nation	24-May-07	Community Meeting
YFP and Mattagami First Nation	25-May-07	Community Meeting
Taykwa Tagamou Nation and YFP	31-May-07	Meeting
YFP and Mattagami First Nation	11-Jun-07	Phone conversation
Stantec to Union of Ontario Indians	15-Jun-07	Letter
Union of Ontario Indians to Stantec	19-Jun-07	Letter
Stantec to INAC LMRB	27-Jun-07	Letter
Stantec to Union of Ontario Indians	11-Jul-07	Letter
Stantec to Flying Post First Nation	18-Jul-07	Letter
Stantec to Mattagami First Nation	18-Jul-07	Letter
Stantec to Nishnawbe-Aski Nation	18-Jul-07	Letter
Stantec to Wahgoshig First Nation	18-Jul-07	Letter
YFP to Mattagami First Nation	18-Jul-07	Letter
Mattagami First Nation to Stantec	31-Jul-07	Email
Wahgoshig First Nation to Stantec	03-Aug-07	Letter
Stantec to Mattagami First Nation	07-Aug-07	Email
Stantec to Wahgoshig First Nation	13-Aug-07	Letter
Wabun Tribal Council to Taykwa Tagamou Nation	26-Sep-07	Letter
Wabun Tribal Council to Taykwa Tagamou Nation	26-Sep-07	Letter
Stantec to Mattagami First Nation	Nov-07	Notification Letter
Stantec to Flying Post First Nation	02-Nov-07	Draft EA Notification
Stantec to Taykwa Tagamou Nation	05-Nov-07	Draft EA Document
Stantec to Wahgoshig First Nation	05-Nov-07	Draft EA Notification
Stantec to Wahgoshig First Nation	05-Nov-07	Draft EA Document
Stantec to Flying Post First Nation	07-Nov-07	Draft EA Document
Stantec to Mattagami First Nation	07-Nov-07	Notification Letter
Stantec to Mattagami First Nation	07-Nov-07	Draft EA Document
Stantec to Mattagami First Nation	07-Nov-07	Draft EA Document

Table 5.3 Summary of Contact with First Nations and Agencies

Contact Direction	Date	Method of Contact
Mattagami First Nation to Stantec	21-Nov-07	Letter
INAC EA Coordination Unit to Stantec	27-Nov-07	Letter
Wabun Tribal Council to Stantec	28-Nov-07	Letter
YFP to Mattagami First Nation	29-Nov-07	Phone
YFP to Mattagami First Nation	05-Dec-07	Letter (via email)
MNR to YFP	15-Dec-07	Voice Message
YFP to Mattagami First Nation	10-Jan-08	Telephone
YFP to Taykwa Tagamou Nation	10-Jan-08	Phone
YFP to Wabun Tribal Council	17-Jan-08	Letter
Wabun Tribal Council to Wahgoshig First Nation	23-Jan-08	Letter
YFP to Wabun Tribal Council	07-Feb-08	Letter
Mattagami First Nation to Taykwa Tagamou Nation	12-Feb-08	Letter
Wahgoshig First Nation to Taykwa Tagamou Nation	28-Feb-08	Letter
YFP to Wabun Tribal Council	29-Feb-08	Phone
YFP to Taykwa Tagamou Nation	04-Mar-08	Phone
YFP to Wabun Tribal Council	06-Mar-08	Phone
Flying Post First Nation to Taykwa Tagamou Nation	07-Mar-08	Letter
Wabun Tribal Council to YFP	10-Mar-08	Phone
YFP to Wabun Tribal Council	10-Mar-08	Phone
YFP to Wabun Tribal Council	13-Mar-08	Phone
YFP to Wabun Tribal Council	17-Mar-08	Phone
Stantec to Mattagami First Nation	01-Apr-08	Newsletter
Stantec to Wabun Tribal Council	Apr-08	Newsletter
YFP to Flying Post First Nation	Apr-08	Newsletter
YFP to Mattagami First Nation	Apr-08	Newsletter
YFP to Taykwa Tagamou Nation	Apr-08	Newsletter
YFP to Wahgoshig First Nation	Apr-08	Newsletter
INAC EA Coordination Unit to Stantec	05-May-08	Letter
Stantec to Flying Post First Nation	06-May-08	Newsletter and Cover Letter
Stantec to Mattagami First Nation	06-May-08	Newsletter and Cover Letter
Stantec to Wabun Tribal Council	06-May-08	Newsletter and Cover Letter
Stantec to Wahgoshig First Nation	06-May-08	Newsletter and Cover Letter
YFP to Taykwa Tagamou Nation	06-May-08	Phone
YFP to Taykwa Tagamou Nation	07-May-08	Letter
Wabun Tribal Council to YFP	08-May-08	Phone
YFP to Taykwa Tagamou Nation	09-May-08	Letter
YFP and Taykwa Tagamou Nation	24-Jun-08	Meeting

Table 5.3 Summary of Contact with First Nations and Agencies

Contact Direction	Date	Method of Contact
YFP, MNR, Wabun Tribal Council, and Mattagami FN	14-Oct-08	Meeting
YFP, Wahgoshig FN, and MNR	21-Oct-08	Community Meeting
Taykwa Tagamou Nation, William Iserhoff, MNR	06-Nov-08	Site Visit
Wahgoshig FN, Matachewan FN, Flying Post FN, MNR, YFP	18-Nov-08	Site Visit
YFP to WTC	28-Nov-08	Email
YFP to WTC	11-Dec-08	Phone
Wabun Tribal Council to YFP	11-Dec-08	Fax
YFP to Wabun Tribal Council	11-Dec-08	Email
Wabun Tribal Council to YFP	17-Dec-2008	Phone
YFP to Wabun Tribal Council	18-Dec-2008	Email
Wabun Tribal Council to YFP	19-Dec-2008	Email
YFP to Wabun Tribal Council	19-Dec-2008	Email
YFP, Wahgoshig FN, Flying Post FN, Mattagami FN, WTC	19 January 2009	Meeting
YFP, MNR, Mattagami FN, Woodland Heritage Services	20 January 2009	Site Visit

During introductory meetings with the MNR (July 15, 2005, September 29 2005), YFP and Stantec were informed by the MNR that the proposed Project was located in the traditional territory of the Taykwa Tagamou First Nation ("TTN"). Therefore, it became imperative to include TTN in meaningful consultation with YFP early in the planning process. Engagement of the TTN began early in the process in an on-going effort to ensure this Nation was included in a meaningful and timely manner.

Regulatory agencies involved with First Nations were also contacted as part of the consultation and information disclosure process. **Table 5.4** summarizes the key First Nation engagement activities with the First Nations communities and regulatory agencies. Copies of correspondence are provided in **Appendix E10**.

Information received at the outset of the ESP from relevant provincial and federal agencies in response to YFP's requests for information on potential First Nations interests did not identify any additional First Nations with potential interests in the Project.

Table 5.4 Key First Nations, Organizations, and Agency Engagement

Proponent-Led Action/Activity	First Nations, Organizations and Agency Response (Date of Response)
TTN	
YFP provided Notice of Commencement (June 15, 2005)	
YFP provided DRAFT Consultation and Information Disclosure Plan for the TTN, October 26, 2005 (updated May 9, 2006)	
Initial business-to-business meeting TTN and YFP held April 7, 2006	
YFP held community meetings in New Post and Moosonee, March 9 and 20, 2006	
YFP provided project description (April 28, 2006)	
YFP held community meetings in New Post and Moosonee, (September 18 and 19, 2006)	
YFP held community meetings in New Post and Moosonee, (May 23 and 24, 2007)	
Business-to-business meetings held in May, June, August, and December 2006. Agreement execution on 14 December 2006.	
Union of Ontario Indians	
Notice of commencement (June 15, 2006)	This letter re-confirms that under no circumstances should any of the YFP communication related to the initiative be characterized or construed as consultation We maintain that aboriginal and treaty rights and any FN interest in its traditional territory, including its resources, cannot be abrogated, derogated, or infringed in any way by government legislation, regulation, policy or initiative Section 35 of the Constitution Act, 1980, recognizes and affirms Aboriginal and treaty rights and in doing so, it protects both the content of these rights and requires a process of consultation and accommodation According to recent decisions of the Supreme Court of Canada, in order to trigger constitutional obligations around meaningful consultation and accommodation, FN are not required to prove the existence of Section 35 rights in a court of law, instead FN must demonstrate a prima facie case for the existence of a Section 35 right We are recommending that you consult with all Anishinabek FN communities whose traditional territory may be affected by this

Table 5.4 Key First Nations, Organizations, and Agency Engagement

Proponent-Led Action/Activity	First Nations, Organizations and Agency Response (Date of Response)
	initiative It is only through direct discussions with Anishinabek FN communities that you will be able to work towards the development of a meaningful consultation process with each individual FN (June 19, 2006)
Indian and Northern Affairs Canada – Litigation Management and Resolution Branch	
Stantec seeks provision of comments, or coordination of comments, regarding any potential land claims present in the Study Area (June 27, 2006)	INAC's Litigation Branch (July 18, 2006) indicated that the Area does include litigation, and listed the two cases pending. INAC was unable to comment on the effect that these land claims would have on the Project. Subsequent review by legal counsel determined that one case was discontinued and the other was resolved by court decision.
Indian and Northern Affairs Canada – Specific Claims Branch	
Stantec seeks provision of comments, or coordination of comments, regarding land claims present in the study area (June 15, 2006)	INAC – Specific Claims notes that there have been no specific claims submitted in Project's study area (July 23, 2006)
Indian and Northern Affairs Canada – Comprehensive Claims Branch	
Stantec seeks provision of comments, or coordination of comments, regarding land claims present in the study area (June 15, 2006)	INAC – Comprehensive Claims Branch notes that the Algonquians of Ontario are currently negotiating a comprehensive land claim with the governments of Canada and Ontario. However, the land claim does not extend into the study area for the Project (February 23, 2007)
Ministry of the Attorney General – Civil Law Office	
Stantec inquires whether or the not the Project study area falls within an area subject to litigation, and if so, its status and process (June 5, 2006)	The Crown Law Office – Civil provides that it is not aware of any active litigation files with reference to the Project's study area (January 25, 2007)
Ontario Secretariat for Aboriginal Affairs	
Stantec seeks provision of comments, or co-ordination of comments, regarding land claims present in the study area (June 15, 2006)	OSAA provides notice that both Matachewan First Nation and Flying Post Nation, who are in close proximity to the study area, have submitted land claims to OSAA; and therefore they should be contacted OSAA recommended that Wahgoshig First Nation, Taykwa Tagamou Nation, and Nishnawbe-Aski Nation be contacted. OSAA also recommends the Project contact the UOI, INAC, and Ministry of the Attorney General (February 6, 2007, letter March 15, 2007)
Nishnawbe-Aski Nation	

Table 5.4 Key First Nations, Organizations, and Agency Engagement

Proponent-Led Action/Activity	First Nations, Organizations and Agency Response (Date of Response)
YFP provided Project Description with request for comments/involvement (April 17, 2007) Stantec provided a follow-up letter requesting response (July 18, 2007) Stantec provided Notice of Draft EA and provided paper and electronic copies of the Draft EA for review (October 29, 2007) YFP provided a letter indicating that the Draft EA would soon be available for review and inviting comments (October 31, 2007) YFP provides newsletter to all stakeholders and First Nation regarding the relocation of the dam and powerhouse to Yellow Falls, and requests comments from stakeholders and First Nations (April 2008). YFP provided a newsletter and cover letter detailing the relocation of the dam and powerhouse to Yellow Falls and requested comments from First Nation (May 6, 2008)	
Matachewan First Nation	
YFP provided Project Description with request for comments/involvement April 17, 2007 Stantec provided a follow-up letter requesting response (July 18, 2007) Stantec provided Notice of Draft EA and provided paper and electronic copies of the Draft EA for review (October 29, 2007) YFP provided a letter indicating that the Draft EA would soon be available for review and inviting comments (October 31, 2007) YFP provides newsletter to all stakeholders and First Nation regarding the relocation of the dam and powerhouse to Yellow Falls, and requests comments from stakeholders and First Nations	

Table 5.4 Key First Nations, Organizations, and Agency Engagement

Proponent-Led Action/Activity	First Nations, Organizations and Agency Response (Date of Response)
(April 2008). YFP provided a newsletter and cover letter detailing the relocation of the dam and powerhouse to Yellow Falls and requested comments from First Nation (May 6 2008)	
Wabun Tribal Council	
Stantec provided Notice of Draft EA and provided paper and electronic copies of the Draft EA for review (October 29, 2007) YFP provided a letter indicating that the Draft EA would soon be available for review and inviting comments (October 31, 2007) YFP offers to provide financial capacity to for WTC review of the Draft EA (January 17, 2008) YFP reiterates its commitment to identifying potential environmental and cultural concerns (07 February 7, 2008).	WTC acknowledges receipt of Draft EA for the Project. WTC states that the member communities do not have the capacity to review the Draft EA and assess impacts to aboriginal and treaty rights (November 28, 2007). WTC acknowledges YFP's offer, but is not prepared to review Draft EA until business relationship between YFP and WTC for the Project has been determined. Numerous telephone exchanges, culminating in a meeting on October 14, 2008.
Flying Post First Nation	
YFP provided Project Description with request for comments/involvement (April 17, 2007) Stantec provided a follow-up letter requesting response (July 18, 2007). YFP provides newsletter to all stakeholders and First Nation regarding the relocation of the dam and powerhouse to Yellow Falls, and requests comments from stakeholders and First Nations (April 2008). YFP provided a newsletter and cover letter detailing the relocation of the dam and powerhouse to Yellow Falls and requested comments from First Nations (May 6, 2008) YFP meets with Flying Post FN and other Wabun Tribal Council communities regarding Project economic benefits (January 19, 2009)	WTC advised TTN via letter that WTC is representing the interest of Flying Post First Nation with regard to the Project. Further WTC states that Yellow Falls is within the traditional lands of Flying Post First Nation and therefore Flying Post is entitled to consultation and accommodation (September 26, 2007). Flying Post FN indicates that their community historically used the area for trapping/hunting/fishing activities. Flying Post First Nation is seeking economic benefit from the Project along with the Wahgoshig First Nation and the Mattagami First Nation.

Table 5.4 Key First Nations, Organizations, and Agency Engagement

Proponent-Led Action/Activity	First Nations, Organizations and Agency Response (Date of Response)
Wahgoshig First Nation	
YFP provided Project Description with request for comments/involvement (April 17, 2007) Stantec provided a follow-up letter requesting response (July 18, 2007) Stantec provided Notice of Draft EA and provided paper and electronic copies of the Draft EA for review (October 29, 2007) YFP provided a letter indicating that the Draft EA would soon be available for review and inviting comments (October 31, 2007) YFP provides newsletter to all stakeholders and First Nation regarding the relocation of the dam and powerhouse to Yellow Falls, and requests comments from stakeholders and First Nations (April 2008). YFP provided a newsletter and cover letter detailing the relocation of the dam and powerhouse to Yellow Falls and requested comments from First Nation (May 6, 2008) YFP holds community meeting at Wahgoshig band office (21 October 2008). YFP meets with Wahgoshig FN and other WTC First Nations regarding Project economic benefits (January 19, 2009)	Wahgoshig FN requested clarification on the potential effect of the Project and cumulative effects of hydroelectric developments on the Lake Sturgeon population. YFP confirms that Lake Sturgeon were not identified in the Project footprint, therefore no significant effects on the Lake Sturgeon populations are anticipated. Wahgoshig FN is seeking economic benefits from the Project along with the Mattagami First Nation and Flying Post First Nation.
Mattagami First Nation	
YFP provided Project Description with request for comments/involvement April 17, 2007 YFP held meeting with Chief and Council and MNR, May 10, 2007 YFP held community meeting May 25, 2007 Stantec provided a follow-up letter requesting	Throughout discussions between YFP and MFN, MFN has stated that they consider the Project to be located within their traditional territory. Accordingly, MFN is seeking financial benefits in association with the Project. Email from Chris McKay (MFN) to Stantec indicating that they are seeking further community consultation regarding the Project and they are not in support of the Draft EA at this time (November 21,

Table 5.4 Key First Nations, Organizations, and Agency Engagement

Proponent-Led Action/Activity	First Nations, Organizations and Agency Response (Date of Response)
response (July 18, 2007). Stantec provided Notice of Draft EA and provided paper and electronic copies of the Draft EA for review (October 29, 2007) YFP provided a letter indicating that the Draft EA would soon be available for review and inviting comments (October 31, 2007) YFP called MFN via telephone to discussion EA concerns (29 November 2007) Letter from YFP to MFN confirming telephone conversation of 29 November 2007 (December 5, 2007) YFP provides newsletter to all stakeholders and First Nation regarding the relocation of the dam and powerhouse to Yellow Falls, and requests comments from stakeholders and First Nations (April 2008). YFP provided a newsletter and cover letter detailing the relocation of the dam and powerhouse to Yellow Falls and requested comments from First Nation (May 6, 2008). Meeting with MNR, WTC, and YFP (October 14, 2008). YFP provides summary of Project modifications to Mattagami First Nation. YFP meets with Mattagami FN and other WTC communities regarding Project economic benefits.	2008). MFN states that MFN cannot allow development in their traditional territory without financial benefit. MFN requested a description of the EA timeline. MFN is not interested in discussing cultural or environmental concerns until economic benefits are clarified. Phone call from MFN (Chris McKay) clarifying that MFN is not necessarily denying consultation, but rather it to occur concurrently with a business agreement (January 10, 2008). MFN requests (via MNR) a meeting with YFP to receive an update on the Project, including the Project modifications (August 20, 2008). MFN confirms their interest in the archaeological resources on-site. YFP directs MFN to the archaeological technical reports provided in the Draft EA (circulated to all First Nations in November 2007). Mattagami First Nation indicates that they have traditionally trapped in the area of Yellow Falls. Mattagami First Nation provides 1928 letter to Dr. F. Speck which indicates that the area surrounding Yellow Falls was used previously by Mattagami community members (Appendix E10).

YFP and the TTN undertook extensive business-to-business discussions at the outset of the Project to determine how the TTN will be involved in the Project and how Project benefits will flow to the TTN community. The result of these discussions was the execution of an agreement in December 2006 between YFP and the TTN on these business-to-business matters.

Based upon the information received by YFP from the regulatory agencies and First Nation organizations during Project development, the TTN was the only First Nation community identified to have a potential interest in the Project due to traditional territory and land use. Engagement of the TTN was undertaken by YFP directly throughout the course of the ERR to identify and address any issues or comments from this community. As demonstrated in **Table 5.4**, consultation activities included sending Project notices, contact with community representatives via telephone and in person, and letters of invitation to participate in, and provide comments on the Project.

In December 2006, following execution of the YFP/TTN business-to-business agreement, YFP was notified by the MNR that the Mattagami First Nation had indicated an interest in the Project during a Water Management Planning meeting held on November 9, 2006. During subsequent discussions with the MNR, the MFN indicated a desire to meet with MNR and YFP representatives, which was held on May 10, 2007. Subsequent to that meeting, YFP hosted a community meeting at the MFN reserve north of Gogama on May 25, 2007. YFP, the TTN, and the MFN are involved in ongoing discussions relating to MFN's interest in the Project.

In March of 2007, during the consultation process for the Project, YFP was advised by the Ontario Secretariat for Aboriginal Affairs ("OSAA") to contact three additional First Nations, including the Matachewan First Nation, Flying Post First Nation, and Wahgoshig First Nation. These First Nations, as well as the Mattagami First Nation are communities within the Wabun Tribal Council ("WTC"). These WTC communities were subsequently contacted by YFP. Flying Post, Matachewan and Wahgoshig First Nations have indicated an interest in the Project, along with the Mattagami First Nation.

Following release of the Draft EA, YFP has continued to engage these WTC Communities in the Project. This engagement has included provision of copies of the Draft EA as well as the spring 2008 Project Newsletter outlining the modification of the location of the dam and powerhouse and requesting input, meetings, phone discussions, etc (see **Tables 5.3** and **5.4**).

Ongoing correspondence with the Wabun communities has revealed that the Wabun communities consider the Project to be located in their traditional territories. As a result, the WTC communities have stated that the Project must therefore accrue economic benefits to their community. Further, correspondence with the Wabun Tribal Council and the Mattagami First Nation indicates that discussions pertaining to environmental and cultural aspects of the Project cannot occur until economic concerns have been addressed.

As discussed previously, YFP and TTN undertook extensive consultation activities during 2006. As a result of these good-faith discussions, a business-to-business agreement was executed in December 2006. This agreement was executed based on the understanding that the Project was located solely within the traditional territory of the TTN. As a result, all potential First Nation benefits that can be supported by the Project were conveyed to the TTN.

Following the execution of this agreement, YFP was advised of the interest of the Wabun communities in the Project. As a result, the Project does not have any capacity to provide further economic benefits to additional First Nations. In accordance with its business-to-business agreement, TTN is responsible for addressing economic concerns raised by other First Nation communities. The TTN and the Wabun communities are currently engaged in Nation-to-Nation discussions; however no agreement has been reached to date. Discussions with TTN have confirmed that they do not agree with WTC's assertions of traditional territory, and accordingly, are unwilling to consider sharing the economic benefits with the WTC communities at this time. YFP has continued to encourage discussion between the communities involved in an effort to more clearly understand the nature of traditional use of Yellow Falls and the surrounding area.

Notwithstanding the outstanding disagreement related to traditional territory, YFP remains committed to maintaining communication with the WTC communities regarding the Project design and schedule, and to seek their input regarding potential environmental and cultural effects under the ESP. To-date, the Mattagami First Nation and Flying Post First Nation communities have indicated that they have traditionally used the Mattagami River area in the vicinity of Yellow Falls for fishing, hunting and trapping. Additionally, pre-contact archaeological resources of interest to these communities may exist in the vicinity of the Project. These areas of concern are described further in **Section 6.9.1**.

5.6.4 Regulatory Agencies

The Project was introduced to federal, provincial, and municipal agencies and information was provided to identify the technical, environmental, and regulatory issues to be addressed early in the planning process. Throughout the agency consultation and disclosure activities, specific issues were discussed and addressed in greater detail.

Table 5.5 summarizes the issues raised by key government agencies as part of the ESR. A concordance table detailing agency comments and Project responses can be found in **Appendix E2**.

Table 5.5 Key Agency Issues and Project Responses

Agency	Interest	Project Response
CEAA	Determination of federal requirements for this project – is a federal EA required?	• The environmental assessment is being prepared to fulfill federal requirements for a screening under CEAA • A project description was sent to CEAA for distribution to potential federal authorities for this project (April 28, 2006) See EA Section 1.11

Table 5.5 Key Agency Issues and Project Responses

Agency	Interest	Project Response
EC	Surface and Groundwater quality, including Acid Rock Drainage/Metal Leaching	• Surficial watercourses potentially affected by the Project were identified and potential effects were assessed during the ESP • Specific studies, such as a sediment quality, water quality, and benthos, were conducted • The Project will follow EC's recommendation for ARD/ML testing and mitigation See EA Section 6.2 and Appendices
	Wildlife and habitat, including Terrestrial, Wetland and aquatic ecosystems migratory birds and Species at Risk	• To the extent possible, access roads, and electrical transmission lines have been sited outside natural areas including wetlands and woodlots • The terrestrial field program was designed to incorporate discussions with Environment Canada and the MNR, and to address comments made in EC September 15, 2005 letter • Environment Canada played a role in the development of Terrestrial Field Programs to collect natural environment data for the evaluation of potential effects (email received from EC on June 19, 2006), as well as provided comments on the Bird Survey Plan for Geotechnical Investigation (as described in an email dated June 23, 2006). • Provided letter to CWS regarding construction of trail access for the geotechnical survey and proposed pre-clearing breeding bird survey for comment • Species listed on *Schedule 1* of the *Species at Risk Act* will not be affected by the Project See EA Section 6.4 and Appendices
	Preparation of environmental protection plans	• General and specific environmental protection measures will be identified in the Construction Environmental Management Plan ("CEMP") for use during the construction phase of the Project. • The Construction Manager will consult with the Environmental Monitor prior to engaging in any work in new areas in order to ensure that the protection measures are sufficiently deployed. See EA Section 9.0 and Appendices
NRCan	Requirements under the Explosives Act and appropriate licenses from MNR/NRCan	• Explosives contractors will be responsible for obtaining all explosives permits that may be required in order to complete the works See EA Sections 6.1, 6.5, and Appendices

Table 5.5 Key Agency Issues and Project Responses

Agency	Interest	Project Response
TC	Requirements under the Navigable Waters Protection Act, which prohibits the construction or placement of any 'works' in navigable waters without first obtaining approval	• An application was made under the NWPA in spring 2007. Applicable permits under the NWPA will be obtained prior to construction See EA Section 6.8.6 and Appendices
DFO	Potential effects on fish and fish habitat Release of deleterious substances into watercourses during construction and operation	• All in-water work will be done while adhering to the DFO and MNR fisheries timing windows for each specific water body to protect local fish populations during their spawning and nursery periods • Adherence to applicable DFO operational statements • A Fish Habitat Compensation Plan has been developed in consultation with the MNR and DFO in compliance with the DFO's no net loss of productive capacity policy. • The dam and powerhouse were relocated from Island Falls to Yellow Falls partially to eliminate the potential for effects to a spawning area immediately downstream of Island Falls See EA Sections 6.2, 6.5, 6.13, and Appendices
	Development of fisheries sampling program	• The program was developed based on field work conducted to-date on the Mattagami River, conference calls with DFO and MNR, and experience with other programs of this type • The field sampling program is a comprehensive program designed to address the fisheries assessment work requirements of this project See EA Section 6.2, 6.5, and Appendices
MOE	Projects of this type require approval under the EAA	• YFP is conducting an environmental review in accordance with Ontario Regulation 116/01 of the Environmental Assessment Act Electricity Projects. The Project is a Category B Project under O. Reg. 116/01 and the Guide See EA Section 1.11
	Consultation with First Nations	• YFP continues to engage the TTN, Matachewan, Wahgoshig, Mattagami, and Flying Post First Nations in good-faith discussions under the ESP. See EA Sections 5.5, 6.10, and Appendices

Table 5.5 Key Agency Issues and Project Responses

Agency	Interest	Project Response
	Surface and Groundwater quality, including Acid Rock Drainage/Metal Leaching	• Surficial watercourses potentially affected by the Project were identified and potential effects were assessed during the ESP. • Specific studies, such as a sediment quality, water quality, and benthos, were conducted. • The Project will follow EC's recommendation for ARD/ML testing and mitigation. See EA Section 6.2 and Appendices
MTO	Possible changes to flow rates at the Mattagami River bridge, relating to erosion and scour. Any plans for emergency release of water and possible affects to the bridge and highway	• Given the location of the project and the run-of-river design (i.e., small upstream headpond area, no downstream water level or discharge changes) beyond regulated flow fluctuations, no effects are expected to provincial road infrastructure. See EA Sections 6.1 and 6.2 and Appendices
	Improvements to the intersection of Highway 11 and Red Pine Road	• YFP will obtain all required permits to facilitate any needed improvements to the intersection of Highway 11 and Red Pine Road. These permits will be obtained during construction permitting, prior to initiation of intersection improvements. See EA Section 6.8.10
MNR	Potential effects on fish and fish habitat	• All in water works will follow DFO Operational Statements to minimize potential to disturb sediments – thereby minimizing potential effects to surface water • All in-water work will be done while adhering to any specific DFO and MNR fisheries timing requirements to protect local fish populations during their spawning and nursery periods • YFP will obtain a Work Permit from the MNR in advance of construction • A Compensation Plan for Project effects to fish habitat has been developed in consultation with the MNR and DFO. • An Environmental Inspection and Monitoring Plan has been developed with input from MNR and DFO to guide future aquatic monitoring. See EA Sections 6.2, 6.5, 9.0, and Appendices
	Potential effects on wildlife and birds	• To the greatest extent possible, access roads, and electrical transmission lines have been sited to utilize existing roads and trails • The terrestrial field program was designed to

Table 5.5 Key Agency Issues and Project Responses

Agency	Interest	Project Response
		incorporate discussions with Environment Canada and the MNR, and to address comments made in EC Sept 15, 2006 letter • Our aquatic field sampling program was developed through an iterative process with MNR and the DFO • Provided letter to CWS regarding construction of trail access for the geotechnical survey and proposed pre-clearing breeding bird survey for comment See EA Section 6.4 and Appendices
	Protection of significant natural heritage features in the area	• The ESP included a series of studies to characterize the natural heritage features in the study area so that protection and/or mitigation could be developed to ensure their continued function. This work was undertaken in consultation with MNR, DFO and EC • An in-depth review of published information was also conducted as part of ESP See EA Section 6.4 and Appendices
	Providing information to those on the confidential MNR mailing list	• YFP provided all notices to the MNR District office in Cochrane, for circulation to those stakeholders on the confidential stakeholder mailing list.
	Clearly defined objectives for the fisheries/habitat background data collection and monitoring	• YFP worked closely with DFO and MNR to develop sampling programs to identify potential effects on fish and habitat • Our goal was to arrive at a mutually acceptable work plan so that we can be confident that the field work fully meets the needs of MNR and DFO • We believe that we have a comprehensive field sampling program designed to address fisheries work required for this project See EA Section 6.2, 6.5, and Appendices
	Potential effects on terrestrial habitats and forestry resources	• Stantec developed the terrestrial study program based on comments received from MNR and EC, preliminary field reconnaissance, and our experience with other programs of this type • Our goal was to arrive at a terrestrial study program so that we can be confident that the field work fully meets the needs of MNR and EC See EA Section 6.4 and Appendices

Table 5.5 Key Agency Issues and Project Responses

Agency	Interest	Project Response
	Project may be in conflict with MNR's draft management goals for the Mattagami River segment enclosed by the Smooth Rock Falls and Lower Sturgeon hydrogenation facilities. Management goals include: • The maintenance of current native species biodiversity • The maintenance of existing habitat diversity • The maintenance of opportunities for a diversified and sustainable angling experience	• The dam and powerhouse were relocated from Island Falls to Yellow Falls to assist in meeting the MNR's Draft management goals, including maintenance of fast-moving water conditions at Island Falls. • The Yellow Falls location will not affect spawning activity noted downstream of Island Falls during 2006 and 2007 aquatic studies; thus maintaining biodiversity. Fast-moving water habitats at Loon Rapids, Davis Rapids, and Yellow Falls were not found to be extensively utilized by fish • The Yellow Falls location will not affect recreational angling at Island Falls • The Project will improve access for angling in the reach of the Mattagami River upstream of Yellow Falls by improvements to Red Pine Road, provision of a portage at Yellow Falls, elimination of the need for portages at Davis and Loon Rapids, and provision of a publicly accessible boat ramp upstream of Yellow Falls • The fish habitat compensation plan, developed in consultation with MNR and DFO, will meet the DFO's "no net loss" of productive fish habitat policy. See EA Sections 6.5, 9.0, and Appendices
	Maintenance of 15 m^3/s minimum flow as prescribed in the 2006 Mattagami River Water Management Plan	• The Project will provide a minimum downstream flow of 15 m^3/s except under extenuating circumstances such as operation of upstream facilities, or drought. • Headpond level will not be altered to achieve a flow of 15 m^3/s in the event of extreme low flows to avoid effects to riparian and littoral habitat and species as well as to avoid non-compliance with headpond levels specified in the EA Report as required for the future WMP amendment. See EA Sections 6.2 and 8.0
	Potential effects to aggregate resources	• Any aggregate extraction will be conducted in accordance with permits obtained from the MNR and the *Aggregate Resources Act*. • Aggregate and quarry material will be conserved and re-used to the extent reasonably possible See EA Section 6.1, 6.6 and Appendices

Table 5.5 Key Agency Issues and Project Responses

Agency	Interest	Project Response
Town of Smooth Rock Falls	We have no policies or guidelines implemented that may affect construction and operation of this Project (September 2, 2005). This project is going to be established outside of the municipality boundaries. THAT Council support the Friends of Mattagami in their quest to halt the Yellow Falls Hydro Dam Power Project on the Mattagami River. And THAT Council forward this resolution to the Ministry of the Environment, Ministry of Energy, Ministry of Natural Resources, and all municipalities for the support, and the Provincial member of parliament, Gilles Bisson (September 10, 2007). THAT Council supports the new hydroelectric dam project at the Yellow Falls location; AND FURTHER THAT Council hereby rescinds Resolution No. 2OO7232 (May 5, 2008).	• During the planning and development stages of the Project, YFP met on several occasions with the Town of Smooth Rock Falls Council. • YFP offered to host a tourism/recreation workshop for the Town (Appendix E9) in order to identify recreational opportunities that might be realized in association with the Project. • YFP relocated the proposed dam/powerhouse structure from Island Falls to Yellow Falls partially to alleviate concerns about loss of recreational opportunities at Island Falls. The Town subsequently rescinded their objection to the Project at the Island Falls location and supports the Project at the Yellow Falls location. See EA Sections 6.7, 6.8 and Appendices

5.7 COMPLETION AND INCORPORATION OF INPUT

The public's feedback through the development of this EA indicated that:

- Effects to local fish species, their habitat, and spawning areas should be evaluated and minimized
- Effects to local snowmobile paths should be considered when siting access roads
- Effects to local boat launching sites should be considered and mitigated
- Effects on access to local areas for hunting, snowmobiling and other recreation activities should be avoided if possible when placing access restrictions on public areas
- Effects on local scenery is a concern and therefore appropriate mitigation measures should be implemented
- The community should be reassured, through information disclosure and appropriate mitigation measures, that the Project would not create more negative effects on the community than positive

- There is community interest in the economic benefits of the Project to the Town of Smooth Rock Falls

Throughout the public and First Nations consultation process, comments and concerns received from the public, agencies, and First Nations were evaluated and incorporated into the decision making process. Responses to this input from interested parties were issued either by letter, email, or phone call.

5.8 REVIEW OF THE FINAL EA REPORT AND NOTICE OF COMPLETION

In compliance with Ontario Regulation 116/01, the Final EA Report must be made available for a 30-calendar day stakeholder review period. The EA is now available for review and comment from **February 18, 2009** through to **March 20, 2009**. Hard copies of the EA are available during this review period at the following public locations:

- Smooth Rock Falls Town Hall
- Smooth Rock Falls Public Library
- Kapuskasing Civic Centre – Town Hall
- Kapuskasing Public Library
- Timmins City Hall
- Timmins Public Library
- C.M. Shields Library (Timmins)
- MNR Cochrane District Office

The Final EA Report and supporting materials are also posted on the Project's website: www.islandyellowfallshydro.com. The Notice of Completion of an Environmental Review Report, with an invitation to comment on the report, was published in local newspapers, distributed to stakeholders via direct mailouts to those on the Project mailing list, and via Admail to those addresses within the study area. The Notice of Completion is also posted on the Project's website.

YFP must receive comments regarding the Project and/or the Final EA Report no later than **4:30 p.m. on March 20, 2009**. All comments and correspondence should be sent to:

Jeff Hankin
Project Manager – Yellow Falls Hydroelectric Project
Stantec Consulting Ltd.
361 Southgate Drive
Guelph ON N1G 3M5

Fax: 519.836.2493 Tel: 519.836.6050 E-mail: mailto:**comments@yellowfallshydro.com**

In accordance with the EA Guide, stakeholders must first attempt to resolve any outstanding issues directly with YFP during the 30-calendar day stakeholder review period. In the event that issues cannot be resolved during this period, the concerned party may make a written request to the Director of the MOE's Environmental Assessment and Approvals Branch ("EAAB") at the address noted below, to request the elevation of the Project to an Individual Environmental Assessment. A copy of the Request to Elevate must also be sent to YFP at the address noted above.

Director of Environmental Assessment and Approvals Branch
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto ON M4V 1L5

Requests to Elevate must be made in accordance with the provisions set out in the MOE's EA Guide and received by the MOE's Director of the Environmental Assessment and Approvals. A copy of the MOE's EA Guide is available on their website: www.ene.gov.on.ca/envision/gp/4021e.pdf.

5.9 FUTURE CONSULTATION

YFP will continue its contact with stakeholders and First Nations during the initial period of operation and for as long as this remains an effective two-way channel for communication. To this end, as appropriate, YFP will maintain the project website (www.yellowfallshydro.com) to convey information about the Project, YFP's involvement in the community, and to provide notice of unique maintenance events.

6.0 Effects Assessment, Mitigation, and Protection

Provincial and Federal Regulations and guidance documents require the following analysis for each project-specific issue identified through the integrated screening checklist (**Section 3.0**).

- Existing Environment – describes the potentially affected environmental feature
- Potential Effects – identifies potential effects, both positive and negative, to environmental features that may occur as a result of the Project
- Mitigation Measures – recommends specific mitigation or protection measures that will be implemented to minimize any potential negative effects of the Project upon environmental features
- Net Effects – describes the effects remaining after mitigation measures have been applied
- Significance of Net Effects. Significance of net effects has been evaluated throughout this section using the values shown in **Table 6.1** (NRCan, 2003). This table generally encompasses criteria for determining significance proposed by the CEA Agency, which include: magnitude of the effect; geographic extent of the effect; duration and frequency of the effect; irreversibility of the effect; and ecological/social context (CEA Agency, 2003).

Table 6.1 Level of Significance After Mitigation Measures

Level	Definition
High	Potential effect could threaten sustainability of the resource and should be considered a management concern. Research, monitoring, and/or recovery initiatives should be considered.
Medium	Potential effect could result in a decline/improvement in resource to lower or higher than baseline levels, but stable levels in the Study Area after project closure and into the foreseeable future. Regional management actions such as research, monitoring, and/or recovery initiatives may be required.
Low	Potential effect may result in a slight decline/improvement in resource in Study Area during the life of the project. Research, monitoring, and/or recovery initiatives may be required.
Minimal	Potential effect may result in a slight decline/improvement in resource in Study Area during construction phase, but the resource should return to baseline levels.
Neutral	No effect is anticipated to occur following implementation of mitigation measures

The expected net effects and their significance to environmental features are based upon the assumption that all mitigation activities are fully implemented during relevant stages of Project construction, operation, and maintenance. Issues raised by stakeholders or First Nations have also been included where they differ from issues identified in the integrated screening checklist.

The decommissioning phase of the Project is not a core part of the analyses of environmental effects, since it is an event that is beyond the temporal boundaries of this EA. A general discussion on decommissioning is provided in **Section 2.4.3** and **Section 6.14**.

Methodology for Mitigation

The need, assessment, and selection of protection and mitigation measures discussed in the following sections have been predicated on the hierarchical principles of:

- *Avoidance* – the elimination of adverse environmental effects by siting, construction scheduling, and design considerations
- *Minimization* – reduction or control of adverse environmental effects through Project modifications or implementation of protection and mitigation measures
- *Compensation* – enhancement or rehabilitation of affected or adjacent areas

The application of these principles has greatly reduced the potential for adverse environmental effects from the Project as discussed in the following subsections.

Responsibilities

YFP retained Canadian Projects Limited ("CPL"), a qualified engineering and environmental consultancy, to assist with specialized construction activities. CPL is responsible for overseeing and carrying out the engineering, procurement, and construction management aspects of the Project as well as environmental compliance during those activities.

6.1 LAND

This section refers to the criterion described in **Section 1 - Land** in the integrated screening checklist, including:

- Bedrock Geology
- Surficial Geology
- Physiography
- Soil Type, Texture and Permeability
- Erodibility
- Sedimentation
- Compaction
- Contamination
- Surface drainage

6.1.1 Geology

6.1.1.1 Potential Effects

Construction

Blasting and aggregate extraction activities may potentially affect local geology during the construction phase. Bedrock excavation will be required to physically accommodate Project structures and supply aggregate materials for the Project. During the operation phase of the Project, additional aggregate extraction may be required to maintain the main access road. No unique or significant geological formations have been noted in the Study Area, although potential mineral deposits have been identified.

The powerhouse, intakes, spillway, and emergency spillway will require excavation into the hornblende/granite gneiss bedrock. Bedrock excavation may also be required for installation of transmission and substation infrastructure where shallow drift is encountered.

Potential effects of blasting include:

- Bedrock fracture
- Fly rock damage and dispersal
- Vibration and air overpressure (see **Section 6.3.3**)
- Increase of surface water turbidity (see **Section 6.2.3**)
- Disturbance of fish and fish habitat, and incidental mortality (see **Section 6.5**)
- Disturbance of wildlife and vegetation (see **Section 6.4**)
- Noise (see **Section 6.3.3**)
- Human health and safety (see **Section 6.8.11**)
- Effects on nearby water wells (see **Section 6.2.6**)

Under natural conditions, fractures in bedrock are caused by weaknesses in the rock, shear planes, or stress. Blasting may cause a change in bedrock stress loads, which, in turn, changes the size and structure of bedrock fractures (Miller, 1996). Two possible effects of blasting on bedrock are changes in the rate of groundwater infiltration or movement, and changes in the rate of physical weathering.

Fly rock refers to airborne material that is created during blasting and excavation. Fly rock can damage nearby structures and vegetation and cause severe injuries if uncontrolled. As well, it can create a travel hazard and have a negative aesthetic effect on the cleanliness of a construction site if significant amounts are dispersed.

Excavation for the powerhouse and spillway will require the removal of approximately 25,000 m^3 of bedrock, while access road construction will require 21,500 m^3 of fill material. In addition, fill will be required on the left river abutment adjacent to the powerhouse (**Table 6.2**). All excavated material may not be useable for the Project and will require on-site storage or off-site disposal. For example, rock excavated for the powerhouse foundation may not be suitable for access road construction.

Table 6.2 Estimate of Material Excavation and Fill during Construction

Location	Cut (m^3)	Fill (m^3)	Net Material
Powerhouse	20,000		
Spillway	5,000		
Access Road		21,500	
Left abutment adjacent to powerhouse		6,000	
Total	25,000	27,500	2,500

Large amounts of aggregate products (such as gravel and rip-rap) will be required from nearby sources for various uses including access road construction, concrete manufacture, and site restoration. Aggregates may be obtained through bedrock quarrying (extraction from surficial geological material) and crushing of material or gravel extraction (surficial deposits). Clean, well-sorted aggregate material (e.g. washed stone) may also be required for site restoration.

The embankment dams originally proposed at Island Falls required significant amounts of rock materials for their construction. As a result, YFP included the establishment of a quarry on the Sydere Road in their original Project design. YFP undertook extensive initial investigations in accordance with *Aggregate Resources Act* requirements to support the establishment of the quarry.

As a result of the relocation of the dam and powerhouse to Yellow Falls from Island Falls, the design of the dam structures have changed significantly. The shorter concrete dam structure proposed for Yellow Falls will require significantly less aggregate material for construction than the embankment dams at Island Falls. As a result of this change, Project demand for quarried materials has been reduced significantly.

Consequently, YFP does not anticipate that quarry establishment will be required; however it has been YFP's experience that supply of aggregate resources can be constrained within the Study Area. As a result of these potential supply concerns, YFP continues to include the aggregate quarry on the Sydere Road in its Project design. Prior to any extraction from the quarry, YFP will be required to complete any remaining approval requirements under the *Aggregate Resources Act*, including any public notification requirements therein.

Operation

Relatively small quantities of aggregate material will be required to maintain the Project access road. No other effects to geology are anticipated during operation.

6.1.1.2 Mitigation and Protection Measures

Construction

The potential for increased bedrock fracturing will be localized to the area affected by excavation. Proper blasting techniques, such as smooth blasting (closely spaced holes charged with low strength explosives used to reduce blast damage to rock and improve stability), can substantially reduce localized bedrock fracturing. Bedrock grout will be used, where necessary, to seal bedrock fractures and prevent water seepage into the powerhouse.

A licensed blasting contractor will undertake blasting, handling, transportation, and storage of explosives in a safe and secure manner in accordance with applicable regulations and guidelines.

Blasting mats will be used wherever necessary to control blasts and limit the dispersal of fly rock. Immediately after blasting, dispersed fly rock will be collected from the area surrounding the blast site and stockpiled.

YFP should consider transporting stockpiled material to a local aggregate producer for further processing if it cannot be used for construction, and if local aggregate producers will handle the material, rather than leaving *in-situ*. It is anticipated that most aggregate material will be used for construction or otherwise re-used through supply to local producers. Every reasonable effort will be made to promote re-use of this non-renewable resource. In addition, material may be stockpiled for later maintenance of the Project access road. In the event that excess aggregate material must be left *in-situ*, it will be regraded, covered with topsoil or other appropriate capping material, and revegetated using native species (**Section 6.4.1.2**) immediately following construction. The specific location and extent of excavation and filling will be confirmed during detailed design. Final designs will be reviewed by the MNR prior to issuance of the necessary construction permits.

Aggregate extraction areas will require a license from the MNR under the *Aggregate Resources Act*. The aggregate permit application requires specific locations and details of aggregate extraction sites including depth to the water table and site rehabilitation measures. YFP will ensure that no aggregate extraction occurs within 120 m of the Mattagami River, as outlined in the MNR Crown Land Use Atlas for the Mattagami River Area (Land Use No. G1744).

All areas used for aggregate extraction will be rehabilitated in accordance with the *Aggregate Resources Act*. Since aggregate extraction will occur over a relatively short period of time, no progressive rehabilitation will occur. However, once Project aggregate requirements are met, rehabilitation will take place as soon as possible. Sites will be re-graded to minimum 3:1 stable slopes compatible with existing land uses, and re-planted using native vegetation as required by aggregate extraction permits. Landscaping and planting plans will be discussed with the MNR as part of the permitting process to ensure that standards for biodiversity and aesthetic values are maintained.

Operation

Aggregate used for maintenance of the Project access road will be obtained from local suppliers or from existing stockpiles. Should additional aggregate extraction be required, YFP may be required to renew or obtain permits under the *Aggregate Resources Act*. Further effects to geology are not anticipated during operation and no further mitigation or protection measures are required.

6.1.1.3 Net Effects and Evaluation of Significance

The Project will affect geology through use of aggregate and rock resources in the Study Area. The significance of this effect is rated as low (may result in a slight decline in resource in Study Area during the life of the Project). No further need for research, monitoring, and/or recovery initiatives is anticipated.

6.1.2 Physiography

Physiography refers to the study of the physical features of the earth's surface, including topographic and landform features.

6.1.2.1 Potential Effects

Construction

Two locally important physiographic features have been identified in the Study Area: the Mahaffy Township Ground Moraine and the Geary Township Shoreline Bluff. These features will not be affected by the Project, as they are located approximately 25 km south of the terminus of the proposed headpond at Loon Rapids, and are well away from the Mattagami River.

In the vicinity of the dam and powerhouse site, topography will be altered as a result of re-grading and installation of Project components. Access roads and transmission lines will generally follow existing topography and limited cut and fill grading will be required to ensure safety and engineering requirements are met.

Localized soil erosion, slumping, and sedimentation of watercourses may occur during construction (**Section 6.1.3**).

Operation

During operation of the Project, changes to topography will occur as a result of headpond formation. The headpond will stretch from Yellow Falls upstream to Loon Rapids, resulting in inundation of approximately 71 ha of land along the existing river and tributaries (see **Figure 2.4**).

Localized soil erosion, slumping, and sedimentation of watercourses may occur during inundation and the initial period of operation until slopes stabilize under a new hydrologic regime. However, the effect is predicted to be limited for the following reasons:

- Water velocities will be reduced from an approximate average of 1.7 m/s to less than approximately 0.3 m/s throughout most of the headpond, indicating that the erosive forces acting on the river bank will also be greatly reduced
- Slopes are currently stable along the river valley in the vicinity of the Project, and there is little evidence of erosion
- Slope height will be reduced, meaning that less area is available to be affected by precipitation or saturation
- The river valley is controlled by bedrock which limits the potential for bank erosion to occur
- Vegetation above the height of the proposed headpond will be retained to provide soil stability.

Aesthetic aspects of proposed landscape changes are discussed in **Section 6.9.4**. Potential effects of inundation on river morphology, water quality and quantity are addressed in **Section 6.2**.

6.1.2.2 Mitigation and Protection Measures

Construction

Alterations to topography resulting from the construction of Project components such as the dam and powerhouse, gated spillway, retaining wall, access roads, and transmission lines will be limited. Re-grading will be required immediately adjacent to the powerhouse and dam to allow construction of the proposed generating station.

One access route into the site will be required and will generally follow the existing Red Pine Road. Access to construction staging areas will also be required around the powerhouse/dam site (**Figure 2.3**). Existing roads and trails will require improvement and ongoing maintenance in order to ensure safe passage of construction, operation, and maintenance vehicles. Cut and fill grading activities associated with access road improvement will have a limited effect on topography immediately adjacent to the existing access routes. Surface erosion due to access road upgrades and water crossings will be mitigated through the implementation of properly installed and maintained silt fences during construction and mitigation measures identified in **Sections 6.2, 6.4,** and **6.5**.

Operation

Inundation will result in alterations to the local topography through formation of the proposed headpond. The extent of the headpond has been limited through facility design and selection of an appropriate headpond elevation.

The headpond will also result in saturation of slopes that were historically unaffected by flood levels. However, headpond formation is not expected to have a negative effect on slope stability

due to a decrease in water velocity that will result in a reduction of the rate and extent of lateral erosion to the valley toe. Also, erosion will be minimized due to the controlled nature of the Project headpond in which water levels do not fluctuate greatly (remain within a band of 0.3 metres or less under normal operating conditions).

Potential effects of the Project on soil stability are addressed in **Section 6.1.3**. Potential effects of the Project on river morphology are addressed in **Section 6.2.3**.

6.1.2.3 Net Effects and Evaluation of Significance

Headpond formation will have a limited effect on topographic features in the immediate vicinity of the Project, resulting in limited changes to topography in the area of the headpond and aesthetic alterations to the viewscape (see **Section 6.9.4**). The proposed headpond is less than 1.3% of the total length of the Mattagami River and will not affect any rare or significant physiographic features.

Minimal effects on physiography are expected to result from the installation of access roads and transmission facilities since they will follow existing routes for the most part.

Consequently, the significance of Project effects on physiography has been rated as low (Potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.1.3 Soils

6.1.3.1 Potential Effects

Construction

The potential for soil erosion increases with the removal and/or disturbance of vegetative cover during construction of the generating station, access roads, and transmission line. Improper topsoil removal and storage during construction can result in topsoil / subsoil mixing, with a consequent reduction in the ability of the soil to support vegetation.

Topsoil storage for extended lengths of time can increase bulk density, decrease water-holding capacity, and reduce microbial activity (Strohmayer, 1999). These changes to soil composition can also reduce the viability of revegetation efforts.

Additionally, soil compaction may increase due to construction vehicle traffic. Compaction may result on travel ways, and around the site where heavy equipment is operating. Excessive compaction can reduce infiltration and hinder root growth and the uptake of nutrients, and is a particular concern under saturated soil conditions that occur during and after rainfall events and spring melt (Moor, 1998). The risk of creating surface ruts and deep compaction increases as soil nears the saturation point.

Once vegetation is removed or disturbed, the ability of the land to intercept rainfall, reduce runoff, or moderate the effects of high winds is greatly diminished. If mitigation and protection

measures are improperly implemented, eroded soil may enter watercourses, creating an increase in sediment load and turbidity that can potentially cause detrimental effects to fish and fish habitat.

The lands surrounding the Project are not used for agricultural production. Accordingly, there is no potential for effects to soils used for agricultural purposes. However, the maintenance of soil quality will facilitate re-establishment of vegetation and stabilization of disturbed areas following construction.

Operation

During the initial period of operation, areas where revegetation efforts were unsuccessful or where ongoing erosion is occurring may be noticed.

6.1.3.2 Mitigation and Protection Measures

Construction

Soil erosion can be greatly reduced using appropriate mitigation and protection measures as outlined below. Except where required for construction of the proposed generating station, headpond, bridges, or transmission line crossings, no disturbance of vegetation will occur within 3 m of a watercourse. Silt fencing, supported by staked straw bales, will be installed at least 3 m from potentially affected watercourses or sensitive areas to reduce the possibility of sedimentation prior to beginning construction. Silt fence will be kept in good repair throughout construction and until rehabilitation efforts have become established. On long or steep slopes, such as those that may exist adjacent to the proposed generating station, multiple silt fences will be installed (e.g. at top of slope, middle of slope, and bottom of slope). In addition or alternatively, flow diversion berms can be created across slopes to divert flow and minimize scour.

In addition to silt fence, geotextile fabric or erosion matting will be used to cover soils where there is risk of erosion such as on steep slopes, or where the soil will be exposed for more than one month to reduce the possibility of splash erosion and rill formation during construction.

The Ontario Provincial Standards (“OPS”) for Roads and Public Works provides a comprehensive set of standards for erosion control measures and materials. Erosion control measures and materials will meet Ontario Provincial Standard Specification (“OPSS”) 577. Geotextile fabric will meet criteria defined in OPSS 1860. Where applicable, mitigation measures described in OPSS 182 will also be implemented.

Following periods of excessive rainfall or saturated soil conditions, construction on wet soil should be suspended until suitable conditions return. It is recognized that construction on wet soil may be necessary to complete a critical task. However, activities should be limited to the smallest possible area. Wide-tracked or low ground pressure vehicles should be used during wet soil conditions if possible. Minimal travel on soil is anticipated once access roads and construction staging areas are developed.

Topsoil will be stripped and stored separately from subsoil to prevent mixing and maintain soil characteristics for subsequent revegetation. The depth of soil stockpiles should be minimized to reduce formation of anaerobic conditions at the pile base, which limits microbial activity. Soil will be replaced as soon as possible. In the event that stockpiles must remain for more than a few months, the surface of the pile will be vegetated to maintain nutrient cycling. Soil is to be spread at the same depth or greater than pre-existing conditions (Strohmayer, 1999)

Following site re-grading, disturbed areas should be seeded as soon as possible. Seed mixes composed of fast-growing, non-invasive native species will be developed for Project use in consultation with the MNR. Silt fence will be left in place until vegetation has re-established.

Where the possibility of erosion exists (such as on slopes), erosion control matting will be installed over disturbed areas, immediately after seeding, to stabilize the soil and reduce the potential for erosion. Erosion control matting must use a biodegradable weave that does not trap wildlife. If watercourse banks are disturbed, coir (coconut fibre) matting or a similar product will be used between low and high water levels to prevent trapping fish.

Dust control measures are addressed in **Section 6.3.1**.

Operation

During operation, if revegetation is required, or where erosion is occurring, appropriate steps such as the mitigation measures outlined above will be taken as required to prevent further soil loss or sedimentation of watercourses.

6.1.3.3 Net Effects and Evaluation of Significance

Limited adverse effects on soil are expected with the proper implementation of the standard, proven erosion control and soil protection measures discussed above. Consequently, the significance of effects of the Project on soil is rated as minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.1.4 Climate

6.1.4.1 Potential Effects

Construction

Construction vehicles will emit Greenhouse Gases (“GHGs”), which are known contributors to global climate change. This effect is addressed in **Section 6.3.2**. No effects on local climate are anticipated during construction.

Operation

Water spray from various outlets such as the spillway, sluices, and tailrace may affect the potential for fog in the immediate vicinity of the powerhouse. In winter months, water spray may freeze and become frost mist (tiny ice particles), coating nearby (i.e. within a few metres)

surfaces with ice. Additionally, spray may affect surrounding vegetation by increasing the amount of water received by plants (addressed in **Section 6.4.1**). Spray is expected to be similar to existing conditions resulting from water falling over Yellow Falls.

Microclimatic effects are usually associated with large-scale reservoirs and dams. For example, the Upper Volta basin in Ghana (part of the largest human-made lake, encompassing 8,482 km^2) experienced a 1^oC rise in air temperature in the basin from 1945 to 1993 (Gyau-Boakye, 2004). Minimal microclimatic effects are expected from the Project headpond due to its relatively small size (160 ha).

6.1.4.2 Mitigation and Protection Measures

Construction

Mitigation measures to reduce GHGs emitted by construction are addressed in **Section 6.3.2**. Effects to the local climate are not anticipated during construction, therefore no mitigation or protection measures are required.

Operation

Water spray, frost mist, and resulting fog will be reduced through the implementation of a properly designed dam tailwater facility. Therefore these effects will be limited to the immediate vicinity of dam outlets such as the sluiceway, spillway, and tailrace as the turbine outlet and spillway gates open at or below the tailwater level. Similar to existing conditions, visibility may be reduced at the dam location, while frost mist may create slippery surfaces, but water spray and frost mist are not anticipated to exceed levels associated with the existing falls. Safety concerns are addressed in **Section 6.8.11**.

6.1.4.3 Net Effects and Evaluation of Significance

Microclimatic effects as a result of inundation are primarily associated with large hydropower facilities and reservoirs that occupy many square kilometres. Since the scale of the proposed headpond at Yellow Falls is relatively small, microclimatic effects are not expected to occur. .

Effects on visibility resulting from water spray and frost mists will be similar to existing conditions. Therefore the significance of the effects of the Project on climate is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.1.5 Seismicity

6.1.5.1 Potential Effects

Construction and Operation

Seismic events (i.e. earthquakes) can occur as a result of natural or anthropogenic events. Seismic events caused by humans (anthropogenic) are usually described as “induced.”

The Study Area for the Yellow Falls Hydroelectric Project is located within an area of naturally low seismic ground motion. With respect to relative seismic risk (see **Appendix F1**), the probability of natural seismic activity is extremely low.

The potential exists for induced seismic events to occur as a result of reservoir filling, large water level fluctuations, or construction related blasting. The probability of induced seismicity is related to the size of the reservoir, properties of the soil and underlying rock, and the nature of faulting below the reservoir. Induced seismicity is usually associated with large-scale reservoirs occupying several square kilometres (Talwani, 1997).

The possibility of natural seismic events in the Study Area is very low, and the proposed headpond area is relatively small, therefore the risk of induced seismicity is considered to be limited.

6.1.5.2 Mitigation and Protection Measures

Construction and Operation

The Project is designed to meet all applicable requirements of the Ontario Dam Safety Guidelines, The Canadian Dam Association Dam Safety Guidelines, the Lakes and River Improvement Act, and the National Building Code of Canada. Adherence to these guidelines requires that the Project consider the natural seismic risk (low). Since no seismic events are expected as a result of construction, no further mitigation or protection measures have been developed.

6.1.5.3 Net Effects and Evaluation of Significance

The Study Area is located in an area of low seismic activity. Induced seismic activity from hydroelectric projects is generally associated with large reservoir-based facilities. The Project does not include construction of a large reservoir. In addition, the Project will meet applicable dam safety guidelines, the Lakes and Rivers Improvement Act, and the National Building Code of Canada. Therefore, no net effects are expected and the significance of effects resulting from seismicity is therefore rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.2 WATER

This section refers to the criterion described in **Section 2 - Water** in the integrated screening checklist, including:

- Surface Water
- Ground Water

Throughout this section, discharge refers to a volume of moving water expressed in m^3/s, while flow refers to the velocity of water, expressed in m/s or the general passage of water downstream.

Siltation refers to the deposit of fine soil or rock particles on the riverbed, while sedimentation refers to the deposition of soil particles in water.

The Project is equipped with gated spillways to regulate water discharge (**Figure 2.3**). The gated spillway consists of 17 gates, each capable of passing 120 m^3/s at normal operating level. The gated spillway can pass a total of 2,106 m^3/s at normal headpond, a discharge which is greater than the 1:10,000 year flood level.

Hydraulic metrics and data were provided by Canadian Projects Limited ("CPL"), the Project engineer.

6.2.1 Upstream Flow Alteration

6.2.1.1 Potential Effects

Construction

Cofferdam installation during construction will constrict the passage of water at Yellow Falls. Although normal river discharge will be allowed to pass downstream, this constriction will result in an increase in upstream water levels (within historic limits). Backwater effects from cofferdam construction are not expected to extend further downstream than Davis Rapids (approximately 4.8 km upstream of Yellow Falls).

Operation

Some hydroelectric facilities store water in large reservoirs so that they may release water and generate electricity during peak demand in order to receive the highest price per kWh possible. These types of peaking facilities can have a significant effect on the downstream environment, as the flows are drastically decreased until peak times during which extremely large flows are released. Rapid changes to flow rates can impair the ability of aquatic flora and fauna to adapt and can have far-reaching negative impacts on the environment. The Project will not be operated as a peaking facility.

To evaluate the effects of the Project on upstream flow, water surface profiles in the headpond reach were calculated using the US Army Corps of Engineers Hydraulic Engineering Centre River Analysis System ("HEC-RAS") version 3.1 by CPL. As part of the design process bathymetric cross sections were surveyed at 500 m intervals from Island Falls (2.4 km downstream of Yellow Falls) to the Lower Sturgeon GS.

The selected river cross-sections were extended above the surveyed water surface using information generated from a Light Distance and Ranging (LiDAR) survey (flown in August 2007 by Terrapoint Canada Inc. with an accuracy of $\pm$ 0.10 m) to provide one metre contour plans between Smooth Rock Falls GS and Lower Sturgeon GS.

This analysis produced detailed cross-sectional data between Island Falls and Lower Sturgeon GS. The model is considered appropriate for estimating backwater effects due to normal and high magnitude flows.

Water surface profiles between Lower Sturgeon and Smooth Rock Falls GS were generated for a range of flows. River water surface profiles are shown in **Figure 6.1** below, for scenarios of average flow, 1:100, and 1:10 000 year flood events for both the existing and future operating conditions.

Operation of the Yellow Falls Hydroelectric Project will result in the inundation of approximately 71 ha of land over a 5.7 km stretch of the Mattagami River from the Project site at Yellow Falls upstream to Loon Rapids, as well as the lower reaches of Rat Creek and several ephemeral tributaries. The maximum extent of inundation of a tributary will be approximately 1600 m up Rat Creek (**Figure 2.4**). Inundation of the Mattagami River and tributaries will change the amount and type of fish habitat present in the area. The effects of inundation on fish and fish habitat are addressed in **Section 6.5**.

Shoreline length in the headpond will increase from approximately 16 km to approximately 24 km. The average amount of water present in the headpond reach will increase from approximately 1.3 million m^3 under present conditions, to approximately 7.4 million m^3. This increased volume of water will slow water velocities in the headpond reach, and affect the "retention time[6]", or the amount of time that it takes for a molecule of water to travel from the terminus of the headpond downstream through the turbines. Under pre-development mean annual discharge conditions, the retention time is approximately 3.3 hours. Under mean annual discharge conditions with the powerhouse/dam structure in place, retention time is expected to increase to approximately 19 hours. Increased retention time has the potential to affect sediment transport capabilities and flow characteristics in the Mattagami River system (**Sections 6.2.1** and **6.2.2**), and result in water quality changes in the headpond (**Section 6.2.4**). An increase in water volume, area, and retention time may also increase the risk of flooding and dam overtopping (**Section 6.2.3**).

The elevation of the Mattagami River at Yellow Falls is approximately 232 m asl during average discharge conditions. At Loon Rapids, roughly 6 km upstream, the average water level of the Mattagami River is 244 m asl during average discharge conditions. During operation of the Project, the river will remain at an average height of 244 m asl from Yellow Falls to Loon Rapids to ensure an adequate supply of water to the turbines and the required hydraulic gradient (see **Figure 2.4**). As the river level rises and falls during seasonal flow changes, the headpond will not significantly expand and contract. The headpond operational plan is to maintain essentially constant water levels that will fluctuate by ±0.3m.

[6] Headpond retention time was calculated using the following equation:

$\phi = (V_{headpond} / Q_{discharge})$ x (1hr / 3600s)
$\phi = (15x10^6 m^3 / 98 m^3/s)$ x (1hr / 3600s) = 42.5 hours
Where ϕ = Average Retention Time (hr), $V_{headpond}$ = Headpond Volume (m^3) , and $Q_{discharge}$ = Annual Average Discharge Flow Rate of Headpond (m^3/s)

The proposed headpond may affect other river users, including Lower Sturgeon GS, by altering flow and discharge characteristics. Effects of upstream flow alteration on fish and fish habitat are addressed in **Section 6.5**. The proposed headpond also has the potential to affect sediment transport (**Section 6.2.3**), and result in water quality changes in the headpond (**Section 6.2.4**). An increase in water volume, area, and retention time may also increase the risk of flooding and dam overtopping (**Section 6.2.3**).

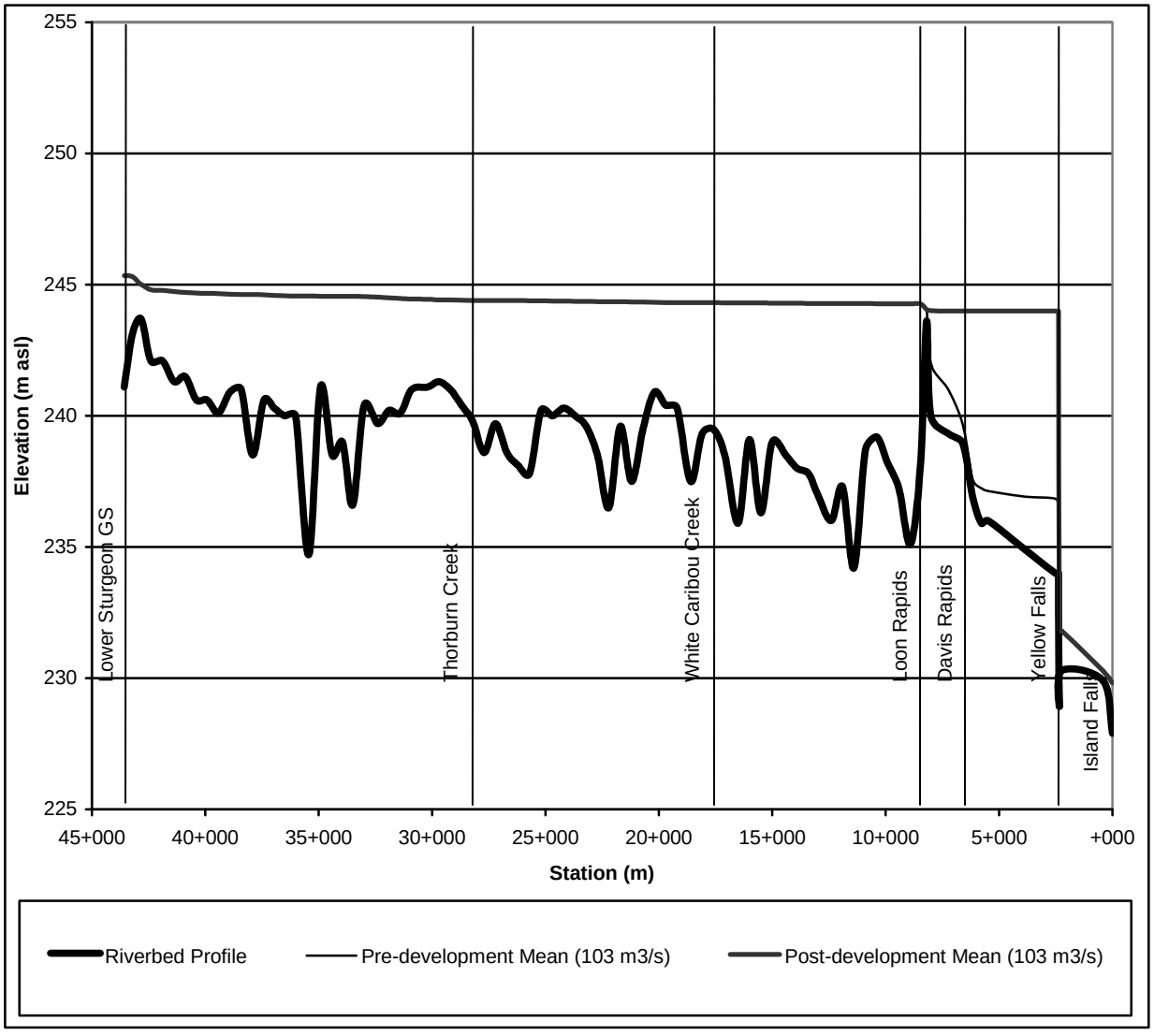


Figure 6.1 Water Surface Profiles for Pre and Post Development Mean Annual Discharge

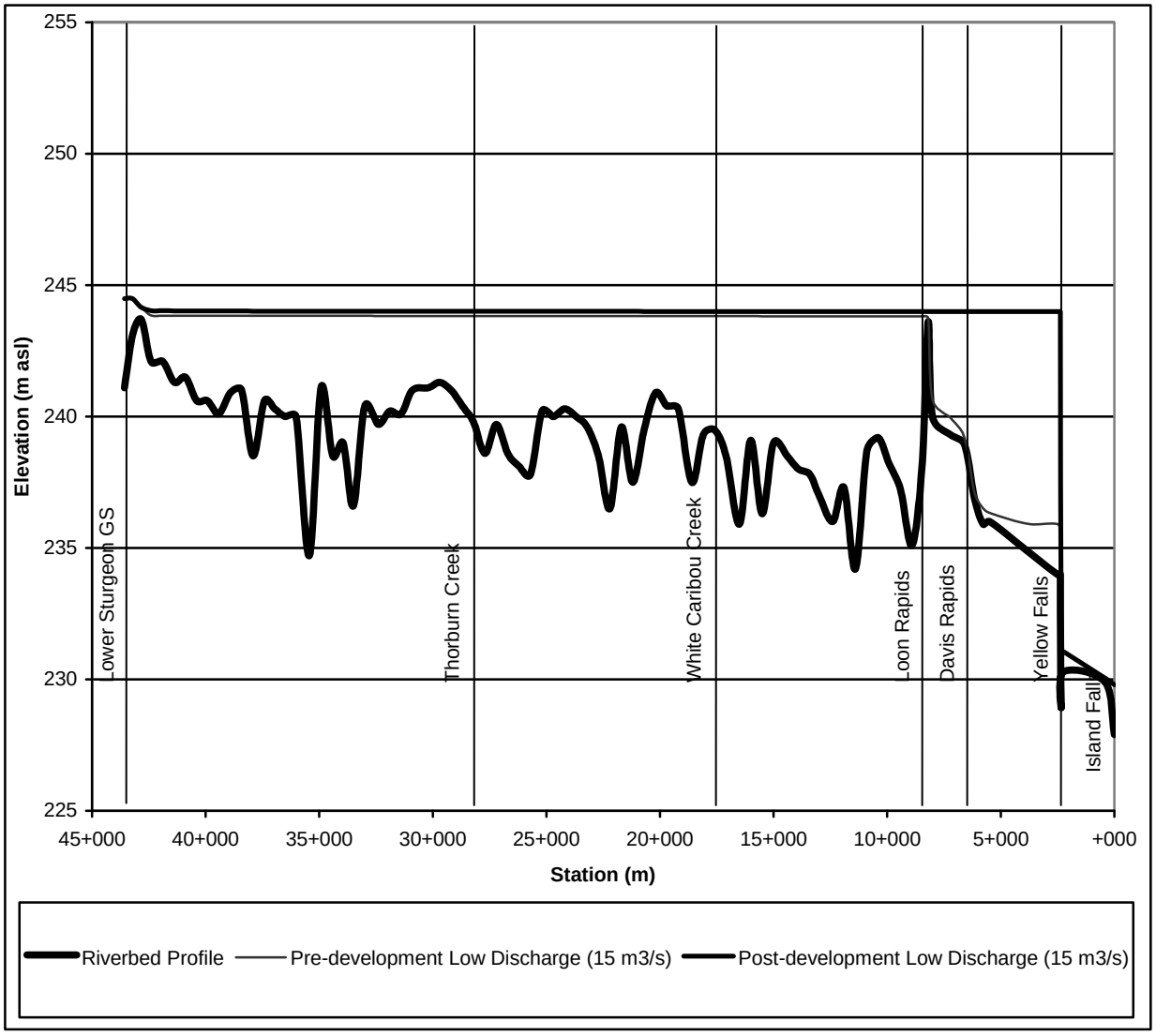


Figure 6.2 Water Surface Profiles for Pre and Post Development Low Discharge Conditions

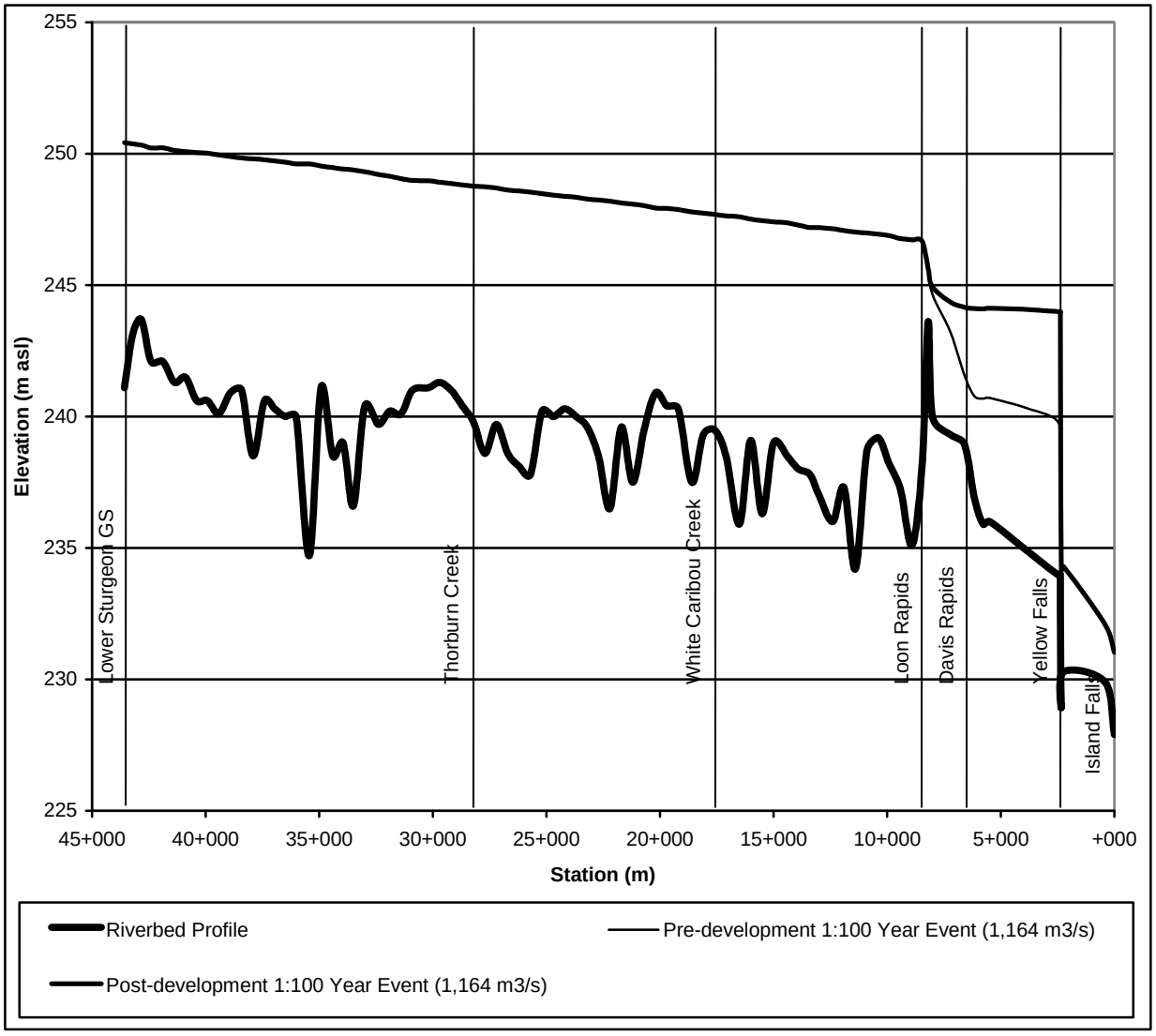


Figure 6.3 Water Surface Profiles for Pre and Post Development 100 Year Discharge

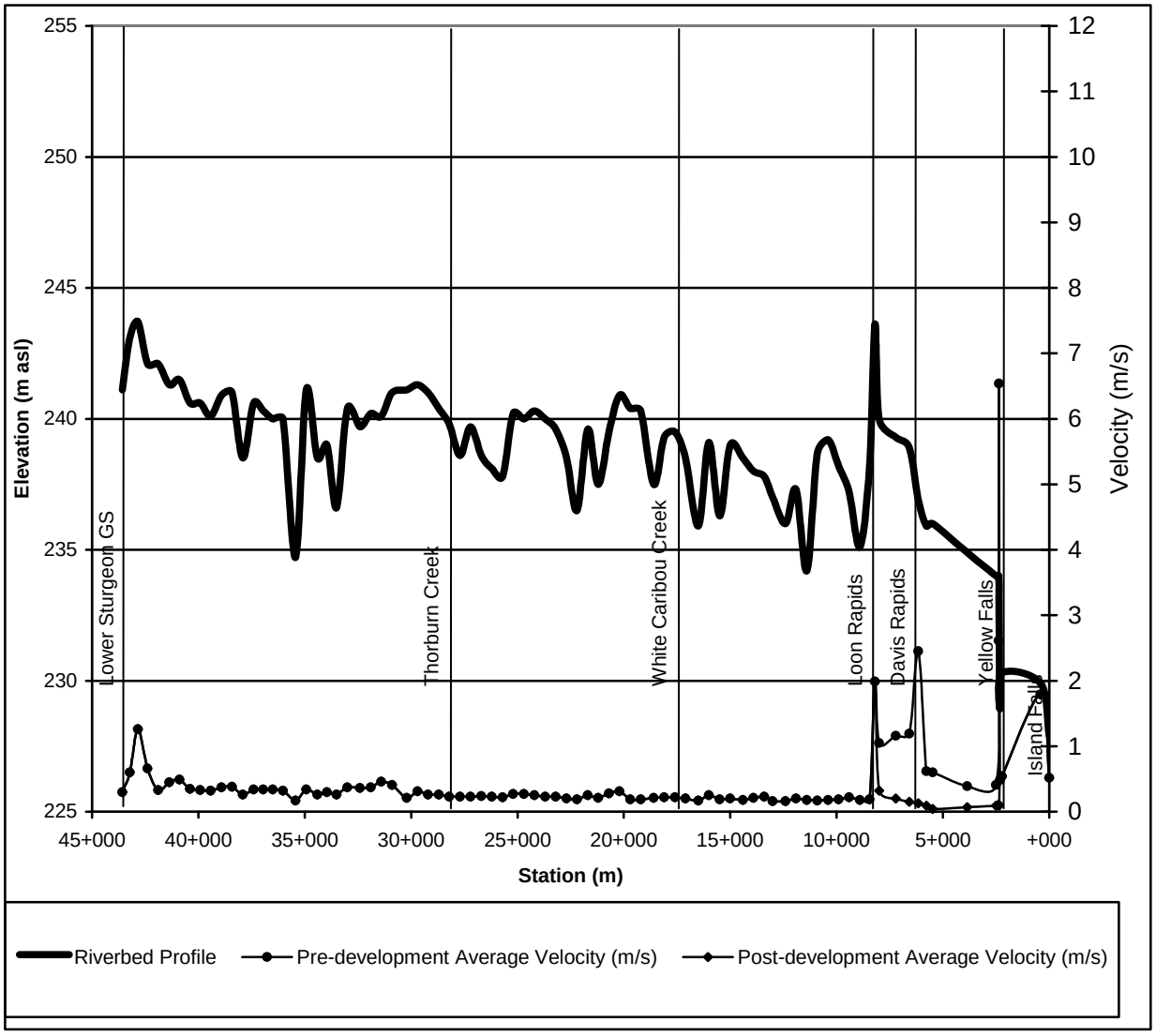


Figure 6.4 Water Velocities for Pre and Post Development Conditions

Water surface profile and velocity graphs (**Figures 6.1 to 6.4**) indicate that Loon Rapids is the critical section in terms of tail-water effects at Lower Sturgeon GS. Pre-Project velocities at Loon Rapids, Davis Rapids, and Yellow Falls are greater than 1 m/s with the highest velocities occurring across Yellow Falls. The velocity in the remainder of the reach between Loon Rapids and Yellow Falls is generally less than 1 m/s. The velocities for the post-Project conditions are substantially lower, varying between 0.06 and 0.32 m/s. The water level and velocity at the top of Loon Rapids is the same for both the pre and post-Project conditions indicating that this is the upper extent of the effect of the headpond.

Water levels upstream of Loon Rapids will remain unchanged for existing and post-development scenarios of the Project. Consequently, the Project will not have an effect on operations at Lower Sturgeon GS.

6.2.1.2 Mitigation and Protection Measures

Construction

Cofferdam construction is required to provide a dry work environment for construction of the dam and powerhouse structures. Working 'in the dry' is necessary to prevent unacceptable levels of siltation and sedimentation in the river. Cofferdams will, by necessity, constrict water flow over Yellow Falls, and may result in limited inundation. No mitigation or protection measures are necessary or possible.

Operation

Several operating parameters and design features will be integrated into the Project for the purpose of mitigating potential effects associated with changing river flows. Flow through turbines will vary and sluiceways will be used to maintain a static headpond water level. The turbine control and spillway gate system used by the Project are very precise. Under normal operating conditions, the amount of water passing through the turbines will be adjusted to reflect incoming flows at the upper end of the headpond. Under low flow conditions, the spillway may be closed to maintain the headpond water levels, while under high flow conditions the spillway may be opened to allow high flows to pass while maintaining headpond levels. Under extreme low flow conditions or during maintenance, it may be necessary to divert flow from the turbines (expected to occur less than 2% of the time) Under such a scenario, all river flow will be passed through the spillway in order to ensure that the outflow of the headpond remains equal to the inflow from above Loon Rapids.

There are no expected backwater effects on the Lower Sturgeon Generating Station under normal operating conditions as a result of the proposed facility and although flow velocities through the headpond reach will be greatly reduced, no adverse effects are foreseen as a result of Project operation. YFP has consulted with Ontario Power Generation Inc. to discuss potential effects to dam safety ratings and plant operations. No additional mitigation or protection measures are necessary.

6.2.1.3 Net Effects and Evaluation of Significance

The proposed headpond will result in altered water elevation, discharge and velocity between Yellow Falls and Loon Rapids – a distance of approximately 5.7 kilometres and an area of 160 ha. Flood control systems designed into the Project will allow passage of a 1 in 10,000 year flood event without altering the headpond level.

The headpond terminates at Loon Rapids. Therefore, backwater is not expected to affect the tail-waters of the Lower Sturgeon Generating Station, or to Abitibi Freehold. As a result of the limited extent of backwater effects, the headpond will not affect the fish sanctuary downstream of Lower Sturgeon GS.

The significance of the Project effects on upstream flow are rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.2.2 Downstream Flow Alteration

6.2.2.1 Potential Effects

Construction

A cofferdam (temporary structure used to enable construction in dry conditions) will be used to direct water around the proposed construction site, creating dry conditions in order to pour concrete for the dam and the powerhouse foundations (**Section 2.4.1**, **Figure 2.3**). Construction of the cofferdam may affect the quantity and location of water moving downstream.

Pumps will be required to move water from the cofferdams to the settling ponds, and to discharge water into the river. In the event of pump failure, the previously dry work area could be flooded.

The removal of cofferdam sections in front of the intakes and spillway will be carried out by inundating the area between the cofferdam and the structure so that most of the removal is done in still water, reducing sedimentation potential.

Headpond filling will commence upon following removal of the cofferdam. As initial filling of a headpond is the most critical time for the structures, the rate of rise will be controlled over a one-month period while pre-commissioning of the plant is underway. To maintain the rate of rise over this period, approximately 3 m^3/s of the inflow will need to be retained. The minimum 15 m^3/s flow to Smooth Rock Falls GS will be adhered to as specified in the Mattagami River Water Management Plan.

Operation

Operation of the powerhouse and spillway facilities has the potential to affect downstream flows through manipulation of facility discharges. In the event of emergency unit tripping or shut down, there is potential for flows to be disrupted.

Spill facilities will be used to maintain headpond levels, ensuring that inflow is equal to outflow in the event that all water cannot be passed through the turbines. If the rate of flow entering the headpond is greater than the capacity of the generating units, excess water will be diverted through the spill facilities. On an annual basis, this is expected to occur about 15% of the time (**Figure 6.5**). Since water will be passing through the powerhouse most of the time, turbine shut-down (“trip”) as a result of an accident, malfunction, low flow event, or other incident, may potentially alter discharge.

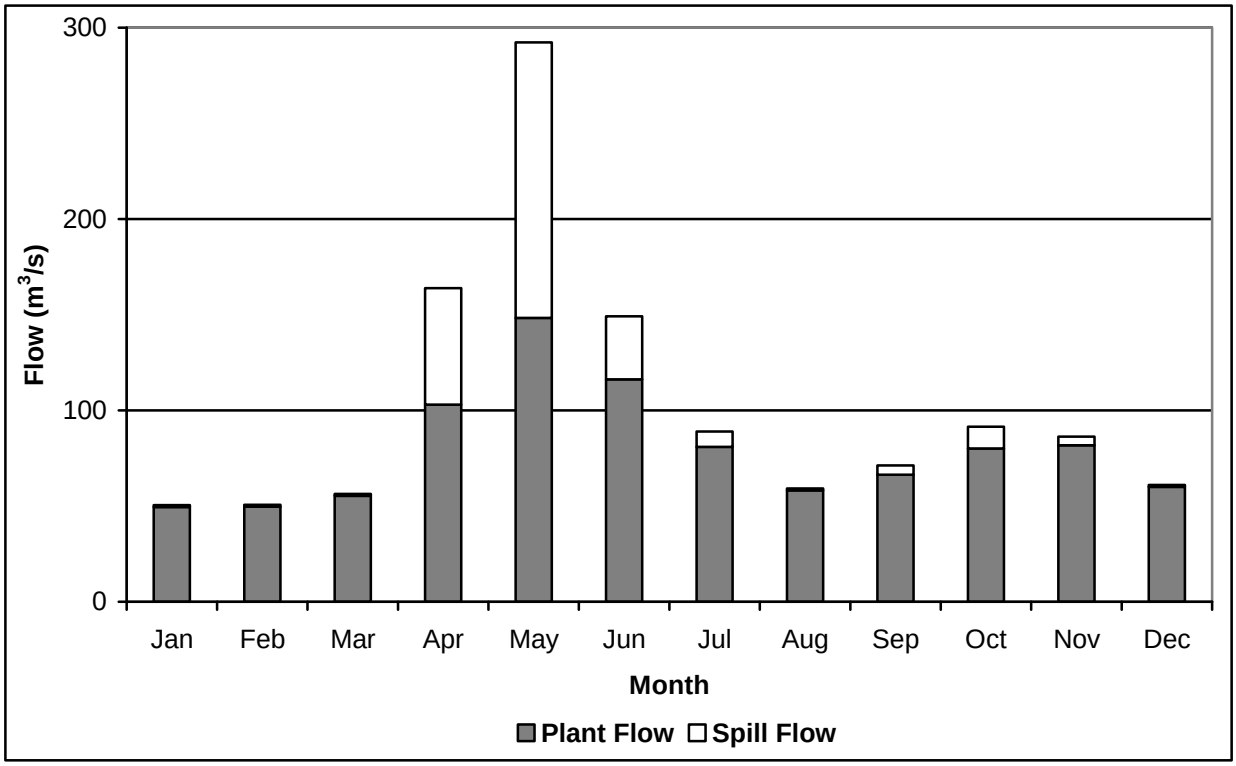


Figure 6.5 Monthly Plant and Spill Flow

The proposed Project will result in water velocity changes at the spillway and immediately downstream of the dam structure. These changes may potentially affect the riparian ecosystem through bank erosion, flooding, sedimentation and alterations to the bed-load.

6.2.2.2 Mitigation and Protection Measures

Construction

Cofferdams will be designed for the 1:20 year flood event. The restriction resulting from the construction of the cofferdam would result in a water level rise of less than two metres above normal levels at the cofferdam location.

Seepage through the cofferdam will be handled using settling ponds to remove sediment contained in the water before discharging the clean water back into the river through dispersion units (such as large cages filled with straw bales) to limit flow velocity and potential river bank erosion. A Permit to Take Water ("PTTW") will be required from the MOE to dewater following cofferdam installation and pump out seepage during construction. A Certificate of Approval (CofA) for wastewater discharge from the MOE will be required to discharge water from the settling ponds.

Pumps will be placed in bermed areas covered with impermeable geotextile fabric to prevent fuel or lubricants from entering watercourses. YFP will use multiple pumps rather than one large pump to provide a minimum of two main and two back-up pumps, which combined are capable of handling at least 100% of the expected seepage rate in case of failure of main pumps.

Cofferdam installation and river flow diversion will result in alteration of flow characteristics at Yellow Falls. The cofferdam structures do not have the capacity to store water; therefore downstream discharge will not be affected.

Following cofferdam removal, headpond filling will take place and is expected to result in short-term reduction in river flow. In the event of unusual low-flow conditions, headpond filling will be suspended to prevent downstream ecological effects. Minimum downstream discharge must not drop below 31.71 m^3/s (lowest July discharge rate on record) if avoidable. In some instances, upstream operations or conditions over which the proponent has no control may not allow maintenance of discharge above this level. If it appears that discharge will drop below this level, headpond filling will be suspended until suitable conditions return.

Operation

The Project design includes several characteristics that mitigate the potential for effects on downstream flow alteration.

The spillway will allow for level adjustment and control of the headpond, ensuring that downstream flow requirements are satisfied. The proposed hydroelectric facility is not designed to operate effectively as a peaking plant. As a run-of-river facility, the discharge rate will equal inflow unless a special case scenario arises that requires the lowering or raising of headpond levels, such as for maintenance or emergency purposes (**Sections 6.12** and **6.13**), operation of upstream facilities, or extreme low or high flow events.

The control system of the facility will be designed to maintain headpond water levels within upper and lower operating bands, which will provide operational flexibility when responding to varying conditions of the river (0.3 m variation in headpond height; **Section 8.0**).

In the event of emergency unit shut-down or tripping, two gates on the spillway will be automated such that when the plant trips the gates will open the corresponding amount. Gate opening speeds will have to be finalized; however, 0.5 to 1.0 m/minute opening times are typical. Therefore, compensating flows would immediately begin to flow from the gates following a plant trip. Flows downstream of the plant match normal flows within 4 to 8 minutes if the plant is running at full capacity and sooner under partial load.

The Project will also require a PTTW to divert water from the Mattagami River through the powerhouse and spill facilities.

6.2.2.3 Net Effects and Evaluation of Significance

Downstream flow will not be significantly altered further than approximately 100 m downstream of the powerhouse/dam structure, and is unlikely to affect other river users outside of this vicinity. During normal operation, the discharge (m^3/s) released by the Project will be the same as under pre-existing conditions at Yellow Falls. As a result, the effect of the Project on downstream flow is rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project)

6.2.3 River Morphology

6.2.3.1 Potential Effects

Construction

Cofferdam installation may change flow characteristics in the vicinity of Yellow Falls, causing limited inundation upstream, and alteration to flow patterns of river flow downstream.

Downstream flow pattern changes will occur immediately below the powerhouse structure as a result of the increased volume of water exiting the powerhouse. Yellow Falls already exhibits increased flow over the south side of the river bend, as evidenced by depositional formation on the east river bank. This flow pattern is not expected to substantially change during the period that the cofferdam is in place. Following cofferdam removal, multiple bays will allow spill to be dispersed across the river. However, flow will still be concentrated on the south side of the river due to the powerhouse location.

Under existing conditions the flow is directed towards the left downstream bank of the river. Under existing conditions, the bend in the river concentrates the water flows along this bank. As the river straightens following the bend, the river flows spread more uniformly across the river, creating a less concentrated flow.

Following Project construction, a very similar flow pattern will occur. Although more concentrated flow may form slightly left of its current location under certain flow conditions, flows will dissipate as the river straightens, as under existing conditions.

Flow patterns will return to preconstruction conditions by approximately 500 m downstream of Yellow Falls and 2 km upstream of Island Falls.

Operation

River Depth

The littoral zone (roughly defined less than or equal to 2 m in depth) within the proposed headpond footprint currently covers approximately 18.5 ha. After inundation, the littoral zone will be expanded by approximately 3 ha, an increase of approximately 16.2%. The existing "littoral" environment occurs throughout the channel, and has significant areas of high flows, with substrate that is predominantly gravel and coarse rock. Slower velocities in the headpond

will be associated with buildup of fine sediments, especially along the margins of the headpond in the littoral zone, and in deeper sections of the headpond.

Sedimentation and Siltation

During low flow conditions, smaller sediment carried by the river waters would be deposited as the velocities drop off, while during flood conditions, the material is once again mobilized and redistributed. The rate at which this occurs depends on the bed-load and the concentrations of suspended sediment in the river. This process of sediment transport and deposition is a dynamic process occurring throughout the life of the Project.

The dam will prevent larger river sediments from moving downstream and therefore this has the potential to degrade the quality of fish spawning substrate below the dam. Lack of sediment deposition is not expected to be an issue downstream of the dam tail-waters, as additional substrate will be naturally eroded from the banks of the river and carried downstream. The Mattagami River does not usually exhibit a high degree of sediment transport due to the prevalence of boulder, cobble, and bedrock substrates and the consequent unavailability of fine material in the River bed and banks.

Sedimentation of the headpond may occur during the initial inundation period, and will continue to a lesser extent during operation, with water level and flow fluctuations. However, since the inundation of the headpond area will slow water velocities and reduce scouring forces, erosion will be reduced, which will decrease local sediment inputs and hence decrease the extent of siltation within the headpond. Also, sediment inputs will be further reduced following the initial stages of inundation as newly inundated areas stabilize. Consequently, significant alterations to existing upstream river bed morphology are not expected.

The headpond will experience a certain degree of siltation over the duration of the facility's existence. This is unavoidable since the river carries sand and silt from upstream erosion and deposits these particles in the reservoir. The size of particles deposited is dependent on the retention time, depth, length and velocity of the headpond and associated waters. Larger particles settle out more readily, while small particles may remain suspended in the water even as it flows over the sluiceway or through the turbines. Over time, this siltation may result in a decrease in average headpond depth in some locations.

Erosion

Bank erosion downstream of the facility is expected to be minimal due to the physical features of the existing shoreline as well as the nature of the flow patterns and velocities of the waters below the facility. The general orientation of Yellow Falls and the proposed dam are such that the flow is directed towards the opposite bank due to a bend in the river. The spillway and tailrace are oriented such that the distance to this opposite bank is approximately 400 m, which is predominantly made up of bedrock, and therefore resistant to weathering and erosion.

Downstream flow pattern changes will occur immediately below the powerhouse structure as a result of the increased volume of water exiting the powerhouse. Yellow Falls already exhibits increased flow over the south side of the river bend, as evidenced by depositional formation on

the east river bank (below dashed line). This flow pattern is not expected to substantially change during the period that the cofferdam is in place. Following cofferdam removal, multiple bays will allow spill to be dispersed across the river. However, flow will still be concentrated on the south side of the river due to the powerhouse location.

The arrow shown on **Figure 6.6** below indicates the direction of flow from Yellow Falls. It can be seen that under existing conditions the flow is directed towards the left downstream bank of the river. Under existing conditions, the bend in the river concentrates the water flows along this bank. As the river straightens following the bend, the river flows spread more uniformly across the river, creating a less concentrated flow.

Following Project construction, a very similar flow pattern will occur. Although more concentrated flow may form slightly left of its current location under certain flow conditions, flows will dissipate as the river straightens, as under existing conditions.

Flow patterns will return to preconstruction conditions by the time they reach the dashed line shown in **Figure 6.6**, some 500 m downstream of Yellow Falls and 2 km upstream of Island Falls.

Figure 6.6 Flow Pattern at Yellow Falls

Movement of Woody Debris

The powerhouse/dam structure and log booms have the potential to prevent the movement of downed woody debris downstream. A loss of the addition of large downed woody debris may result in a deterioration of fish habitat cover. Cycling of large wood debris in riverine ecosystems occurs over centuries, so that potential effects would only become evident after many years.

Wave Action

Additional wave action may occur as a result of an increase in water surface area in the headpond and may result in erosion of river banks. Waves involved in coastal erosion processes are driven on-shore by strong winds blowing across large expanses of water. Wave energy is primarily determined by the wind velocity, duration, and fetch (distance that wind blows across; Ritter et al, 2002). Since the headpond represents a total area of approximately 160 ha, significant wave-induced erosion is unlikely to occur.

6.2.3.2 Mitigation and Protection Measures

Construction

The effect to upstream river discharge and flow characteristics will not be significant during construction. Water velocities and discharge rates will remain unchanged, as the river will maintain cross-section and natural flow rates within historic values. Although limited inundation may occur after cofferdams are installed, no mitigation or protection measures are required.

Operation

Headpond depth will be monitored periodically in accordance with the Environmental Inspection and Monitoring Plan (**Appendix J**). If excess siltation occurs, the proponent should consider dredging or other mitigation options as discussed with relevant agencies in the future. In the event that dredging becomes necessary, excavation and disposal of dredged material must occur in accordance with the MOE *Guidelines for Evaluating Construction Activities Impacting on Water Resources Part III A, B, and C* (1994). The MNR and DFO may also have specific requirements, such as completion of a Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects, or a letter of authorization, and must be consulted prior to undertaking dredging activities.

Although erosion is not anticipated to occur downstream of the facility the opposing shoreline will be visually monitored (see **Appendix J**) to determine if significant erosion is occurring following initial start-up of the plant and large flow events. If erosion is identified, YFP will work with the MNR and DFO to identify potential bank protection measures. These measures may include placement of suitable large aggregate materials along the bank.

The existence of eight other hydroelectric generating facilities on the Mattagami River has already reduced the ability for the ‘cycling’ of woody debris to occur. The sections of river above and below the proposed facility are lined with trees and continue to produce sufficient debris as

natural shore-line erosion occurs. However debris is somewhat limited to the respective reaches of river.

6.2.3.3 Net Effects and Evaluation of Significance

The Project will increase sediment loading throughout the headpond. However, a reduction in sediment entrainment in the water within the headpond area will counteract this phenomenon and reduce the net effect since a portion of the sediments contained within the incoming river flow will settle out and the amount of sediment entrained within the headpond will be reduced.

The Project is unlikely to affect the bank opposite the tailrace since it is primarily composed of bedrock. Cycling of woody debris will closely approximate pre-construction conditions, and is not likely to be significantly affected by the Project. As a result, the significance of Project effects on river morphology is rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.2.4 Surface Water Quality

6.2.4.1 Potential Effects

Construction

Potential effects resulting from construction of dam and powerhouse structures include:

- Erosion of disturbed soil causing sedimentation of watercourses (see also **Sections 6.1.3.2** and **6.4.1.2**)
- Sedimentation caused by installation of cofferdams
- Blasting during excavation may introduce fine sediment and fly rock into watercourses
- Accidental spills and discharges that may affect watercourses (addressed in **Section 6.12**)
- Increased turbidity during construction
- Introduction of contaminants through dam construction, including wastewater from cleaning of concrete truck drums.

Potential environmental effects associated with the construction of Project access roads, boat access ramp, and transmission lines may include:

- Effects on rivers and wetlands due to installation of docks, transmission poles and stringing transmission wires
- Fragmentation of river and wetland ecosystems (**Sections 6.4** and **6.5**)

- Washouts of roads due to inappropriate design such as inadequate culvert sizes
- Sedimentation or siltation due to road construction and/or improper silt fence installation.

During construction, foundation excavation, use of aggregate material for road upgrades, concrete production, or waste/spoil may disturb and expose rocks containing large amounts of sulfide minerals (typically pyrite). Once exposed to water and oxygen, bacteria found within the rock multiply dramatically, aiding sulfide oxidation and producing extremely low pH conditions in surface and subsurface water. This chemical reaction and subsequent impairment of water quality is known as Acid Rock Drainage ("ARD"). ARD usually occurs when rock is exposed to chemical weathering for long periods, such as when an abandoned mine shaft remains flooded for several years (McGinness, 1999).

Operation

Potential effects of operating procedures on water quality are listed below:

- Water temperature changes, including warmer temperatures within the headpond, warmer temperatures downstream, and temperature stratification within the headpond
- Reduction in dissolved oxygen content through an increase in turbidity, an increase in nutrient concentrations, and increased temperatures

Water Temperature

Due to the increased water retention time and water surface area of the headpond relative to current conditions, the temperature of the water is expected to increase slightly above baseline conditions (anticipated to be less than one degree Celsius according to Stantec's monitoring experience at other similar facilities with larger headponds).

Stratification, which is primarily associated with large reservoirs that store water for extended periods of time and do not rapidly exchange water, is not expected to occur in the headpond of the proposed facility because of the low average retention time of approximately 19 hours (Canadian Dam Association, 2007).

Nutrients

Along with the effects of temperature, an increase in nutrient loading is expected to occur as a result of headpond formation. Once the terrestrial areas are inundated to form the headpond, the existing soils and associated organic matter will increase nutrient levels within the water. This results in an increase in biomass and productivity of species that are tolerant of such changes in nutrient loading. This may result in the accumulation of additional organic matter on the headpond floor. Also, since high nutrient concentrations are not continuously added to the headpond, but rather enter the headpond as a spike immediately after inundation, nutrient concentrations are expected to lessen once these nutrients become fixed through the growth of bacteria and vegetation.

Northcote and Atagi (1997) present a model showing the changes in nutrients in reservoirs after flooding. Leaching of nutrients from the soil causes an initial Sediment Oxygen Demand ("SOD"). Dissolved oxygen concentrations, therefore, decline shortly after flooding. Dissolved nutrient concentrations spike initially (2 to 5 years), and gradually decline over time (maximum 5-10 years) as nutrients are released from rotting vegetation and from soils. On rare occasions compounds toxic to fish (e.g., terpines, topolones, lignins, etc.) have been shown to leach from decaying vegetation causing effects on fish and invertebrates (Pease, 1974). Water quality effects associated with inundation are not always long lived (Ball et al., 1975).

Aquatic primary producers typically benefit from the flooding of the terrestrial environment, because of the release of dissolved nutrients. Substantive growths of periphyton (attached algae) can be expected on hard surfaces (fallen trees, logs, stumps) in response to the spike in nutrients. Rooted macrophytes, protected by in-water structures (fallen trees, etc.) can also increase in density within reservoirs and headponds in response to the new nutrient supply (Thomas and Bromley, 1968).

Dissolved Oxygen

Discharging water through and over hydroelectric facilities is known to cause super-saturation of oxygen in rivers in certain instances. Air is entrained in falling water as it is released over dam spillways, which then fall into the pools at the base of the dam. Additionally, water discharged through the turbines entrains air at the vortices near the turbine intakes. The air is then forced into the solution through the increased hydrostatic pressures that occur near the turbine blade edges. The effects of super-saturated gases on aquatic organisms can be severe. Fish and other organisms residing in the tail-waters or passing through the turbines can develop problems with their swim bladders and in severe cases this causes fish injury or mortality.

Nutrient loading and temperature increases can lower the dissolved oxygen content of the waters downstream of the headpond, as the ability for water to hold dissolved oxygen is decreased with increasing temperatures. The reduction in dissolved oxygen is more than compensated for as a result of several features inherent in the facility's design. As water flows from the headpond over the sluiceway, it becomes extremely turbulent as it reaches the tail-waters. This increased turbulence results in aeration of the water and therefore increases the dissolved oxygen content. Significant turbulence is also introduced at the tailraces from water passing over the spillway, which will further increase the dissolved oxygen content.

Contaminants

The potential for adverse effects exists if chemically treated wood is to be used in the Project, since chemicals (such as arsenic) may leach into the surrounding water. When used in an aquatic location, this may have detrimental environmental effects, even when following the manufacturer's recommended procedures and published best management practices.

Potable water to supply the powerhouse will be taken from the Mattagami River and may not comply with *Ontario Drinking Water Standards*.

6.2.4.2 Mitigation and Protection Measures

Construction

Several procedures will be implemented in order to mitigate the potential for effects on surface water quality during construction and operation of the Project. These measures include the use of silt fencing and enforcement of setbacks from watercourses for various activities as follows (see **Sections 6.1.3.2** and **6.4.1.2**):

- No material will be stockpiled within 30 m of a watercourse
- No refueling will take place within 30 m of a watercourse
- No vegetation removal will take place within 3 m of a watercourse crossing unless necessary for construction
- No understory vegetation will be removed within 3 m of the Mattagami River during headpond clearing.
- No grubbing will occur within 3 m of the Mattagami River during headpond clearing. Trees will be removed using the mitigation and protection measures outlined in **Section 6.4.1.2**.
- No vegetation removal or clearing will occur above 244 m in elevation

Silt curtains will be implemented provided water velocities permit installation. Turbidity monitoring during construction will also take place at the Project site and at all water crossings along access roads (**Appendix J**).

During cofferdam installation and removal, silt curtains will be installed approximately 25 m downstream if water velocity permits. During cofferdam removal, the earth-fill plug will be removed first, followed by the rock fill. Sediment control measures and materials will meet OPSS 577. Additional mitigation measures described in OPSS 182 will also be implemented as required.

During cofferdam installation and removal or any other in-water construction activities, turbidity will be closely monitored in both upstream and downstream locations to ensure that excess sedimentation does not affect aquatic life forms or habitat. Sediment introduced to watercourses during construction must not cause more than a 10% change to background level secchi disk readings as described in *Provincial Water Quality Objectives* (MOE, 1999). A handheld turbidity meter will be used in place of secchi disks for more accurate readings at the request of the MNR. Records will be kept on-site for inspection by relevant agencies. Additionally, if construction requires fill material to be introduced into a watercourse, fill will meet criteria for “lowest effect level” as described in *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* MOE, 1993).

The proponent will obtain approval under Section 53 of the *Ontario Water Resources Act* (OWRA) to collect, treat, and dispose of waste water contained between or seeping into cofferdams. Approval under Section 53 of the OWRA will be obtained by the contractor responsible for supplying concrete, as water used to clean concrete truck drums is considered waste water.

Although the Town of Smooth Rock Falls water treatment plant is unlikely to be affected, contact information for the plant operations manager will be kept on hand at all times in the event that turbidity increases above anticipated levels, at which time the plant operations manager will be contacted as soon as possible.

Blasting will be confined within cofferdams and will take place under dry conditions according to applicable regulations and standards, including DFO Guidelines. Consequently, there is little potential for blasting to introduce large quantities of sediment into the Mattagami River. However there is some potential for fly rock and dust to be deposited on the river. These amounts are expected to be very minimal and will be further reduced through implementation of blasting mitigation and protection measures (see **Sections 6.1.1.2**, **6.3.3.2**, and **6.5.1.2**).

Erection of transmission poles will occur alongside the existing access road for the most part. Therefore, the overall effects of transmission line construction will be greatly reduced. Transmission line installation across waterbodies and wetlands will follow the DFO's *Overhead Line Construction Ontario Operational Statement* (undated). Access road installation will comply with the MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990).

Loss of hydrologic connectivity may occur where the access roads cross streams, rivers, and wetlands. All culverts and bridges used for watercrossings will be designed in accordance with MNR and DFO requirements. In addition to stream crossings, culverts will be placed underneath access roads where swales or low areas exist. These measures will assist in maintaining hydrologic connectivity for aquatic flora and fauna, reduce potential for road washout, and reduce the need for corduroy road or swamp mats. The proponent will also consider use of a cellular confinement system ("geogrid"), filled with appropriate size rock, to prevent access roads through wet areas from sinking and to allow water flow-through. However, this measure may not be necessary and is dependent on local soil conditions at the time of construction.

Clear span bridges proposed for river or stream crossings will be constructed according to the DFO's *Clear Span Bridges Ontario Operational Statement* (undated). The potential for sedimentation/siltation will also be greatly reduced through implementation of proper construction based mitigation measures, such as the proper installation of silt-fencing and placement of granular and fill materials in a manner that prevents erosion of materials into waterways (see **Section 6.2**).

Boat ramp construction has the potential to disrupt habitat along shoreline areas as these areas generally provide habitat for a variety of aquatic organisms, including fish. Fish are known to lay eggs, feed and hide from predators near shoreline areas. The boat ramp will be constructed

according to the DFO *Dock and Boathouse Construction Operational Statement* (2007) and an application for construction of the boat ramp will be submitted to Transport Canada prior to construction.

During construction of the Yellow Falls Hydroelectric Project, excavation near and within the riverbanks will occur over a short time period to allow installation of the powerhouse and dam structure. Once in place the concrete structure will effectively limit infiltration of surface water or exfiltration of groundwater in the excavated area. Grout will be used to prevent water seepage around foundation joints.

Exposed rock, such as that used for rip-rap, road bed, or waste/spoil rock materials will be tested to ensure that significant sulfide oxidation will not occur prior to being used or spoiled.

As recommended by EC, site assessment and mitigation, if required, will adhere to the following documents, prepared through the Mine Environment Neutral Drainage ("MEND") program:

- Price, W. A. 2005. List of Potential Information Requirements in Metal Leaching, Acid Rock Drainage Assessment and Mitigation Work, MEND* Report 5.10E, on behalf of MEND and sponsored by The Mining Association of Canada, MEND, and Natural Resources Canada (Mining and Mineral Sciences Laboratories). Reviewed September 2008. Available at: http://www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mend/reports/report510-e.pdf
- Price, W. A. and J. C. Errington. 1998. Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia,., Ministry of Energy and Mines. Reviewed September 2008. Available at: http://www.em.gov.bc.ca/Subwebs/mining/Project_Approvals/guidelines.htm
- Price. W. A.. 1997. Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia. Ministry of Employment and Investment. Reviewed September 2008. Available at: http://www.mndm.gov.on.ca/mndm/mines/mg/leg/BC%201997%20Draft%20Guideline.pdf

In the event that rock exhibits potential for ARD, appropriate subsurface use may reduce potential for sulphide oxidation since the rock will be less exposed to weathering. If mitigation becomes necessary, measures will be discussed with relevant agencies prior to implementation. As recommended by EC, mitigation measures may include:

- Minimizing excavation and exposure of rocks having highly leachable and/or reactive contaminants
- Controlling the amount of surface area exposed to leaching from natural processes
- Control of oxidation and acid generating process
- Control of contaminant migration
- Collection and treatment of contaminated drainage
- Conditioning rock

- Covers and seals
- Underwater deposition
- Segregation and Blending
- Base additives

Rock exhibiting potential to contribute to ARD will not be used in locations where it will be exposed to weathering.

Operation

Water Temperature

Key Project specific factors that decrease the potential for elevated water temperatures and related decreases in dissolved oxygen are the relatively small size of the headpond the low retention time of the water flowing through the headpond. Formation of the headpond will create a surface area less than twice the size of the original river. Further, the retention time of the headpond is well below that typical of lakes of the same size. These characteristics reduce the potential temperature increases, and the concentration of dissolved oxygen will not be critically decreased.

Nutrients

The extent of nutrient loading will be reduced through the clearing of trees and brush in the areas to be inundated.

Dissolved Oxygen

Several additional factors will contribute to the maintenance of dissolved oxygen concentrations in the headpond at levels suitable for naturally occurring aquatic species. Ensuring that a new riparian zone is established and remains intact will aid in mitigating increases in temperature in the headpond, which will subsequently aid in sustaining dissolved oxygen concentrations. The higher latitude of the Mattagami River results in cooler average annual temperatures and therefore the extent to which the headpond will warm is reduced.

Several features inherent in the Project design mitigate the potential for dissolved gas super-saturation. The hydraulic head of 12 meters is typical for run-of-river facilities in Ontario. The dam at Yellow Falls and most other similar dams in Ontario are considered ‘low head’, and according to the MNR, “This [adverse physiological response in organisms] is rarely a serious threat at the low head dams typically operating in Ontario since gas super-saturation usually occurs at high head dams only” (Stokes et al., 1999). Turbines are designed with high operational efficiencies which limit the potential for cavitation and the tail-waters will be equipped with dissipaters, minimizing the potential for dissolved gas super-saturation.

Contaminants

In order to avoid any potential adverse effects to the aquatic environment from contaminants, only untreated plywood and wood formwork materials will be used during construction, all of which will be in accordance with Canadian Standards Association (CSA) standards. The debris

booms will be constructed from untreated timber and will be replaced on a regular basis. All other miscellaneous timber utilized in this Project will not be treated.

Water taken from the Mattagami River to supply the powerhouse will be treated on site. Treatment methods may include ultraviolet light, filtration, or reverse osmosis as appropriate to ensure the health and safety of operations personnel and compliance with *Ontario Drinking Water Standards*. Approval for the potable water supply may be required under the *Safe Drinking Water Act*. Periodic water testing will be undertaken by the proponent during operation as required by the applicable regulations.

6.2.4.3 Net Effects and Evaluation of Significance

Water quality may be moderately degraded due to nutrient enrichment and increased suspended sediment in the short term, but is anticipated to return to background quality within 2 to 5 yrs. As such, the significance of effects on water quality is rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.2.5 Ice

6.2.5.1 Potential Effects

Construction

The Project is unlikely to affect ice formation on the Mattagami River during construction.

Operation

Ice formation on the Mattagami River provides an essential means for crossing the river for both animals and humans (snowmobilers, hunters, etc.) during the winter months. Ice also has the potential to affect terrestrial features, due to flooding associated with ice dams. Potential effects include damage to ecosystems, permanent alterations to river flow paths and damage to infrastructure such as bridges, roads and homes.

Several natural occurrences can affect the formation of ice, such as fluctuating air temperatures, river flows, wind velocities, evaporation, natural damming caused by ice or other debris, and precipitation events.

Operation of the Project can affect ice depths and formation rates, resulting in changes to water levels, evaporation, and wave action. Factors such as increased turbulence and water velocity will decrease the rate of ice formation immediately above the dam, while increased turbulence at the tail-waters of the dam will prevent ice formation downstream (up to a certain distance). Other factors will promote ice formation such as decreased velocities and changes to flow dynamics in the headpond. Changes in water levels are most likely to have the strongest influence on ice formation. Headpond ice is usually thinner and denser than river ice, and will therefore take up less volume. (Greig et al., 1992)

In addition to these environmental changes, ice formation presents problems for hydroelectric dam operation in that it has the ability to form around or flow into the turbine water intakes, effectively blocking the flow of water or damaging equipment when flowing through the turbines (Ashton, 1988).

Frazil ice is a natural and common occurrence on the Mattagami River during the winter months. Frazil ice forms in flowing or turbulent water that has become supercooled by heat transfer to overlying air. The cold air temperatures and large water surface area typical of turbulent river section results in the generation of fine ice particles, which coagulate into frazil clusters or flocs.

The rate and quantity of frazil ice formed in a specified volume of supercooled water increases with both increasing turbulence and decreasing water temperature. The influence of turbulence on the rate of frazil ice formation is more pronounced for larger initial supercooling. The turbulence characteristics of a flow affect the rate of frazil ice formation by governing the temperature to which the flow can be supercooled, by influencing heat transfer from the frazil ice to surrounding water, and by promoting collision nucleation, particle and floc rupture and increasing the number of nucleation sites.

The formation of the headpond will result in reduced velocities and substantially reduce flow turbulence at Davis Rapids and Loon Rapids. Therefore, the amount of frazil ice expected will be considerably less than existing conditions, and an ice sheet similar to what is seen downstream of the areas of white water on the river would quickly form. The following photo depicts ice conditions in March of 2006 at Yellow Falls (**Figure 6.7**).

Figure 6.7 Ice Conditions at Yellow Falls March 2006

6.2.5.2 Mitigation and Protection Measures

Construction

Since the Project is unlikely to affect ice formation during construction, no mitigation or protection measures have been identified.

Operation

Since the proposed hydroelectric facility is a run-of-river operation, and is to be located on an existing waterfall in a pre-existing area of high turbulence, the extent to which this facility will prevent ice formation downstream of the dam is expected to be very low. Formation of the headpond will create ice with increased uniformity and continuity within the headpond.

Water temperatures and ice conditions will be monitored so that intakes may be operated more efficiently in order to prevent ice build up or ingestion into the turbines. Also, the design of the facility is inherently more ice friendly than those facilities that operate as peaking plants, because dramatic fluctuations to water levels and velocities, which would free river ice, forcing it downstream, or prevent the formation of ice all together, will not occur.

6.2.5.3 Net Effects and Evaluation of Significance

The extent to which the Project will prevent ice formation downstream of the dam is expected to be very low. Formation of the headpond will create ice with increased uniformity and continuity within the headpond and may reduce potential for frazil ice formation, resulting in potential ecological benefits, since frazil ice can abrade gills, can cause hemorrhaging, and may result in suffocation of fish (Brown et al, 1993). Consequently, the significance of net adverse effects has been rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.2.6 Groundwater

6.2.6.1 Potential Effects

Construction

During construction, excavation and blasting activities may contact the ground water table, requiring dewatering in significant quantities (i.e. pumping of groundwater) into the Mattagami River. Excavation and blasting has the potential to temporarily increase turbidity of the local ground water supply, while dewatering could temporarily reduce the local water table level. Potential effects on surface water during dewatering are addressed in **Section 6.2.6**.

Groundwater is not used as a water supply in the immediate vicinity of excavation, and no wells have been identified in the immediate Project area. The closest recorded well is approximately 17 km southwest of the proposed headworks (MOE, 2006).

The formation of the proposed headpond may have localised effects on upland vegetation bordering the headpond, particularly in areas of low relief as a result of locally altered groundwater flow regimes.

A potential effect exists from accidental spills of fuel and lubricating fluid during the construction and operation of the Project. In the case of an accidental spill, the contaminant could eventually enter the ground water system through permeable areas of soil. Mitigation and protection measures for accidental spills and releases are provided in **Section 6.12.2**.

The levels of infiltration and recharge will not be significantly affected during construction; however surface water run-off may be locally altered as a result of construction including site grading, which may change the locations of infiltration.

Operation

Project operation is not expected to affect ground water quality, levels or flow within the Study Area. However, local changes to groundwater levels and flows could occur in the vicinity of the headpond as a result of elevated surface water levels. In addition, installation and use of a septic system with a capacity of less than 10,000 L/day to service the powerhouse may affect ground water quality in the local vicinity if not properly designed and installed.

6.2.6.2 Mitigation and Protection Measures

Construction

To limit the effects of an accidental spill on groundwater, the construction contractor will use standard containment facilities and emergency response materials will be maintained on-site, as outlined in **Section 6.12.2**. The construction contractor will strictly adhere to the Emergency and Spills Clean-Up Management Plan. If dewatering rates are expected to exceed 50,000 L per day, a PTTW will be required from the MOE.

Operation

The septic system will require approval from the local Health Unit prior to installation and will be designed to meet all regulatory requirements.

During operation, YFP will strictly adhere to the Emergency and Spills Clean-Up Management Plan as discussed in **Section 6.12**.

6.2.6.3 Net Effects and Evaluation of Significance

Dewatering during construction may result in localized temporary changes to groundwater flow and levels. Groundwater may also be affected by elevated surface water levels in the headpond during operation. Consequently, the significance of net effects has been rated as low (Potential effect may result in a slight decline/improvement in resource in Study Area during the life of the Project).

6.3 AIR AND NOISE

This section refers to the criterion described in **Section 3 - Air and Noise** of the integrated screening checklist, including:

- Air Quality
- Greenhouse Gases
- Dust or Odour
- Noise

6.3.1 Air Quality

6.3.1.1 Potential Effects

Construction

Effects to air quality from hydropower facilities are primarily associated with construction, which results in dust and vehicle emissions (NRCan, 2000; IEA, 2000). Vehicle emissions are a potential source of GHGs and are examined in **Section 6.3.2.**

Dust production is related to the movement of vehicles and disturbance of soil during construction under dry conditions, and is usually short-term and confined to the local area. During high wind conditions, dust and sand particles can damage surrounding vegetation by sand blasting. Blasting during excavation may also release fine rock particles into the air. In addition, fine dust may be deposited on plant leaves, causing impairment of the photosynthesis process.

Operation of the concrete batching plant may increase emissions. It should also be noted that location of the concrete batching plant near to construction will greatly reduce truck travel and thus GHGs.

Nuisance effects due to dust are likely to be minimal since seasonal residences and trapping cabins are outside the likely zone of influence. The closest seasonal residence is a camp located approximately 1500 m northwest of the powerhouse/dam site.

Operation

The operation of hydroelectric generating facilities usually results in limited effects on air quality. However, operations will result in decomposition of organic material as a result of headpond formation and changes to local visibility can occur due to fog and frost mist (NRCan, 2000; IEA, 2000) in the immediate vicinity of the dam. Vehicle emissions and emissions from the decomposition of organic material are examined in **Section 6.3.2**.

6.3.1.2 Mitigation and Protection Measures

Construction

During dry conditions, water will be sprayed on areas with heavy vehicle traffic, such as the power plant site and access roads, to suppress dust emissions as determined by site conditions. Dust control agents such as oil will not be used in order to prevent potential contamination of nearby watercourses and damage to vegetation. Vehicle speed will be limited in construction areas to reduce soil disturbance. If extremely dry and windy conditions occur, the contractor will consider covering soil piles with geotextile to reduce wind erosion.

Prior to blasting operations, rock will be thoroughly pre-dampened using water only. Moisture content of only one percent can greatly reduce dust compared to dry rock (NIOSH, 2003). Blasting activities with the potential for dust creation will not occur under extremely windy conditions to prevent sandblasting effects on surrounding vegetation.

A CofA (Air) will be required from the MOE for the concrete batching plant. The concrete batching plant will comply with its CofA (Air), which will define limits for specific emissions

If more than 50,000 L/day of water is required for dust suppression, a PTTW will be required from the MOE.

Operation

Fog and frost mist are examined in **Section 6.1.4**.

6.3.1.3 Net Effects and Evaluation of Significance

Provided that mitigation and protection measures are followed, construction activities may have a localized, temporary effect on air quality due to dust. No effects on air quality during operation are expected. Therefore, the significance of net effects is considered minimal (potential effect may result in a slight decline/improvement in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.3.2 Greenhouse Gases

6.3.2.1 Potential Effects

Construction

Greenhouse gases ("GHGs") include carbon dioxide (CO_2), methane (CH_4), nitrous oxides (NO_x), and halocarbons (e.g. chlorofluorocarbons, and hydrofluorocarbons). Ongoing GHG emissions are a major instigating factor of global climate change (Intergovernmental Panel on Climate Change, 2001; Environment Canada, 2006).

Although hydropower is one of the few sources of electricity that does not directly produce GHGs during generation, emissions will originate from vehicles and equipment (such as water pumps, chainsaws, generators, etc.) during construction and maintenance. Effects are limited to construction and ongoing maintenance and will not significantly influence the regional airshed.

Operation

During operation, GHGs, specifically CO_2 and CH_4, may also originate from decomposition of submerged vegetation and organic matter in the headpond. Additionally, clearing and formation of the headpond will remove trees and other vegetation that act as natural carbon sinks. Trans-boundary effects are not anticipated, as the scale of potential GHG emissions will not influence the regional airshed.

GHG emissions from hydropower headponds are usually considerably less than for generation of other forms of electricity. Research on dams throughout the world typically shows that GHG emissions from large hydroelectric stations are an order of magnitude less than electricity production using fossil fuels, and even less for small hydroelectric projects (less than or equal to 20 MW) such as the Yellow Falls Hydroelectric Project (Gaffin, undated; Boyle et al, 2003), although some large dams in tropical climates may cause similar emissions to fossil fuel generation (Gaffin, undated). **Figure 6.8** depicts air emissions by power source.

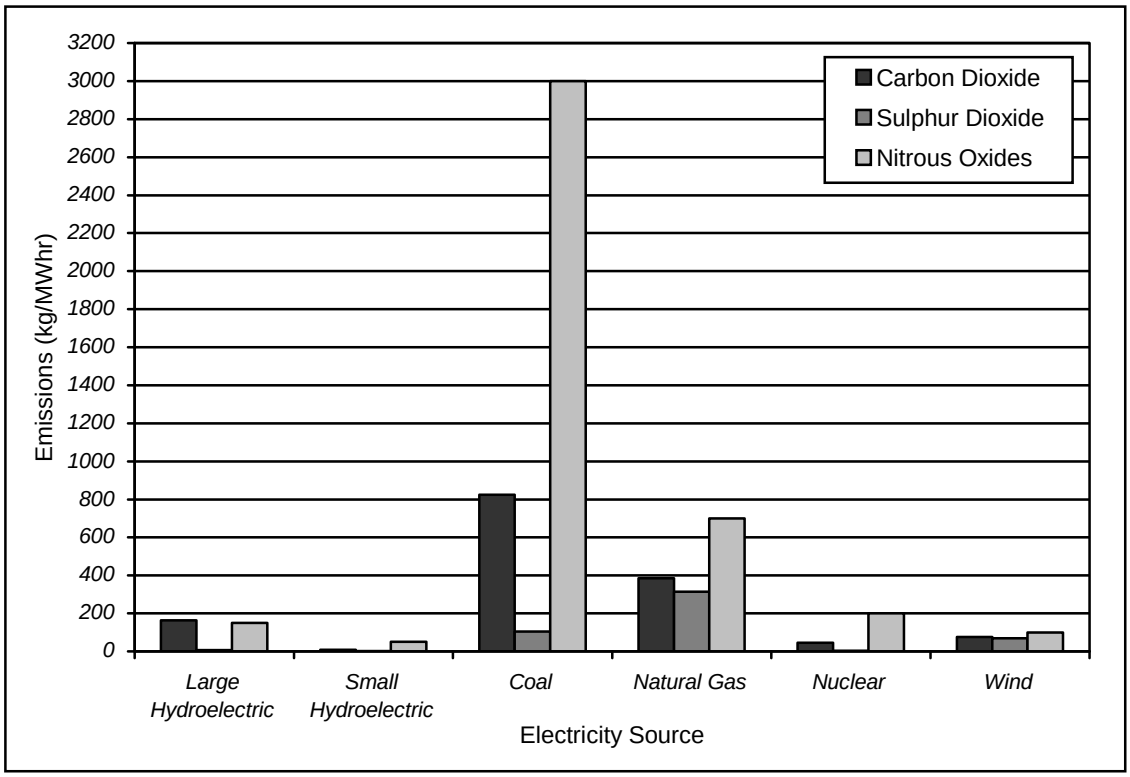


Figure 6.8 Air Emissions by Power Source

Derived from Boyle et al, 2003; Yundt, 1996; Bergstrom et al, 2004

In boreal climatic regions such as Canada, GHG emissions from large headpond areas are generally similar to large natural lakes (Bergström et al, 2004; World Commission on Dams, 2000). Even fewer emissions are typically produced by run-of-river hydropower because a comparatively minimal reservoir area is required and the reservoir level remains fairly static. A relatively static headpond level will not introduce significant amounts of new organic material through continual flooding and recession like that seen for peaking stations.

6.3.2.2 Mitigation and Protection Measures

Construction

The following are recommended mitigation and protection measures to reduce air emissions during construction and maintenance (Cheminfo, 2005):

- Construction equipment and other vehicles will be kept in good repair, including engines and exhaust systems, and must meet MOE and MTO standards
- Unnecessary idling of vehicles will be limited
- Low sulphur diesel or biodiesel should be used if available
- Local suppliers should be used whenever available at sufficient quantity and quality and at competitive cost to minimize the distance that goods and materials must be transported to the site.

Operation

The primary method of reducing GHG emissions from the anaerobic decomposition of vegetation in the headpond is to remove vegetation prior to commencing headpond formation. As previously mentioned, climatic and operating conditions of the Project indicate that decomposition will not occur at an accelerated pace after the headpond is filled. However, all trees within the potential area of headpond formation will be cleared. Where possible, loose woody debris will be chipped and removed from the construction site for landscaping or compost use. Grubbing within the headpond does remove additional woody debris; however removal of root structures through grubbing increases the potential for disturbance and erosion of organic-rich topsoil, increasing the potential for mercury methylation and sedimentation of the headpond.

6.3.2.3 Net Effects and Evaluation of Significance

Vehicle emissions during construction and operation are expected to be short-term in duration and are not likely to have a significant effect on the regional airshed.

GHG emissions from the headpond are expected to be similar to those from natural lakes in the area. Small hydroelectric facilities typically have extremely low emissions throughout their lifecycle. When compared with other forms of electricity generation, the Yellow Falls Hydroelectric Project will help offset GHG emissions from other sources of electricity. Therefore, the level of significance assigned is positive and low (potential effect may result in a slight improvement in resource in Study Area during life of Project)

6.3.3 Noise and Vibration

6.3.3.1 Potential Effects

Construction

The Project is located in a Class 3 Rural Area, defined by the MOE as having natural sounds with little or no road traffic (MOE, 1997). The nearest population centre, Smooth Rock Falls, is approximately 18 km north of Yellow Falls.

Vehicles, equipment, and blasting activities will be the primary sources of noise and vibration during construction. The concrete batching plant will comply with its Certificate of Approval - Air, which will define a limit for environmental noise levels at any receptors in the vicinity of that facility.

Operation

During operation, noise emissions will originate from the generator, transformer, turbine, and falling water. Maintenance activities may intermittently introduce vehicle and equipment noise to the area. No ongoing sources of vibration are anticipated.

YFP retained Aercoustics Engineering Limited ("AEL") to undertake a preliminary noise analysis (**Appendix I**) of a similar operating station for the purpose of estimating sound levels from the proposed Yellow Falls project. Based on conservative calculations, the Project will comply with MOE publication *NPC-232 – Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)*.

Noise will also be generated by the switching station located near the point of interconnect point to Hydro One's network. However, the nearest receptor to the switching station is approximately 3 km southeast of the point of interconnect and is unlikely to be affected.

6.3.3.2 Mitigation and Protection Measures

Construction

All vehicles and equipment with combustion engines used during construction must use effective exhaust and intake mufflers. Construction equipment must meet sound level requirements set out in MOE publication *NPC-115 - Construction Equipment*.

Whenever possible, work activity will be scheduled during daylight hours (e.g. 7 am to 7 pm) to limit potential effects on nearby people and wildlife. However, critical tasks (e.g. watercrossings) may require extended work hours.

Blasting must comply with the guidelines outlined in MOE Publication *NPC-119 - Blasting*. In accordance with this document, sound pressure generated by blasting should not exceed 120 dB. Peak particle velocity should not exceed 1 cm/s to reduce vibration.

Operation

All vehicles and equipment with combustion engines used during operation or maintenance must use effective exhaust and intake mufflers.

Noise emissions from stationary equipment, such as the powerhouse, transformer, and switching station, must comply with MOE publication *NPC-232 – Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)* which specifies sound pressure limits at a point of reception within 30 m of a dwelling or camping area (**Table 6.3**). Preliminary noise analysis indicates that the Project will satisfy these requirements (**Appendix I**).

Table 6.3 Sound Pressure Levels by Time of Day

Time of Day	One-hour equivalent sound level (dBA) or logarithmic mean impulse sound level (dBAI)
7:00 am to 7:00 pm	45
7:00 pm to 7:00 am	40

Prior to commencing operation, a Certificate of Approval (Noise) must be obtained from the MOE.

6.3.3.3 Net Effects and Evaluation of Significance

Noise and vibration will primarily be associated with Project construction. During operation, noise emissions will be generally associated with water flow from the facility, similar to the existing falls. No significant or long-term adverse effects resulting from noise and vibration are expected with proper implementation of mitigation and protection measures discussed above, and therefore the significance of these effects is considered to be minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.4 NATURAL ENVIRONMENT

This section refers to the criterion described in **Section 4 - Natural Environment** of the integrated screening checklist, including:

- Terrestrial Vegetation
- Wetlands
- Aquatic Vegetation
- Wildlife
- Fire Hazards
- Protected Natural Areas
- Species of Concern

6.4.1 Terrestrial Vegetation

6.4.1.1 Potential Effects

Construction

Vegetation clearing, including tree and understory species, will be required for several Project components. Tree clearing is typically accomplished using heavy equipment to fell, de-limb, and transport trees away from the site for processing. Heavy equipment is then used to remove stumps and remaining vegetation through a process called "grubbing." Grubbing will be required for construction of the access roads and the dam site.

The proposed headpond area will require removal of existing vegetation to reduce the potential for mercury methylation. Access roads and the transmission line route will require clearing to enable construction and ongoing maintenance. Along the transmission line route, trees will be cleared to limit the potential for power line failure and subsequent disruption of plant operations. Construction staging areas and the location of the substation will also need to be cleared. All merchantable timber will be harvested in accordance with the *Crown Forest Sustainability Act* and agreements with Tembec.

Vegetation clearing may result in increased potential for erosion (**Section 6.1.3**), alterations to the amount of shade on the river (**Section 6.2)**, and changes to nutrient inputs and outputs (**Section 6.2.4)**. Vegetation clearing could also result in loss or fragmentation of habitat for native plant species and wildlife (**Section 6.4.4**). Increased run-off may occur because of an increase in water yield in cleared areas, and reduced soil infiltration capacity, potentially resulting in increased erosion and potential sedimentation of watercourses.

Vegetation clearing will result in an accumulation of debris such as leaves, twigs, chips, and branches. If debris is allowed to enter watercourses, decomposition could result in increased oxygen demand and reduced oxygen levels. If debris is allowed to block streamflow in tributaries, fish passage, flow rates, and oxygen levels may be affected (MNR, 1988).

Vegetation clearing could also lead to a loss of vegetation biodiversity, changes to vegetation community types, introduction of edge effects (i.e., sunscald, wind-throw, and soil drying) to retained vegetation, or increase noxious or invasive plant species. During vegetation surveys, 31 exotic species were noted in the proposed locations of Project components. Using the Weediness Index, which quantifies the potential invasiveness of non-native plant species (Oldham et. al., 1995), twelve species (**Table 6.4**) were determined to have a moderate to high potential for invasiveness.

Table 6.4 Invasiveness Potential for Species within the Study Area

Scientific Name	Common Name	Potential Invasiveness (Weediness Index)
Bromus inermis ssp. inermis	Awnless Brome	High
Elymus repens	Quack Grass	High
Melilotus alba	White Sweet-clover	High

Table 6.4 Invasiveness Potential for Species within the Study Area

Scientific Name	Common Name	Potential Invasiveness (Weediness Index)
Pastinaca sativa	Wild Parsnip	High
Lotus corniculatus	Bird's-foot Trefoil	Moderate
Taraxacum officinale	Common Dandelion	Moderate
Hieracium aurantiacum	Devil's Paintbrush	Moderate
Hieracium caespitosum	Field Hawkweed	Moderate
Hieracium piloselloides	Glaucous King Devil	Moderate
Trifolium pratense	Red Clover	Moderate
Agrostis gigantea	Red-top	Moderate
Ranunculus acris	Tall Buttercup	Moderate

Although old growth forests and forest reserves have been identified in the Study Area, these areas will not be affected by the construction or operation of the Project as the nearest location is approximately 13 km away from Project components and is well outside the zone of potential influence for headpond formation. One rare plant species (yellow rattle) was identified through existing background information and during field programs (**Section 6.4.5**).

Operation

Increased run-off may occur because of an increase in water yield in cleared areas, and reduced soil infiltration capacity, resulting in increased erosion and potential sedimentation of watercourses. Trees and vegetation along the Project access road and transmission line right-of-way ("ROW") may require periodic trimming or removal. Application of herbicide to control vegetation during operations may result in effects to water or soil quality.

6.4.1.2 Mitigation and Protection Measures

Construction

Following relocation of the proposed dam and powerhouse were from Island Falls to Yellow Falls, additional lengths of access road and transmission line will be required. Based on previous work undertaken for the Island Falls location and overlap between the access road, headpond, and transmission line locations between the previous powerhouse site at Island Falls, and the current site at Yellow Falls, few rare plants or vegetation types are expected to be present. However, a botanist will undertake a survey of additional transmission line and access road lengths to ensure no rare plants or vegetation types will be affected by construction.

Vegetation will only be cleared where absolutely necessary. Areas to be cleared must be clearly marked using flagging tape, fencing, spray paint, or other signage prior to beginning any clearing activities. Trees will be felled into the area to be cleared to prevent damage to surrounding vegetation. Where possible, tree clearing will take place during winter months while the ground is frozen to reduce the potential for soil compaction and rutting and to avoid potential effects to nests of migratory birds (**Section 6.4.4**). Timber will be removed in the areas to be inundated in order to reduce mercury methylation. Final vegetation removal will take place

immediately before construction begins to minimize soil exposure. If absolutely required, limited areas may be cleared in advance to facilitate the construction schedule provided that erosion control measures outlined in **Section 6.1.3.2** are undertaken to limit soil exposure and erosion.

Most potential effects of tree clearing on watercourses can be reduced or eliminated if care is taken when clearing riparian areas and steep slopes. In riparian areas, the following mitigation measures to reduce erosion and potential sedimentation will be employed (adapted from MNR, 1991):

- A 3 m buffer of undisturbed vegetation (aside from tree species) must be left next to the banks of watercourses, including the Mattagami River. Heavy equipment should not be operated within the buffer. No grubbing is to occur and extra long winch cables should be used to remove felled trees in the buffer. Skid trails will be avoided near watercourses.

- Grubbing will not occur within or adjacent to the proposed operational shoreline level to limit the potential for soil erosion. This area is encompassed generally between 243 and 244 m contour levels.

- Construction crews will be educated about buffer zones and adhere to corresponding guidelines.

- Trees will be felled away from watercourses to prevent debris loading, impairment of fish passage, and increased oxygen demand.

- Temporary roads for clearing access will not be established in riparian areas.

- Slash and other clearing debris will not be piled near watercourses.

- Timber stockpiling will take place away from water and drainage ways and designated construction machinery storage or refueling areas.

- If clearing or grubbing activities expose mineral soil slopes, re-grading will be considered to limit the potential for erosion.

- Silt fence and staked straw bales must be installed adjacent to potentially affected watercourses or sensitive areas to reduce the possibility of sedimentation. Silt fence will be kept in good repair throughout construction until vegetation is reestablished and the potential for erosion returns to baseline levels. In areas where long or steep slopes exist, more than one silt fence should be installed (e.g. at top of slope, middle of slope, bottom of slope). Alternative erosion control measures including flow diversion berms are also acceptable. Whichever method is used, erosion control measures must limit the potential for eroded soil to enter watercourses.

Revegetation should take place as soon as possible following construction. Although no revegetation will be possible in the area cleared for the headpond, low growing, native plant species should be seeded on either side of the main access road and in the transmission line corridor to limit establishment of invasive or noxious species. Seed will be broadcast spread or otherwise distributed according to the producer's instructions. A seed mix containing non-invasive, native species for use in these areas will be developed in consultation with the District MNR office. Erosion control measures and materials will meet OPSS 577. Additional mitigation measures described in OPSS 182 will also be implemented as required.

Construction methods outlined in the MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990) will be followed for installation of access roads. Temporary access roads will be removed as soon as use of the road is no longer required. Biologically appropriate seedlings and whips will be planted as part of the revegetation program. Fertilizers will not be used to limit increased nutrient concentrations within watercourses.

Erosion control matting will be used on steep slopes to prevent migration of soil and subsequent impairment of vegetation re-growth. Live stakes, seedlings, or whips from appropriate native species (e.g. willow, dogwood, or trembling aspen) will be installed where appropriate to limit potential for future erosion.

Operation

During operation, the success of revegetation efforts will be monitored (see **Appendix J**). Areas where vegetation failed to grow or where erosion is occurring will be repaired and revegetated as soon as practicable using the mitigation measures described above. Only mechanical methods will be used to maintain vegetation. Application of herbicide will not occur.

6.4.1.3 Net Effects and Evaluation of Significance

Headpond formation, construction of the powerhouse and dam structure, access roads, transmission lines, and ancillary facilities will result in the removal of an area of vegetation for the life of the Project. However, vegetation removed as a result of the Project represents a small portion of habitat available in the Study Area. Routing of access routes and the transmission line along existing linear features will further reduce potential effects of the Project on vegetation.

Consequently, the significance of potential effects has been rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.4.2 Wetlands

6.4.2.1 Potential Effects

Construction and Operation

Provincially significant wetlands ("PSWs") are given special planning status in Ontario because of the important natural heritage functions these features provide. No PSWs are located in the

Study Area and no significant wetland communities were identified during background research or field surveys. Wetland types found in the Study Area are abundant throughout north-eastern Ontario.

The area of inundation contains wetlands in low-lying areas, including shallow marshes dominated by arrowhead, meadow marshes, thicket swamps, and heath lands subject to seasonal flooding. Effects on wetland hydrology are expected to be localized to the headpond area since wetland areas are primarily located in the Mattagami River valley.

The proposed main access and transmission line route traverses forested swamps dominated by black spruce and containing Labrador tea and moss. Some alder thicket swamps and meadow marshes also exist along the proposed route.

These wetlands can be particularly sensitive to soil compaction, siltation and sedimentation, and indirect effects resulting from the creation of new edges during access road and transmission line construction. Most tree species in swamps have shallow roots and are particularly sensitive to wind throw. Understory flora may also be sensitive to changes in temperature and moisture that can result from increases in sun and wind exposure when new forest edges are created. Furthermore, wetland drainage may be altered due to installation of the road surface and vegetation clearing.

6.4.2.2 Mitigation and Protection Measures

Construction and Operation

The mitigation and protection measures outlined below apply to access road and transmission line routes. No mitigation measures are required for wetlands that will be inundated by the proposed headpond. Construction methods outlined in the MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990) will be followed for installation of access roads.

Wherever possible, existing vegetation will be retained. Along access routes, tree roots will be left in place and not grubbed through wetland areas. Where roads cross wetland areas, culverts should be placed under the road in low-lying areas (e.g. swales) to facilitate drainage between wetland features.

Silt barriers (e.g. fencing or brush barriers) will be erected adjacent to construction areas within wetlands. These barriers should be monitored and maintained during and following construction until soils are re-stabilized with vegetation. Any surface runoff will be directed away from wetland units to avoid erosion or introduction of sediment.

All fuel and chemical storage and activities with the potential for contamination will occur in properly protected areas at least 30 m from wetlands.

Revegetation will take place immediately following construction. Low growing, native plant species should be established on either side of the main access road and in the transmission line corridor to limit establishment of invasive or noxious species. Seed will be broadcast

spread or distributed according to the producer's instructions. A seed mix containing non-invasive, native species for use in wetland areas will be developed in consultation with the local MNR office. Biologically appropriate seedlings and whips should be planted as part of the revegetation program.

6.4.2.3 Net Effects and Evaluation of Significance

Wetland types found in the Study Area are prevalent throughout much of north-eastern Ontario. There is limited potential for the Project to affect wetlands after mitigation and protection measures have been implemented. However, some wetland areas will be removed as a result of access road and transmission line construction, and formation of the headpond. Minor effects of access road installation may include increased wind throw and localized changes to wetland vegetation communities due to microclimatic and edge effects immediately adjacent to proposed access routes. The significance of potential effects on wetlands has been rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

Since the potential for the Project to affect wetlands is limited outside of the immediate area of construction, and affected wetland types are prevalent throughout the Study Area, no requirement for wetland evaluations is foreseen.

6.4.3 Aquatic Vegetation

6.4.3.1 Potential Effects

Construction

Approximately 4.5% of the existing Mattagami River area between Yellow Falls to immediately upstream of Loon Rapids contains mostly sparse aquatic vegetation cover. Aquatic vegetation community types are typically dominated by bur-reed or pondweed, which are prevalent throughout the Study Area. The amount of cover provided by aquatic vegetation in the Study Area is not generally high.

Operation

Existing submergent and emergent vegetation within the headpond area will be affected by the increase in water depth. However, the Project will result in a new littoral zone (roughly defined less than or equal to 2 m in depth) 16.2% (approximately 30,000 m^2) larger than currently exists (based on 2006 habitat characterization and measurement of area between the current average river elevation and 244 contours along the proposed headpond). Since the littoral zone is expected to increase by approximately 16.2%, and water velocity will be slower, new submergent and emergent vegetation is likely to be established naturally, potentially providing fish habitat for some species and moose feeding areas.

Background information and field surveys have not identified nuisance aquatic vegetation in the vicinity of the Project, nor will nuisance vegetation be imported for the purpose of the Project.

No aquatic plants of conservation concern were identified through existing background information or during field programs.

6.4.3.2 Mitigation and Protection Measures

As the amount of aquatic vegetation is expected to return to baseline levels or increase following inundation, no additional mitigation measures are required.

6.4.3.3 Net Effects and Evaluation of Significance

Aquatic vegetation provides cover for fish and food for wildlife, including moose. Inundation is not expected to have a significant effect on the amount of aquatic vegetation as the amount is expected to remain the same or increase as more habitats become available following formation of the headpond. As a result, the significance of potential effects is rated as minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.4.4 Wildlife

6.4.4.1 Potential Effects

Birds

Construction

The majority of bird species in the Study Area depend on extensive forest habitats. Some habitat will be lost to the headpond, and construction of the access road and transmission lines will result in the removal of some forest, but will generally follow existing roads or trails for the most part. Expanded right-of-way width necessary for access roads and transmission lines will result in some fragmentation of the habitat for area-sensitive birds.

Potential disturbance to birds during construction may arise from noise, and human activity. It is expected that the more sensitive birds, such as forest raptors, will temporarily avoid the forest areas adjacent to construction.

Operation

Disturbance during operation will be limited to road traffic from daily operator visits and ongoing maintenance, along with low-level noise from the plant. The bird species present are expected to become quickly habituated to this type of disturbance.

Amphibians and Reptiles

Construction

Four species of frogs were widespread throughout the Study Area, including in wet areas along the proposed access road and transmission line routes. These wet habitats are extensive within the Study Area. The limited disruption of amphibian habitat will have an insignificant effect on habitat availability. Standard access and sediment controls in wet areas will minimize the potential effects to these areas.

Operation

The formation of the headpond may affect rocky outcrop habitat, used by amphibians and reptiles. However, headpond creation with its associated reduction in flow velocity in the river and increased littoral zone may also create additional amphibian habitat.

Mammals

Construction

Additional areas suitable for moose feeding may be created As a result of increased littoral area. Approximately 4.5% of the existing Mattagami River area between Yellow Falls to immediately upstream of Loon Rapids contains mostly sparse aquatic vegetation cover under pre-construction conditions, although a much smaller proportion is composed of the preferred food plant species. Moose feeding area may increase post-construction, as the area of the littoral zone (less than or equal to approximately 2 m in depth) is expected to increase by 16.2% (approximately 30,000 m^2) and water velocity will be reduced. Inundation will result in the loss of current shoreline habitat that potentially provides feeding and denning habitat for mink and otter, and denning habitat for marten. Shoreline habitat will re-establish along the new headpond shoreline during initial operation.

Construction activities may create high levels of noise and human activity during work hours. Sensitive species will likely avoid the area, and movement patterns may be temporarily disrupted. Some mammals (such as raccoons and bears) may become attracted to the construction site if litter or food is not securely stored. No further direct effects on mammals are expected as a result of construction activities. Some mammal species that are more sensitive to disturbance, such as marten and lynx, avoid areas with even low levels of human activity.

Operation

Disturbance during operation will result from limited road traffic and low-level noise from the plant. Improved access may also result in increased local use of the roads and headpond for fishing or other activities. Most species of wildlife become quickly habituated to this type of disturbance. The species that are more sensitive to disturbance, including marten and lynx, will likely continue to avoid areas with even low levels of human activity. Traffic is not expected to be at levels sufficient to influence mammal movement.

6.4.4.2 Mitigation and Protection Measures

Construction

It is recommended that tree clearing for the access road and transmission line routes, as well as the area to be inundated by the headpond, take place outside the core breeding season (May 16th to July 31st) for forest birds to avoid disruption or destruction of nests. Tree clearing activities for the Project should occur during the winter months if possible. If tree clearing is required during the core breeding season, an ornithologist will undertake a nest survey prior to clearing to identify nesting birds. Identified nests will be provided with an appropriate clearing buffer as recommended by the ornithologist until breeding season has ended and young have fledged.

To the extent possible, clearing and blasting activities will be timed for the mid-summer, fall, and/or winter so that disturbance to wildlife breeding and breeding bird nesting is avoided. To limit habitat disturbance, vegetation removal will be minimized where possible.

Habitat may be created or enhanced for breeding or staging waterfowl and moose through inundation and the associated increase in river run. Habitat effects on area-sensitive forest birds will be minimal, as only a small area of edge forest trees will be removed. Disturbance during construction can be partly mitigated by conducting activities at appropriate times. Construction personnel will avoid interacting with wildlife. Litter and food will be disposed of promptly and stored securely if left on site.

Noise suppression equipment will be used to decrease the noise created during the construction phase of the Project, thereby decreasing the potential for wildlife movement being disrupted as a result of increased noise within the Study Area.

Operation

Throughout operations, tree trimming or removal as required for maintenance of the transmission line ROW will take place outside of the core breeding season of between May 16th and July 31st. Additionally, large-scale maintenance operations that may require tree clearing or other activities that may affect breeding birds or other wildlife will be undertaken outside the May 16th and July 31st breeding season or in consultation with a qualified ornithologist or biologist.

Operations and maintenance personnel will avoid interacting with wildlife. Litter and food will be disposed of promptly and stored securely if left on site.

6.4.4.3 Net Effects and Evaluation of Significance

Wildlife in the Study Area may be habituated to periodic disturbance through harvesting activities. The effects of the Project on wildlife are anticipated to be similar to effects associated with historic and ongoing natural and anthropogenic habitat disturbance in the area.

Habitat disturbance will be minimized since access roads and transmission lines will follow existing linear features. Habitat for some species, including staging waterfowl and moose may be improved. As a result, the significance of potential effects has been rated as minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.4.5 Species of Concern

6.4.5.1 Potential Effects

Construction and Operation

Species at Risk in Canada

Monarch butterfly (*Danaus plexippus*) was sighted during wildlife surveys. This migratory species has been designated under the federal *Species at Risk Act* ("SARA") because it is threatened by increasing use of pesticides, loss of old field and meadow breeding habitat, and loss of wintering habitat in Mexico (Environment Canada, 2006a). Monarchs rely on stands of milkweed species, which were not recorded in the Study Area. This species is known to occur north of the Study Area (Layberry et al., 1998), and individuals observed during wildlife surveys were likely migrants moving through the Study Area. This species is unlikely to be affected by Project construction or operation.

No other flora or fauna listed under Schedule 1 (threatened, endangered, or special concern) of the SARA are present in the Study Area (EC, 2007).

Committee on the Status of Endangered Wildlife in Canada Listed Species

The following Committee on the Status of Endangered Wildlife in Canada ("COSEWIC") listed birds have been noted as present in the Study Area in the Atlas of the Breeding Birds of Ontario (**Table 6.5**). However, none of the following birds are listed in Schedule 1 of the SARA. Mitigation and protection measures for birds are provided in **6.4.4.2**.

Table 6.5 Ontario Breeding Bird Atlas COSEWIC Listed Species

Region	Square	Species	Breeding Evidence Category	No. of Records	COSEWIC Status
42	17MQ65	Rusty Blackbird	POSS	1	Special Concern
42	17MQ40	Short-eared Owl	POSS	1	Special Concern
42	17MQ65	Canada Warbler	POSS	2	Threatened
42	17MQ40	Common Nighthawk	POSS	1	Threatened
42	17MQ65	Olive-sided Flycatcher	POSS	2	Threatened

Species at Risk in Ontario

The Bald Eagle (*Haliaeetus leucocephalus*) is listed in northern Ontario as a species of Special Concern by the Committee on the Status of Species at Risk in Ontario ("COSSARO") and the Species at Risk in Ontario ("SARO") regulation (O. Reg. 230/08). The preferred breeding habitat for Bald Eagle is adjacent or close to relatively clear and shallow (less than 1 m) water bodies with productive fish populations. Most significant nesting habitats have numerous large conifer and/or deciduous trees in good condition along the shoreline, providing birds with good visibility and a clear flight line to the nest (MNR, 2000). Bald Eagles do not currently nest along the proposed headpond, although a nest was sighted in the vicinity of the North Muskego River

approximately 14 km downstream of the Project site. However, the proposed headpond will increase the littoral zone (less than 2 m depth) area by approximately 30,000 m^2 following construction. Water velocities will be reduced compared to existing conditions and provide for an increase in potential habitat, so it is unlikely that the Project will affect this species.

No other flora or fauna listed under the SARO regulation not listed on Schedule 1 of the SARA or through COSEWIC have been noted in the study through field work, anecdotal information, or the NHIC database.

Provincially and Locally Rare and Vulnerable Species

One rare plant species, Yellow-rattle (*Rhianthus minor ssp. groenlandicus*), was noted during vegetation surveys. Yellow-rattle is ranked S3 (vulnerable in the province due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation). This species is absent in southern Ontario, hence its provincial rarity ranking; however, this plant is locally common and was observed on the roadside and trails off Highway 655, but was not observed at the Project site. This species is unlikely to be affected by Project construction or operation.

The NHIC database (2007) indicated that three other ranked species may occur in the Study Area. *Sphagnum jensenii*, a moss, was recorded in 1976 and is ranked by the MNR as S2 (imperiled in province because of rarity due to very restricted range, very few populations [often 20 or fewer], steep declines, or other factors making it very vulnerable to extirpation from the province). Red-disked Alpine (*Erebia discoidalis*), a butterfly, was recorded in 1992 and is ranked by the MNR as S3 (vulnerable in the province due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation), and Lake Emerald (*Somatochlora cingulata*), a dragonfly (no record date available), is ranked by the MNR as S2S3 (imperiled to vulnerable). These species were not observed during vegetation and wildlife surveys, and it is not anticipated that the Project will affect these species.

6.4.5.2 Mitigation and Protection Measures

Construction and Operation

A small number of migrant Monarch butterfly mortalities may occur as a result of collision with vehicles or other Project components, as commonly occur on roadways throughout Ontario. However, populations are unlikely to be affected by construction or operation of the Project as habitat or staging areas are outside the potential zone of influence. Therefore, no mitigation or protection measures are necessary for this species.

Yellow-rattle occurrences will be noted where Project components will be constructed. If Yellow-rattle will be affected by construction, plants will be transplanted to a more suitable location, in consultation with terrestrial biologists.

Due to noise and human activity, construction may prevent Bald Eagles from utilizing the area in the immediate vicinity of Yellow Falls and the proposed headpond area during construction.

Once operation begins, the increase in littoral zone and reduction in water velocity throughout the headpond area may result in more suitable conditions for Bald Eagle foraging and breeding. Large trees must be left along the shoreline of the proposed headpond to provide suitable nesting habitat where possible. Since the Project may result in an improvement to potential Bald Eagle habitat, no further mitigation or protection measures are necessary.

Species noted in the NHIC database have not been recently recorded in the Study Area and were not noted during vegetation and wildlife field surveys conducted by Stantec. With the exception of *Sphagnum jensenii*, these species are able to disperse from areas where Project activities will occur and are unlikely to be affected by construction or operation. As a result, no mitigation or protection measures are required.

6.4.5.3 Net Effects and Evaluation of Significance

The Project may result in a slight improvement to Bald Eagle habitat due to increase in littoral area and lower water velocities in the headpond. The Project is unlikely to affect any other species of conservation concern. Consequently, the significance of net effects has been rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.4.6 Fire Hazards

6.4.6.1 Potential Effects

Construction and Operation

The Project is located in the MNR East Fire Region (Zone 16). The Project site is located in a forested area where fire is a naturally occurring disturbance. However, from 1997 to 2006, approximately 41% of wildfires were started by people (MNR, 2002). Construction equipment and personnel have the potential to unintentionally start forest fires through use of equipment, welding, metal cutting, blasting, burning of woody debris, cooking fires and barbeques, or careless disposal of cigarettes.

Uncontrolled forest fires have the potential to damage infrastructure and equipment, cause loss of life or severe health problems, and destroy wildlife habitat. Forest fires also cause the loss of merchantable timber and potentially reduce the area available for outdoor recreation.

Timber stockpiling and tree limbing activities may increase potential fuel loads during the construction period of the Project.

6.4.6.2 Mitigation and Protection Measures

Construction and Operation

During construction and operation, the proponent must adhere to the requirements of the *Forest Fires Prevention Act* (RSO 1990, C. F.24) and the *Modifying Industrial Operations Protocol* developed by the Aviation and Forest Fire Management (“AFFM”) unit of the MNR (2007).

A fire prevention and preparedness plan must be developed and approved by the MNR Cochrane District Fire Management Supervisor prior to construction, including (MNR, 2007):

- Proponent, contractor, MNR, and emergency contacts
- Type of operation by risk category
- Fire prevention planning
- Fire prevention monitoring
- Fire preparedness monitoring

Fire extinguishers must be located within 5 m of each piece of construction equipment. Backpack pumps will be located on each piece of heavy equipment (e.g. feller buncher, excavators, etc) or as required by the fire prevention and preparedness plan. A fire equipment cache containing pumping units, backpack pumps, shovels, axes, and any other equipment needed to suppress forest fires must be located near worksites. Appropriate fire training must be given to all personnel. 25% of employees must have training that meets the MNR SP-102 standard (MNR, 2007).

Organic debris such as brush and non-merchantable timber will be piled and burned, or immediately chipped and removed from the work site to an appropriate location. Organic material will be removed at least 1 m around the debris pile. Debris must be burned in an excavated pit to reduce the potential for wind to spread the fire. No burning is to occur under windy conditions. A fire permit from the MNR District Office will be required to burn any material. Care must be taken to avoid burning on peat-based soil.

6.4.6.3 Net Effects and Evaluation of Significance

No effects resulting from accidental fire are expected to result from the Project provided that the mitigation and protection measures described above are implemented. Consequently, the significance of net effects is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.4.7 Protected Natural Areas

6.4.7.1 Potential Effects

Construction and Operation

No ANSIs, ESAs, provincial parks, federal parks or candidate parks have been identified in the Study Area. There are three conservation reserves and one forest reserve within the Study Area. These reserves are well outside of the Project footprint (see **Figure F2-7**) and it is not anticipated that the Project will have an effect on these areas.

6.4.7.2 Mitigation and Protection Measures

Construction and Operation

Since the Project is unlikely to have an effect on protected natural areas, no mitigation measures are required.

6.4.7.3 Net Effects and Evaluation of Significance

No effects on protected natural areas are expected to result from the Project. Consequently, the significance of net effects is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.5 AQUATIC ENVIRONMENT

This section refers to the criterion described in **Section 4 - Natural Environment** of the integrated screening checklist, including:

- Fish Habitat
- Fish Movement
- Fish Survival
- Lake Sturgeon
- Benthic Organisms
- Fish Sanctuary

6.5.1 Fish

6.5.1.1 Potential Effects

Construction

Fish Habitat

Fish habitat is characterized by substrate type, water depth, water velocity, water temperature, morphological features such as riffles, pools, and runs, and the presence of aquatic vegetation. Habitat requirements vary for each species of fish and different habitat types may be used for foraging, spawning, overwintering, and at different life stages. The construction of the dam and powerhouse structure will likely be considered a Harmful Alteration, Disruption, or Destruction of fish habitat ("HADD") as defined by Fisheries and Oceans Canada ("DFO"). Construction activities will affect fish habitat and movement, and may affect survival, though those effects will be mitigated to the extent possible.

Construction of the dam and powerhouse structures will result in the loss of approximately 3,652 m^2 of fish habitat during the life of the Project. However, formation of the headpond will create approximately 71 ha of additional aquatic habitat. Dominant substrate in this area is bedrock and boulders (**Appendix G1, Figure IV3-1**). Morphological features include falls and run (**Appendix G1, Figure IV3-2**). Field studies conducted in 2006 and 2007 identified potential

spawning activity 50 to 100 m downstream of Yellow Falls near the east bank of the Mattagami River by white sucker. During 2006 Aquatic Assessment work, a small number of walleye and white sucker were captured downstream of Yellow Falls. During the Spring 2007 Fish Habitat Utilization Survey (Golder, 2007; **Appendix G2**), only white sucker were noted downstream of Yellow Falls. The Project will not be located on the potential white sucker spawning habitat downstream of Yellow Falls.

Fish Movement

Yellow Falls is likely impassable by fish migrating upstream (**Appendix G1-II**). However, some downstream travel by eggs and larvae of target fish species may occur. Downstream fish passage over Yellow Falls will be maintained in during Stage One of dam construction. Following installation of the Stage Two cofferdam, eggs and larvae will be able to pass through the spillway gates and powerhouse.

During cofferdam construction and subsequent pumping from the construction area (**Section 6.2.2**) there is potential for stranding fish remaining in the area.

Survival

Explosives will be used to excavate powerhouse and dam foundations. Explosives can change water pressure, potentially resulting in damage to internal organs, and vibration that may damage incubating eggs (Wright and Hopky, 1998). Explosives work will be conducted in the dry, so it is unlikely that this work will have any effect on local fisheries.

Fish Sanctuary

A fish sanctuary is located immediately downstream of Lower Sturgeon Generating Station and extends to the northern boundary of Mahaffy Township (**Figure F2-7**). This fish sanctuary was created to protect walleye spawning habitat from recreational fishing pressure (MNR, 2007) and is located approximately 15 km south of the terminus of the proposed headpond at Loon Rapids. Thus, the fish sanctuary will be not be affected by the formation of the headpond or the Project in general.

Operation

Fish Habitat

Although the run-of-river operational approach and proposed dam design will operate within the existing regulated flow regime, flows downstream of Yellow Falls will be concentrated to turbine outlets and the gated spillway, thus changing the orientation of flows at the base of Yellow Falls where small numbers of white sucker are presumed to spawn.

Inundation of the headpond will change upstream habitats due to increased water depth. The operation of the dam will result in the formation of a headpond behind the 15 m high dam and will generally change the 6 km reach upstream of Yellow Falls from a lotic (fast-moving) environment to a lentic (slower moving) environment (**Section 6.2.2**). While creation of the headpond will modify existing riffle sequences into runs, including Davis Rapids and Loon Rapids, it will create additional new habitats such as over-wintering habitat. Headpond

formation will nearly double the existing aquatic habitat area above Yellow Falls. The river reach between Yellow Falls and Loon Rapids has an area of approximately 89 ha, while the inundated area will add approximately 71 ha of new aquatic habitat, for a total headpond area of 160 ha.

Based on sampling data from 2006 and 2007 field work, along with a radio telemetry study carried out in 1990 (McKinley and Sheehan, 1990), the loss of riffle habitats between Yellow Falls and Loon Rapids is considered to be non-significant to the spawning success of white sucker, walleye, northern pike, and other species. Though those species are present in this stretch of river during spawning periods, they are present at very low abundances. Populations of walleye, white sucker, pike and lake sturgeon are maintained as a result of successful spawning activities at the base of Island Falls (or other adjacent habitats as in the case of pike), and it is supposed that populations in the downstream reach are somewhat supported by drift of fish from the upper reach. Upstream populations of each of those species appear to be maintained by spawning activities at or near the Lower Sturgeon Generating Station (in the case of sturgeon, walleye and likely suckers), and in tributaries such as Rat Creek (such as walleye and white sucker). Riffle habitats between Yellow Falls and Loon Rapids are not suitable spawning habitats for northern pike. There are many alternative spawning areas for each of the four target species, such that they will be unaffected by the proposed headpond (**Appendices G1** and **G2**).

Substrate in is the affected river reach is dominated by boulder and cobble mixed with areas of sand, silt, clay, gravel and bedrock (**Appendix G1, Figure IV3-1**). The river in this area is dominated by runs/flats and riffles with occasional shallows and pools. Following commencement of operations, the affected reach will be dominated by pool habitats, with most of the pool habitats occurring in the lower sections of the headpond. The upper headpond will generally consist of runs/flats.

Through inundation, areas with deeper pools and submerged bedrock features will be created (e.g., submerged islands and rapids), and will result in an increase of in-stream cover. Existing in-stream cover provided by some bedrock features such as boulders and rapids could be reduced due to deposition of river sediments. With slower, run/flat morphology, the river will become more depositional in nature. Areas downstream of Yellow Falls and at Davis Rapids with a high percentage of cobble substrate will experience increased sediment deposition (**Section 6.2.3**).

Cobble substrate is favourable for white sucker, walleye, and lake sturgeon spawning. Based on field studies in 2006 and 2007, use of areas with cobble substrate at Yellow Falls and Davis Rapids is limited. Although these potential spawning areas may change into deeper pools, these new areas will provide new rearing/foraging habitat. Littoral or shallow areas (i.e. less than 2 m depth) populated by northern pike will become deeper. However, new shallows will be generated at back shore areas following headpond inundation.

The headpond will provide approximately 16.2% (30,000 m^2) more shallow littoral habitat than currently exists, an area anticipated to be highly productive in terms of generating benthic and

fish biomass (**Appendix G1**). The increase in littoral fish habitat will benefit a number of fish species including those that require slower velocities such as young-of-year pike and white sucker, and smaller-bodied species such as shiners, dace, and darters.

The existing littoral zone occurs throughout the channel with varying flow velocities and substrate that is predominantly gravel and coarse rock. The post-construction condition will have reduced flow velocities at all flow volumes. Average existing flow velocities at average flow volumes are generally greater than 1 m/s. Following Project construction, flow velocities decrease to an average of approximately 0.3 m/s. Slower velocities in the headpond will likely result in deposition of fine sediments, especially along the margins of the headpond in the littoral zone (**Section 6.2.3**). Over time, the littoral area will provide additional spawning, rearing and foraging habitat for northern pike with the establishment and growth of aquatic plants.

The littoral zone of the new headpond will contain a benthic community that is relatively productive and diverse which will provide food for sturgeon and other benthic feeding fishes such as white and longnose sucker, as well as forage fish such as darters and sculpins.

Potential spawning habitats for walleye in Rat Creek will be inundated, but will also be replaced (naturally via access to suitable new areas further upstream in the tributary through inundation) by new spawning habitats of similar size for these two species.

Fish Movement

Yellow Falls is considered a naturally impassable obstacle to upstream fish movement. Construction of the dam/powerhouse structure at Yellow Falls will not affect the current inability for fish to move upstream past this structure. It is unlikely that the fish species within the Mattagami River are able to ascend Yellow Falls under most flow conditions. If fish can successfully ascend the falls, it is unlikely they do so in large numbers. The ecological significance of such passage by a few individuals would be negligible to the overall sustainability of local populations both upstream and downstream of Yellow Falls.

Riffles at the base of Yellow Falls were not used as a major spawning area, relative to riffle habitats at the base of Island Falls. Fish (primarily small numbers of white sucker) that would normally use the Yellow Falls riffle for spawning can be expected to switch to spawning at the base of Island Falls.

Survival

Impingement and entrainment are potential hazards to fish once the dam is in operation. Impingement occurs when flowing water causes fish to be pinned or trapped against water intake structures or trash racks. Studies suggest that fish mortality related to impingement in small hydro electric projects is negligible (**Appendix G1**). For example, results of various monitoring programs at three hydro sites indicate no evidence of fish mortality caused by impingement (Heisey et al., 1996).

Entrainment occurs when fish in the water column pass through the water intake and power generating turbines. Entrainment typically involves smaller organisms, such as small fish and

ichthyoplankton (i.e., fish eggs and larvae), and other aquatic organisms (Cada, 1990). Once entrained in the intake water, organisms will pass through the turbine. Fish injury or mortality is a concern when fish pass through the turbines of a hydroelectric facility, as injuries and mortalities can result in negative effects on fish populations. In general, smaller fish suffer lower injury rates passing through turbines, likely due to the ability of smaller fish to pass between gaps in the turbine blades without making physical contact. Injuries and mortalities can be minimized by reducing the number of entrained fish (i.e., diverting fish from the water intake via physical transportation or bypass) and improving passage conditions within the turbine (Cada, 2001).

Fish that are small enough to pass through the trash rack (i.e., those with a girth less than 23 mm) could become entrained into the turbines. Fish small enough to become entrained (<200 mm in length) are likely to have survival rates greater than 95% (Skanski et al, 2001; Heisey et al, 1996) when passing through turbines. Consequently, most of the entrained fish will enter downstream areas alive.

Factors that can contribute to mortality of entrained fish are fish species and post-passage predation. Fish passing through a turbine are subjected to a variety of stresses, including shear, change in water pressure, and turbulence. These stresses can cause a loss of equilibrium and disorientation, which can lead to increased susceptibility to predation. These additional factors have not been rigorously studied, therefore the significance is currently unknown (Cada, 2001).

Entrainment is anticipated to be minimal since none of the target species makes significant downstream migrations. Passive drift may occur in the fry stage for some species; however, during that life stage, fish are of a size that would pass through the turbines with high survival rates. Larger fish will be rheotactic (generally swim upstream) when encountering the initial downstream flows associated with the intake (turbines), and will utilize burst speeds to overcome intake velocities and move away from the turbine intakes.

Fish Sanctuary

The fish sanctuary is located approximately 15 km upstream of the terminus of the proposed headpond and will not be affected by the construction or operation of the Project.

6.5.1.2 Mitigation and Protection Measures

Construction and Operation

Fish Habitat

Alterations to fish habitat in the Mattagami River, resulting from the construction of the proposed dam, will require YFP to obtain an authorization from the Department of Fisheries and Oceans. Formation of the headpond results in an overall net gain in aquatic habitat. However, relative abundance of different habitat types will be altered due to the overall lentic nature of the headpond.

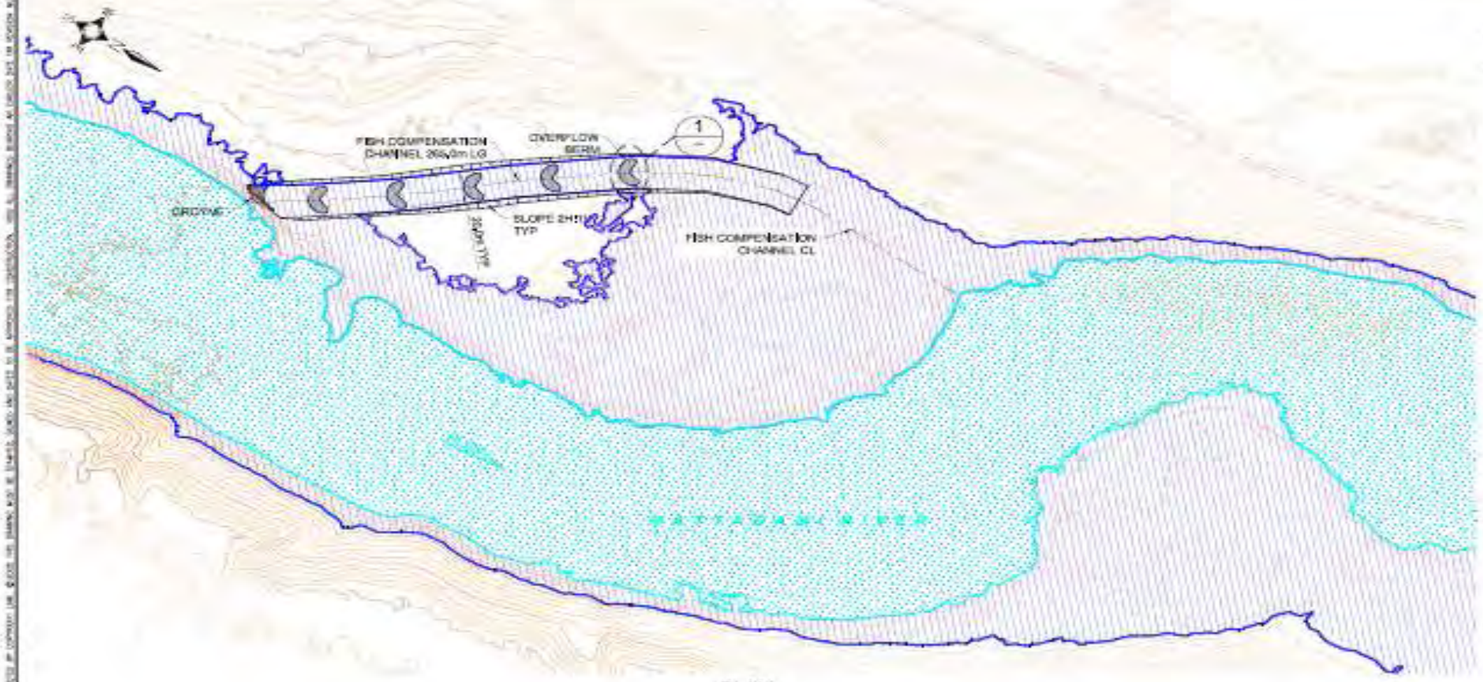
YFP has developed the Yellow Falls Hydroelectric Project Fisheries Compensation Plan (**Appendix G4**) to identify potential habitat compensation and mitigation measures. Potential compensation options were evaluated in terms of expected benefits and limitations. As a result some compensation options were determined to be infeasible due to constructability concerns, limited potential effectiveness, or low alignment with preferred agency compensation strategies. The preferred compensation options proposed by YFP that appear feasible for incorporation into the Project design are summarized below. Discussions with agencies regarding mitigation and protection measures are ongoing and the final compensation methods will require DFO approval prior to construction.

Construction of Headpond Spawning Habitat

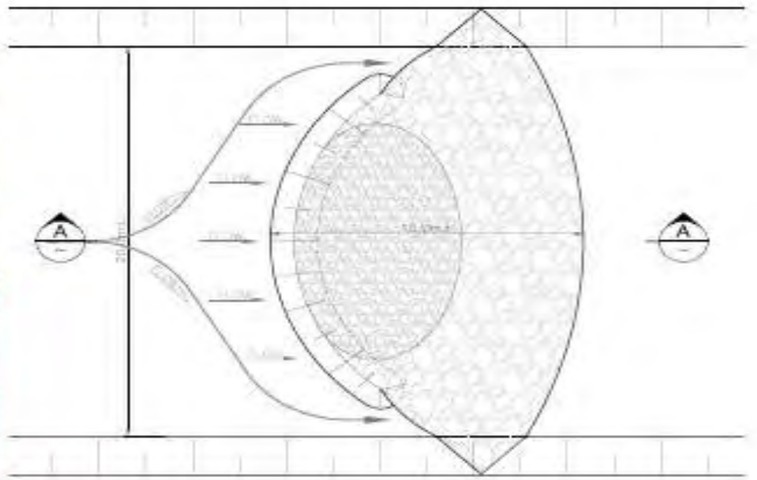
Fisheries assessment investigations undertaken for the Project in 2006 and 2007 identified the physical suitability of Loon Rapids and Davis Rapids for spawning, however limited spawning activity/utilization was identified during two years of fisheries investigations. Despite this limited utilization of these habitats for spawning, the Project will alter their morphology of these habitats, and will result in the reduction of riffle/rapid morphology within the local Study Area.

Accordingly, YFP proposes to create artificial spawning habitat approximately 1 km upstream of Yellow Falls. At this location, headpond creation (headpond elevation 244 m) will result in the establishment of an area of shallow water, with water depths varying between 0 metres (exposed ground) and 1 metre, surrounding an ‘island’ of greater elevation. Water depths of 0.5 to 1 metre are consistent with the range of ideal water depths for spawning habitat for three of the four target species; walleye, lake sturgeon, and white sucker (**Appendix G4**).

The constructed habitat will consist of an excavated channel with a bottom elevation of 243 m. The channel will include the construction of flow deflectors to induce turbulent flow within the channel, as well as the placement of cobble and boulder substrates. Channel construction will be undertaken prior to headpond filling. The habitat channel is shown in (**Figure 6.9**). A full description of the habitat channel is provided in (**Appendix G4**).

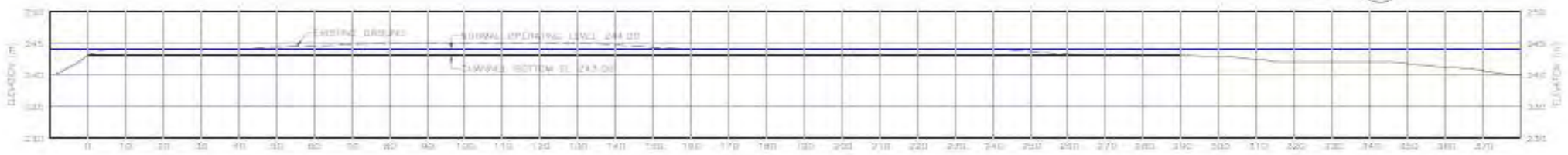


PLAN
1:3000



DETAIL 1
1:250

SECTION A
1:40



PROFILE
HOR 1:1200
VERT 1:600

NOTES

1. BASE CONTOURS FROM LIDAR SURVEY FLOWN JUNE 2005 BY TERRAPOINT CANADA INC.
2. ELEVATIONS ARE CANADIAN GEODETIC DATUM.
3. CONTOUR INTERVAL IS 1m.

LEGEND

INUNDATED AREA - WATER LEVEL (244.0m)

EXISTING ROADS

0	30	60	90	120	1:3000
0	12	24	36	48	1:1200
0	2.5	5.0	7.5	10.0	1:250
0	0.4	0.8	1.2	1.6	1:40

METRES

REV	Y	M	D	REVISION DESCRIPTION	DES	DRN	CHK
0	06	09	19	ADDED OVERFLOW BERMS	SJS	ITP	SJS
A	06	09	19	FIRST ISSUE	SJS	VNK	SJS

Canadian Projects Limited
CALGARY, ALBERTA

Yellow Falls Power LP

YELLOW FALLS POWER LIMITED PARTNERSHIP

YELLOW FALLS HYDROELECTRIC PROJECT GENERAL HEADPOND - FISH COMPENSATION PLAN, PROFILE & SECTION	PROJECT NUMBER 1032-002 CAD NUMBER 4.3.111 DRAWING NUMBER Figure 3,1

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ENVIRONMENTAL ASSESSMENT REPORT

FIGURE NO.
6.9

Improvement of Spawning Habitat at North Muskego River

In the spring of 2007 and summer of 2008 the North Muskego River was assessed to determine its utilization by the target species. A bedrock outcrop and associated rapids located four kilometres upstream of the Mattagami River mouth was identified as being utilized by spawning walleye and white suckers (Golder, 2007). This location was identified as the lone opportunity for potential compensation within the tributaries in the Study Area, due to access restrictions elsewhere.

Construction of habitat within tributaries upstream and downstream of the Project is not considered feasible due to the potential environmental impacts associated with the construction and maintenance of the access roads required for habitat construction and monitoring/maintenance activities, as well as the limited suitability of the tributaries for habitat construction efforts **(Appendix G4)**. However, this rapids feature within the North Muskego River is in relatively close proximity to existing trails and to Red Pine Road, and possesses suitable flows and gradient for the proposed riffle habitat construction.

At this location, the potential exists to introduce constructed spawning habitat in association with the rapids feature that currently exists. Based on in-field observation by Golder Associates during the 2007 spawning season, and bathymetric measurements undertaken in 2008, there is opportunity for habitat construction along the margins of the existing rapids feature, adjacent to the shoreline. **Figure 6.10** shows the substrate characteristics and bathymetric conditions at this location.

Habitat construction is proposed to occur on an existing bedrock shelf which currently contributes limited habitat value. Construction at this location will utilize the backflows and eddies presently occurring over the bedrock shelf, which appear sufficient provide suitable flows for spawning by lake sturgeon, walleye, and white sucker.

The proposed habitat construction will consist of placement of cobble substrate to a variable depth of 0.5 – 2 metre below the typical water surface elevation. The proposed habitat construction will provide additional spawning habitat that is suited to all four target species, and that will be accessible to these species during the spawning period. Construction of habitat at this location also reflects the apparent affinity of the local fish populations for tributaries during spawning.

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LEGEND

- Habitat Photo Location and Direction
- Flow Direction
- Mesohabitat Definition Limit
- Falls
- Local Road
- Railway
- River or Stream
- Wetland
- Waterbody
- Wooded Area

Habitat Type

FA/CH	Falls/Chute - Water falling over vertical drop, channel constriction due to bedrock
FL	Flat - Flat, low velocity, near laminar flow, more depositional than run habitat type
P1	Pool - Pool, highest quality pool habitat based on size and depth, generally >1.5 m deep
R2	Run - Class 2 Run, moderate quality/depth, high/moderate instream cover except at low flow

REFERENCE

Digital NNR NRVIS data provided produced by Golder Associates Ltd., used under licence from the Ontario Ministry of Natural Resources. © Queens Printer 2006
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

2 0 2
SCALE 1:12,500 KILOMETRES

PROJECT
YELLOW FALLS POWER LP
ISLAND FALLS HYDROELECTRIC PROJECT

TITLE
LOCATION OF BEDROCK OUTCROP
ON NORTH MUSKEGO RIVER

Golder Associates Sudbury, Ontario

DESIGN	PM	15 July 2007	FIGURE: 3-2
GIS	SR	16 Aug. 2007	
CHECK	PM	16 Aug. 2007	
REVIEW	JC	16 Aug. 2007	

Stantec

Yellow Falls Power LP

PREPARED FOR:
YELLOW FALLS POWER LP
ENVIRONMENTAL ASSESSMENT REPORT

FIGURE NO.
6.10

Movement

Following cofferdam construction, water will be pumped out of the construction area. Once water reaches a suitable level for wading, workers will remove fish remaining in the area using a seine net, dip net, or backpack electrofisher as appropriate. Any fish caught will be documented, placed in a pail containing clean water, and quickly transported to the Mattagami River downstream of the cofferdam area. Fish removal and relocation will be considered complete when no more fish are readily caught. A scientific fish collection permit, obtained from the MNR, will be required for this process. Water pumping will occur at such a rate as to ensure survival and capture of the maximum number of fish possible.

Design features of the Project such as the gated spillway will allow passage of large quantities of water and could be utilized by larval and juvenile fish for downstream passage through the dam structure. Flow and river conditions downstream of the Project shall remain relatively unchanged during operation thus limiting the potential effects to fish during this time.

Survival

To mitigate potential effects to fish from the use of explosives near the Mattagami River during construction of the Project, DFO *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky, 1998) will be implemented. The guidelines recommend the following mitigation measures:

- Ammonium nitrate-fuel oil mixtures will not be used
- Holes in which charges have been laid will be back-filled (stemmed) with angular gravel to the level of the substrate/water interface or the hole collapsed to confine the force of the explosion to the formation being fractured. The angular gravel is to have a particle size of approximately 1/12th the diameter of the borehole.
- All “shock-tubes" and detonation wires are to be recovered and removed after each blast.
- No explosive is to be knowingly detonated within 500 m of any aquatic mammals such as otters and beavers (or no visual contact from an observer using 7x35-power binocular).
- No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swimbladder of a fish.
- No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation.

Impingement may occur to larger aquatic organisms that become entrained in the intake water and trapped against the trash rack. Therefore, in order to reduce the possibility of impinging smaller organisms, trash rack spacing of 23 mm has been proposed for the Project. Such

spacing should allow aquatic organisms small enough to become entrained, to pass through the trash racks without experiencing the effects of impingement. Velocities at the intake screens will be 0.6 m/s, which is slower than the burst speeds of small sturgeon (0.7 m/s), the poorest swimming species in the river (**Table 6.6**; **Appendix G1**).

Table 6.6 Burst and prolonged swimming speeds of lake sturgeon, northern pike, walleye, and white sucker in relation to fish length

Species	Burst Swimming Speed (m/s)			Prolonged Swimming Speed (m/s)		
Fish Length	20 cm	40 cm	>50 cm	20 cm	40 cm	>50 cm
Lake Sturgeon	0.65-0.85[ab]	0.9[a]	1.9[a]	0.37-0.75[ab]	0.2[a]	0.85[a]
Northern Pike	n/a	4.7[d]	n/a	0.25[c]	0.37[c]	0.42[c]
Walleye	1.9[a]	2.3[e]	2.5[e]	0.43[e]	0.85[c]	1.14[e]
White Sucker	n/a	n/a	n/a	0.52[c]	0.76[c]	0.86[c]

a – Peake et al., 1996, b – Smith, 2006; c – Jones et al., 1974; d – Harper and Blake, 1990; e – Peake et al., 2000

Recent research conducted by CHD (with significant input from Chris Katopodis of DFO) for the Dunvegan Hydroelectric Project in the Peace River, Alberta provided the following estimates of fish fork lengths that are excluded at various trash rack bar spacing (**Table 6.7**).

Table 6.7 Trash Rack Spacing for Northern Pike and Walleye

Fish Species	Trash Rack Spacing
Northern pike	8.7 to 31.7 mm
Walleye	29.2 to 37.2 mm

Since average fork length of adult fish in the target species group within the Study Area is greater than that found for the same species in the Dunvegan project, the trash rack spacing requirement of 23 mm calculated for the Dunvegan Project will adequately address exclusion requirements at the Project site.

Fish Sanctuary

Since the fish sanctuary will not be affected by the Project, no mitigation or protection measures are required.

6.5.1.3 Evaluation of Significance

The Project will be constructed at a natural barrier that is considered impassable to fish. Approximately 95% of small fish and larvae that become entrained will pass through the turbines unharmed. Additionally, larger juvenile and adult fish will be able to avoid entrainment as their burst speeds exceed intake velocities. Although some mortality is anticipated, percentages of fish killed are not expected to be high.

During construction, effect of explosives on fish can be mitigated using standard measures.

The Project will adhere to the DFO “no net loss of productive capacity” policy. Mitigation and protection measures in compliance with this policy are provided in **Appendix G4**.

Fish spawning surveys conducted during 2006 and 2007 have not identified significant utilization by fish of existing riffle/rapid habitats in the stretch of river between Yellow Falls and Loon Rapids. Long-term monitoring of the fishery in the Study Area will be a requirement as detailed in **Appendix J**.

The Fish Sanctuary located downstream of Lower Sturgeon GS will not be affected by the Project.

Consequently, effects of the Project on fish are rated low (slight decline in resource in Study Area during the life of the Project).

6.5.2 Lake Sturgeon

6.5.2.1 Potential Effects

Construction and Operation

Due to the unique challenges facing lake sturgeon populations world-wide, and their importance to local anglers as expressed during public consultation activities, effects of the Project on this species are addressed separately in this section. Lake sturgeon abundance within the Moose River basin as a whole is considered low, and the most recent assessment by the Committee On the Status of Endangered Wildlife In Canada (“COSEWIC”) has recommended that the James Bay populations, of which the Moose River is a part, be designated a species of “special concern” under the federal *Species At Risk Act* (“SARA”). However, the process of listing this species is incomplete, that is it is still under formal review (COSEWIC, 2007). At the time this report was written, no status ranking for lake sturgeon is available under the SARA.

Lake sturgeon are considered to be a species of special concern under the SARO regulation (MNR, 2008).

The effects of habitat fragmentation caused by dam construction are unclear. There is evidence to suggest that restricted spatial habitat is not adversely affecting sturgeon populations, and existing habitat ranges may be sufficient to support adult populations of lake sturgeon (Auer, 1996; Smith and Baker, 2005). Movements by individual sturgeon greater than 50 km have not been reported in the Moose River Basin. Sheehan and McKinley (1992) and Gibson et al. (1984) reported that sturgeon utilize the entire length of river available to them between dams and natural barriers on the Mattagami and Abitibi Rivers, respectively. Many dammed sites may have represented natural barriers to migration prior to construction. The dam at Smooth Rock Falls, for example, was constructed at an impassable location, as was the dam at Lower Sturgeon Falls. The Mattagami River in the vicinity of the proposed Project, therefore, has always been “fragmented”, in terms of the ability of fish to move upstream.

A population collapse has been documented in the Little Long headpond on the Mattagami River (Nowak and Hortiguela, 1986). The collapse is likely related to other factors such as habitat alteration and rapid water level change as opposed to the area imposed by barriers. Gibson et al. (1984) and CIMA (1991) hypothesized that the sturgeon populations inhabiting the upper Abitibi River are in danger of collapse because of recruitment failures associated with habitat fragmentation and flow manipulations. The magnitude and severity of the effects of headpond formation are likely site-specific and dependent on a number of other existing conditions, including previous commercial harvests, water quality, substrate alteration as a result of pulp and paper activity, and water level change (Payne, 1987).

Aquatic assessment investigations conducted for the Project have confirmed that lake sturgeon are located within Area A (below Island Falls). No sturgeon have been identified in Area B or Area C (i.e., between Yellow Falls and Loon Rapids). The population size of lake sturgeon in Area A (downstream of Island Falls) is currently in the low 100's, or below numbers (~ 500) considered necessary to support a healthy, self-sustaining population over a long period of time due to lack of genetic diversity (Soul, 1980). Age classes indicate generally poor recruitment, though there was apparently strong recruitment 10 yrs ago.

The local sturgeon population has been and currently is influenced by barriers at Smooth Rock Falls (impassable dam), Yellow Falls (impassable falls), and Lower Sturgeon Falls (impassable dam). A commercial fishery that operated between 1927 and 1980 resulted in the harvest of relatively high numbers of fish in the stretch of river upstream of Loon Rapids, and probably significantly reduced numbers of sturgeon between Lower Sturgeon Falls and Loon Rapids. The currently fragmented nature of the population limits genetic mixing, and reduces the size of the local spawning populations, especially considering that female fish do not spawn every year.

Modeling undertaken for the Project has determined that lake sturgeon are unable to ascend Yellow Falls with the exception of a very small probability of limited passage during infrequent (i.e. 1:50 or 1:100 year) flood events. During fisheries field investigations undertaken for the Project, lake sturgeon were not found between Island Falls and Loon Rapids. As a result, the proposed Project is not anticipated to increase the fragmentation of the local lake sturgeon population.

6.5.2.2 Mitigation and Protection Measures

Construction and Operation

The downstream successful passage of larval, juvenile and adult sturgeon is considered highly significant because it is believed that the stocks below Island Falls and Smooth Rock Falls are partially influenced by drift of larval, juvenile and adult sturgeon from upstream spawning areas (potentially as far upstream as Lower Sturgeon). The successful downstream migration of larval sturgeon should be ensured by use of the Kaplan turbines, which have a > 95% success rate of passing small fish.

The upstream migration of sturgeon is presently considered negligible because of the difficulty that both Island Falls and particularly Yellow Falls pose for this species.

6.5.2.3 Evaluation of Significance

Lake sturgeon do not appear to be present in the area occupied or affected by the proposed powerhouse/dam structure and headpond. In addition, larvae, and juveniles will be able to pass downstream through the dam structure via spill facilities. Consequently, the significance of Project effects on lake sturgeon is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.5.3 Benthic Organisms

6.5.3.1 Potential Effects

Construction and Operation

Benthic organisms are small invertebrates that live in or on the river bed. Within the headpond, several changes to the fauna can be predicted. First, the conversion of a lotic (fast-moving) to a lentic (slower moving) habitat will alter the composition of the benthic community. Organisms requiring flowing water (i.e., typically the larger "sensitive" insects) will be replaced by organisms tolerant of still waters (i.e., simpler insects and worms). Benthic organisms will colonize newly inundated soils, initially in high numbers. Additional detail is provided in **Appendix G1-V**.

Deep benthic habitats in the headpond of hydroelectric projects may contain nutrient enriched sediments, potentially leading to anoxia and reduction of numbers of benthic organisms. In the absence of anoxia, enriched sediments may actually fertilize the benthic organisms, leading to increased numbers. Anoxia is not likely to occur in the Project headpond due to its small relative size, low likelihood of stratification, and moving (mixing) water (**Section 6.2.3**).

Downstream of the proposed dam, alterations to thermal and flow regimes, sedimentation, water chemistry and biotic interactions have the potential to alter the benthic community. Since the proposed Project will impound water, discharges of warmer than average surface water may occur. Such thermal enrichment can alter natural reproductive cycles of insects, with subsequent effects on the downstream benthic community. Impoundments typically entrap suspended sediments, removing natural sediment load from the river. Although headponds trap some suspended solids, they can export large quantities of limnoplankton that become food for filtering benthic organisms (e.g., some caddisflies and blackfly larvae).

The littoral zone of the new headpond will contain a benthic community that is relatively productive and diverse. The mayfly *Hexagenia*, a major food item in the diet of lake sturgeon, is a common invertebrate in depositional reaches of the Abitibi River, and can be expected to increase in numbers in the depositional areas of this reach of the Mattagami River. The littoral zone can also be expected to support large numbers of chironomids, worms, snails, and bivalves, all of which will provide food for sturgeon and other benthic feeding fishes such as white and longnose sucker, as well as forage fish such as darters and sculpins.

Benthic organisms in fast-running waters can be a source of food for small fish when they "drift" suspended in the water column. Drifting occurs as a natural phenomenon, aiding in the natural

dispersal of larvae of aquatic insects and other benthic organisms. The conversion of the headpond from a fast-flowing system to one that is more lake like will reduce benthic drift, and thus part of a food resource for fish that are downstream.

6.5.3.2 Mitigation and Protection Measures

Although benthic communities will be altered upstream and downstream of the proposed Project, an increase in littoral area and subsequent increase in benthic productivity in the headpond is expected. Further, the creation of a lake-like water body will increase the numbers of zooplankton and phytoplankton, other sources of food for small fish.

Drift of benthic organisms from the new spawning habitats will help to offset losses of drift as a result of headpond formation. Zooplankton and phytoplankton will drift from the new headpond, offsetting some of the losses of normal benthic community drift, though the new organisms will be of a different and smaller form.

The creation of constructed riffle habitat within the headpond and the North Muskego River will also contribute additional benthic production to the Mattagami River.

6.5.3.3 Net Effects and Evaluation of Significance

The Project will significantly alter the species composition of benthic communities, but is expected to provide an overall increased productivity of benthic organisms, zooplankton and phytoplankton, ultimately resulting in an increase in fish productivity (fish biomass). Changes to benthic community composition will occur as a result of changes to physical habitat. Consequently, the significance of Project-related effects on benthic organisms as a food source for fish is rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.5.4 Mercury Methylation

Mercury is a natural component of the earth, its soil and the water. Soils naturally contain traces of inorganic mercury, a form of mercury that generally does not result in harmful effects. When soils are saturated (as occurs following inundation), microbes convert the inorganic mercury to methyl mercury. Of the total mercury that occurs in rivers, most is inorganic, while a small fraction can exist as methyl mercury. There is thus always a certain amount of methyl mercury that can accumulate in animals and pose risks. The “natural” sources of mercury in the environment include mercury normally found in soils and rock, and atmospheric mercury (much of it a result of combustion of fossil fuels).

Accumulation of methyl mercury occurs when inorganic mercury in flooded soil is converted to methyl mercury. The methyl mercury is accumulated by microorganisms (bacteria, etc.), which are consumed by invertebrates (clams, snails, midges, etc.), which in turn may be consumed by fish. Most of the mercury in the system is bound up in living organisms, or stuck on the bottom of the river.

6.5.4.1 Potential Effects

Construction

Mercury methylation occurs following the establishment of the headpond; accordingly the construction phase of the project will not result in additional mercury methylation

Operation

The proposed headpond will inundate 71 ha of terrestrial habitat. Inundation will facilitate methylation of mercury in the short term, and will likely lead to short-term and modest increases in mercury concentrations in tissues of game fish within the proposed headpond.

Concentrations of mercury increased moderately in walleye within the headpond of the Carmichael Falls Generating Station located on the Groundhog River, approximately 40 km southwest of the Project site. The headpond associated with that facility is approximately 9 km long, and resulted in a similar extent inundation of the surrounding terrestrial environment (ESG, 1999). Being similar in size and conformity, similar increases in fish body burdens of mercury can be anticipated in the headpond of the proposed Project. (**Appendix G1-VI**)

Experience with similar hydroelectric projects elsewhere tells us that elevated mercury in the flesh of fish is likely to decline over time as the methyl mercury flushes out of the system, with levels returning to normal, within as little as 20 years. Mercury levels will decline over time, because there are finite amounts of inorganic mercury present in the soil prior to inundation. Once the available inorganic mercury is converted to methyl mercury, the decline in methyl mercury concentrations in fish flesh can be anticipated to commence.

Increases of mercury concentrations in fish tissue can be anticipated to be limited spatially. Seyler and Kristmanson (1999) demonstrated that though walleye in headponds tend to have elevated mercury concentrations, concentrations in fish downstream of headponds tend to be at background or pre-inundation levels. That phenomenon was observed at Carmichael Falls post inundation (ESG, 1999).

Mercury concentrations in fish within the proposed headpond have historically been collected by the Ontario Ministry of the Environment (1977 and 1996; see Golder, 2008), and were collected as part of baseline monitoring programs specifically for the Project in 2006 (Aquatic Assessment program by Stantec; **Appendix G1-VI**), 2007 (aquatic sampling by Golder, **Appendix G2**), and 2008 (Golder, 2008). Concentrations of mercury in walleye (the principal sport fish) caught in the vicinity of the headpond have generally varied with fish total length. Concentrations in 2006 were lower than other years, potentially because of the time of year (autumn), when summer growth might have “diluted” body burdens. Concentrations of mercury in the muscle of an average 40-cm fish have typically been ~ 400 ng/g (or less, and below the total restriction guideline of 520 ng/g for women of child-bearing age and young children; **Figure 6.11**).

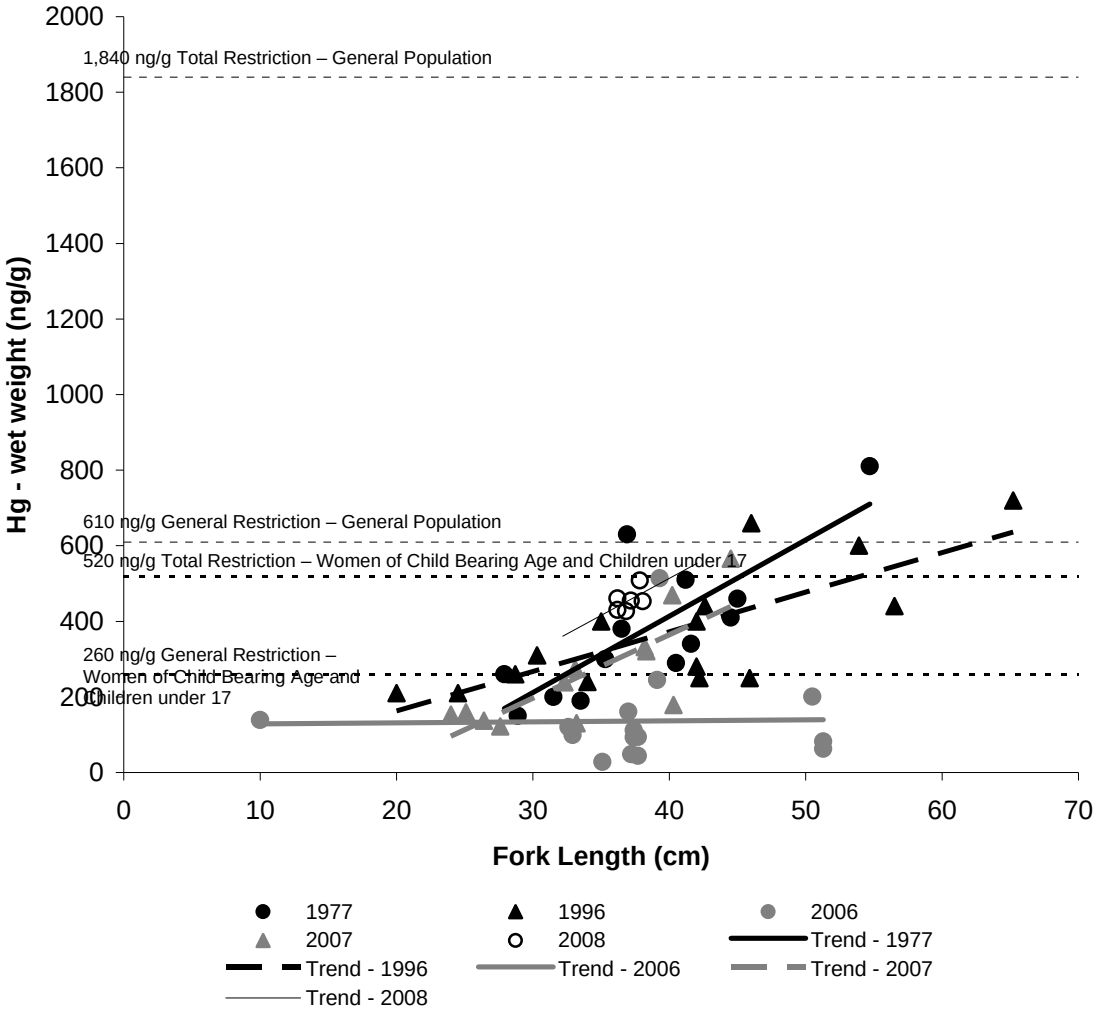

Figure 6.11 Methyl Mercury Concentrations in Filets from Walleye and White Sucker (1977 to 2008)

This section of the Mattagami River generally has average to lower than average mercury concentrations in fish when compared to other sections of the Mattagami, and other rivers in the region. Many other locations in the Moose River Basin have concentrations high enough (in some cases upwards of 900 ng/kg) to warrant restrictions on consumption.

Wildlife consumers of aquatic organisms can also experience mercury accumulation. One recent paper (Arch. Env. Cont. Tox., 2006, 51:661-672) has indicated that the “safe” concentration of mercury in the diet of bald eagles is between 270 and 2,660 ng/g. No effects would be expected at 270 ng/g, while “low” effects are possible at concentrations exceeding 2660 ng/g. Concentrations below 2,660 ng/g would be considered levels that pose a limited risk of impairment, while concentrations below 270 ng/g would be levels that pose no risk of impairment. The critical concentration range for river otters was between 660 and 3,290 ng/g.

As discussed above and in the fisheries report, mercury levels in 40-cm walleye are between about 50 and 600 ng/g. A 40-cm fish is large, and would be about the upper size range for consumption by both otter and eagles. Present and anticipated future concentrations of mercury in fish flesh (likely between 500 and 1,000 ng/g) are expected to be close to the lower value for otters, and certainly not near the upper value. Assuming that otters only consumed large fish (worst-case assumption), there would be a low likelihood of impairment resulting from mercury. Considering that otters consume foods other than large fish, the risks of future ill health to otters post inundation of the headpond can be considered to be quite low. The risks of ill health to eagles as a result of eating large fish from the headpond can also be considered low, particularly when considering that eagles will spend much of the year in a different location (i.e., will migrate), will consume prey other than large fish when in the vicinity of the project, and will very likely consume prey from areas outside than the headpond.

Mattagami River water used in homes and businesses has been treated by the municipal facility. Raw water may be used when it is collected directly from the river, perhaps while camping or by cottagers. Municipal treatment of river water uses Alum followed by filtration to remove solids, and the water is disinfected through chlorination. Removal of solids effectively removes contaminants including mercury. Disinfection kills microbes such as E. coli and associated viruses that can make people ill.

Mercury methylation is not expected to affect use of the Mattagami River for drinking water since methyl mercury concentrations are anticipated to be limited to the headpond. Further, mercury in the water column is mostly adsorbed (stuck to) particles which are removed during the course of water treatment.

Persons that use raw river water may be exposed to slightly higher amounts because the methyl mercury would not have been removed from the water by filtration. However, boiling water before use will reduce the potential for exposure to mercury since the boiling point for methyl mercury is 92^{o}C, while the boiling point for water is approximately 100^{o}C.

6.5.4.2 Mitigation and Protection Measures

Construction

Since construction of the Project will not result in mercury methylation, no mitigation or protection measures are required.

Operation

To mitigate the potential for mercury mobilization within the headpond area, pre-impoundment clearing will take place to limit mercury supply within the headpond. Mercury levels in fish in the headpond will be monitored for several years after impoundment (**Appendix J**). Mercury concentrations as monitored in common sport fish will be made available to the appropriate agencies for their use in developing consumption guidelines.

6.5.4.3 Net Effects and Evaluation of Significance

Concentrations of mercury in the flesh of piscivorous fish generally increase by two to three times background after inundation of a headpond. Such increases in mercury concentration in the muscle of fish would produce concentrations of between ~ 800 and 1,200 ng/g, above the total restriction for women of child-bearing age as well as the general restriction for the general population.

MNR Catch and Possession limits for Walleye in the Study Area are 4 fish, with one over 46 cm for a sport license, and 2 fish, with one over 46 cm for a conservation license. Size and catch limits may further reduce risk of exposure to mercury since smaller fish exhibit a smaller "body burden" of mercury than larger fish (MNR, 2007).

Concentrations will likely increase early in the life of the headpond (e.g., years one to ten), but will decline over time (e.g., years 10 to 20) after inundation. The net effect of methyl mercury bioaccumulation in fish flesh is likely to be limited to the headpond and may result in a reduction in the use of the natural resource in that area.

Concentrations of mercury in fish flesh are not anticipated to increase in downstream fish populations, including those more regularly angled downstream of Yellow Falls. Therefore, the effect of the Project on mercury methylation is rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project). Bioaccumulation of mercury in fish flesh will be monitored as detailed in **Appendix J.**

6.6 RESOURCES

This section refers to the criterion described in **Section 5 - Resources** of the integrated screening checklist, including:

- Non-renewable Resources
- Agricultural Production
- Mineral, Aggregate or Petroleum Resources
- Forest Resources
- Game and Fishery Resources
- Commercial fisheries
- Aquaculture
- Wild rice production

6.6.1 Use of Non-Renewable Resources

6.6.1.1 Potential Effects

Construction

During construction, the Project will use aggregate resources, and construction equipment will require oil-based fuel (petroleum or diesel fuel), both of which are non-renewable resources. In addition, aggregate material will be required to upgrade and create the access road and provide material for concrete production. Use of aggregate is examined in **Section 6.1.1**.

Internal combustion engines have typical efficiency values of between 24% and 32% (Boyle et al, 2003).

Operation

The efficiency of hydroelectric power can be compared to other forms of electricity generation using an "energy payback ratio" which is the amount of energy required to construct and maintain a generating station compared to the amount of energy produced during operation (see also **Section 6.3.2**).

As can be seen in **Figure 6.12** (Boyle et al, 2003), run-of-river hydropower is typically the most efficient form of electricity generation, producing, on average, 267 units of energy during operation for every unit used during construction and maintenance. The high efficiency of hydroelectric generating stations is a result of the fuel source – flowing water is a continually renewed resource. Consequently, the Project will result in the efficient use of a small amount of non-renewable resources.

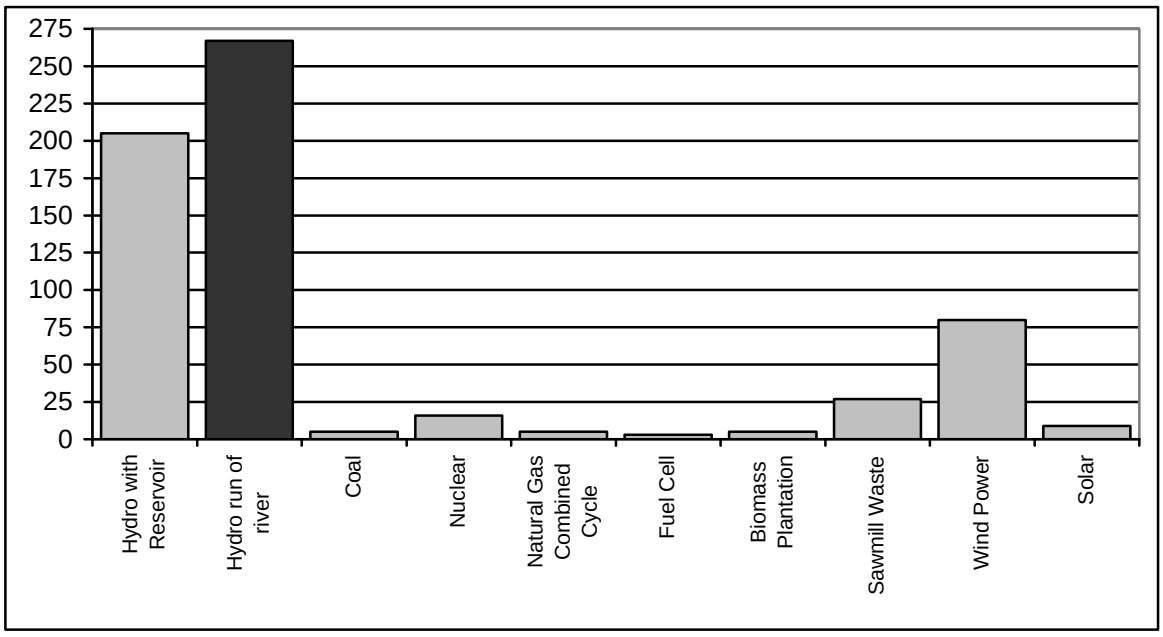

Figure 6.12 Energy Payback Ratio of Generating Station Types (Boyle et al, 2003)

6.6.1.2 Mitigation and Protection Measures

Construction

In order to mitigate fossil fuel consumption, the proponent will implement fuel conservation measures, including a no idling policy. Additionally, the proponent will encourage efficient use of hydrocarbon based fuels for travel/transportation through procurement of goods and services locally.

Operation

Hydropower is very efficient and non-renewable resources are not consumed during the electricity generation process, therefore no mitigation and protection measures are required for the operation of the facility.

6.6.1.3 Net Effects and Evaluation of Significance

Provided that the above mitigation and protection measures are implemented, the Project will not have a significant effect on non-renewable resources and may assist in offsetting inefficient resource uses, such as hydrocarbon fuels and coal. Consequently, the significance of net effects has been rated as positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).

6.6.2 Forest Resources

6.6.2.1 Potential Effects

Construction

The Study Area is part of the Smooth Rock Falls Forest. Currently, Tembec Industries Inc ("Tembec") harvests forest resources under a Sustainable Forest License ("SFL") in accordance with the *Crown Forest Sustainability Act*.

As a result of construction activities, timber will be removed from portions of the Study Area for site access, electricity transmission, construction staging, aggregate extraction, and as required in the areas adjacent to the powerhouse and dam location. Timber will also be removed from the headpond formation area. A total of approximately 70 ha of forest will be cleared as a result of the Project, some of which is currently occupied by clear-cut areas, alder and red osier thicket swamps, and meadow marshes.

The MNR Mattagami River policy area (G1744) requires a 120 m buffer from the Mattagami River in which timber harvesting is not permitted during forestry operations. Following headpond formation, the buffer will be displaced and restored adjacent to the headpond boundaries. As a result of construction activities and headpond formation, the revised policy area will occupy approximately 140 ha of additional forest resources which will be removed from production for the life of the Project.

Operation

There is no need to harvest any timber from the Project site during operation of the hydroelectric facility. However, trees that may interfere with transmission lines or other Project infrastructure may require periodic trimming or removal.

6.6.2.2 Mitigation and Protection Measures

Construction

Timber to be removed from the Study Area will be harvested and processed in accordance with an overlapping agreement between YFP and Tembec. All merchantable timber will be provided to local mills for processing. The number of trees removed from the Study Area will be minimized to the extent possible.

An amendment to the SFL will be required to withdraw Crown land from forest production as a result of the Project, and the MNR must give the Licensee at least 30 days written notice. A Forest Resource Licence ("FRL") will be required to clear timber for access roads, transmission lines, construction areas, headpond areas, structures, and ancillary facilities. Stumpage fees will be required for any timber harvested, and renewal fees paid by the SFL holder may require reimbursement. Stumpage fees and renewal fees will be reimbursed according to MNR requirements and the overlapping agreement between YFP and Tembec.

Operation

Should trees require periodic trimming or removal to prevent interference with Project operation, relevant mitigation measures outlined in **Section 6.4.1** will be followed. Since large-scale timber harvesting will not be required during the operation phase of the Project, no further mitigation measures are required.

6.6.2.3 Net Effects and Evaluation of Significance

There is potential for the Project to disrupt harvesting of forest resources in the Study Area. However, significant forest resources exist in the Study Area, and the Project will remove only a small portion from production. Appropriate agreements will be executed with the local SFL holder in accordance the *Crown Forest Sustainability Act.* The effect of the Project on forest resources is therefore expected to be low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.6.3 Game, Fish, and Wild Foods

6.6.3.1 Potential Effects

Construction

The Project is located in the vicinity of three registered trap line areas (MNR Trap Line reference numbers C64, C66, and C67). Requests for new trap lines are assessed by the MNR on a case-by-case basis. Although access roads and transmission lines will, for the most part, follow existing linear corridors, headpond formation may affect trapping lines.

More than 30 species of fish are present in the Study Area, including three common game species: walleye, pike, and whitefish. Proposed commercial fishing operations are considered by the MNR for only coarse fish species (MNR, 2005b). No commercial fishing or aquaculture operations currently exist in the Study Area. Improvements to river access through elimination of barriers to boat travel and access to the boat ramp upstream of Yellow Falls are likely to increase opportunities for sport fishing in the headpond area. In addition, recreational fishing is likely to continue. Effects of the Project on fish are addressed in **Section 6.5**.

Access for recreational trapping or hunting in the immediate vicinity of Project will be limited during construction, and increased noise and activity in the vicinity of Red Pine Road during construction may disturb game during fall hunting season, changing wildlife movement or presence from what hunters may be accustomed to.

A wild rice stand is located 1.3 km west of Red Pine Road, and will not be affected by the construction or operation of the Project.

Operation

Improved access along Red Pine Road following construction may increase hunting, fishing, and trapping opportunities, and create additional hunting and fishing pressure in the area.

Big game such as moose and bear may be particularly susceptible to increased hunting pressure because of relatively low reproduction rates. However, if the supply of local individuals for hunting decreases, it is likely that hunters will move to other locations. Increased hunting pressure along Red Pine Road is unlikely to influence population levels since considerable habitat for large game exists elsewhere in the Study Area. Currently, most habitats in the immediate vicinity of Red Pine Road are not ideal for either moose or black bear (see **Section 6.7.4.1**), although these species are present.

In addition, the MNR licenses hunting activities for moose via a four-step draw process and black bear by providing one game seal per hunter per season (in some areas, an additional game seal may be purchased after the first has been affixed). The licensing process for bear, moose, and other game ensures sustainability of wildlife populations in Ontario and continued opportunities for wildlife harvesting (MNR, 2007).

Similarly, improvement of Red Pine Road may provide enhanced access to fishing opportunities in the proposed headpond area. People wishing to fish must purchase fishing licenses from the MNR, which provide for a specific number of catches per day and a limit to the number of fish in an individuals possession at one time, according to species (MNR, 2007). Fisheries regulations are in place to ensure continued sustainability of game fish populations and continued recreational opportunities.

Potential aquatic feeding areas for moose and feeding and denning areas for mink, otter, and marten may be present along the shores of the Mattagami River. As a result of headpond formation, additional areas suitable for moose feeding will be created.

Approximately 4.5% of the existing Mattagami River area between Yellow Falls to immediately upstream of Loon Rapids contains mostly sparse aquatic vegetation cover under pre-construction conditions, although a much smaller proportion is composed of the preferred food plant species. Moose feeding area may increase post-construction, as the area of the littoral zone (less than or equal to approximately 2 m in depth) is expected to increase by 16.2% (approximately 30,000 m^2) and water velocity will be reduced.

The feeding and denning characteristics listed by MNR (2000) as criteria for determining significance for furbearers, such as large trees more than 40 cm in diameter (marten) and shorelines with numerous dead falls, large logs, log jams, and rock piles (mink and otter) were present in the Study Area. MNR (2000) notes that for mink, otter and marten feeding and denning sites, habitat assessments should be approached at a landscape level; if these species are present in the area and large blocks of suitable habitat are represented post-development, these species are likely to continue to be present.

6.6.3.2 Mitigation and Protection Measures

Construction

The proponent, through the MNR, has contacted registered trap line permit holders in order to determine potential effects to existing trapping locations. No comments or concerns have been received to date.

Mitigation and protection measures for noise, addressed in **Section 6.3.3.2**, are expected to limit the effect of construction activities on wildlife. However, hunters may require additional travel away from the Project site to access game during the construction period. Following construction, game availability and movement patterns are expected to be similar to pre-existing conditions (**Section 6.4.4**).

Operation

Since the Project site does not represent ideal habitat for large game, and will have limited effect on game presence during operation, no further mitigation measures are proposed. The Project is not expected to negatively affect the availability of fish, or wild food for consumption; consequently, no additional mitigation and protection measures are required.

6.6.3.3 Net Effects and Evaluation of Significance

Following construction, the Project is not anticipated to have a significant effect on commercial trapping or recreational hunting, fishing access, and wild food gathering. Therefore, effects of the Project on game, fish, and wild Food are rated as minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.7 LAND USE

This section refers to the criterion described in **Section 7 - Land-Use** in the integrated screening checklist, including:

- Land-Use
- Recreational Land Uses
- Utilities and Services

6.7.1 Residential, Commercial, and Industrial Land Use

6.7.1.1 Potential Effects

Construction

The Project is located in the unincorporated townships of Haggart, Sydere, and Bradburn on Crown Land. Although no lands occupied by the Project are designated as residential, commercial, or industrial, these uses are identified within the Town of Smooth Rock Falls, and cottages scattered downstream of the Project are consistent with residential land uses. Smooth Rock Falls is the closest settled area, and is located approximately 18 km north of Yellow Falls. Project infrastructure, including transmission lines and access roads, will not be located within Town boundaries. As such, no effects are anticipated on residential, commercial, or industrial land uses within the Town during the construction phase of the Project.

The closest downstream cottage is located approximately 4 km from Yellow Falls. Several cottages are located between approximately 9.5 km downstream of Yellow Falls and the Town of Smooth Rock Falls boundary. These cottages are approximately 4 km west of Red Pine Road. Three cottages are located on the North Muskego River approximately 500 m from Red Pine Road.

A seasonal residence is located approximately 1600 m northwest of Yellow Falls and 400 m west of the Mattagami River. Seasonal residents located within 1 km of Red Pine Road and Project infrastructure may experience disturbance due to noise during construction. In addition, access along Red Pine Road may be affected during construction due to truck traffic and safety concerns.

Cottage owners along the North Muskego River have expressed concern to YFP about an existing “pull-off” parking area located adjacent to Red Pine Road that would be disturbed during construction. In response, YFP will construct a new permanent parking area of compacted gravel approximately 20 m deep and 35 m wide adjacent to the Red Pine Road in the immediate vicinity of the existing pull-off area. The permanent parking area will be constructed during access road improvements (**Figure 6.13**).

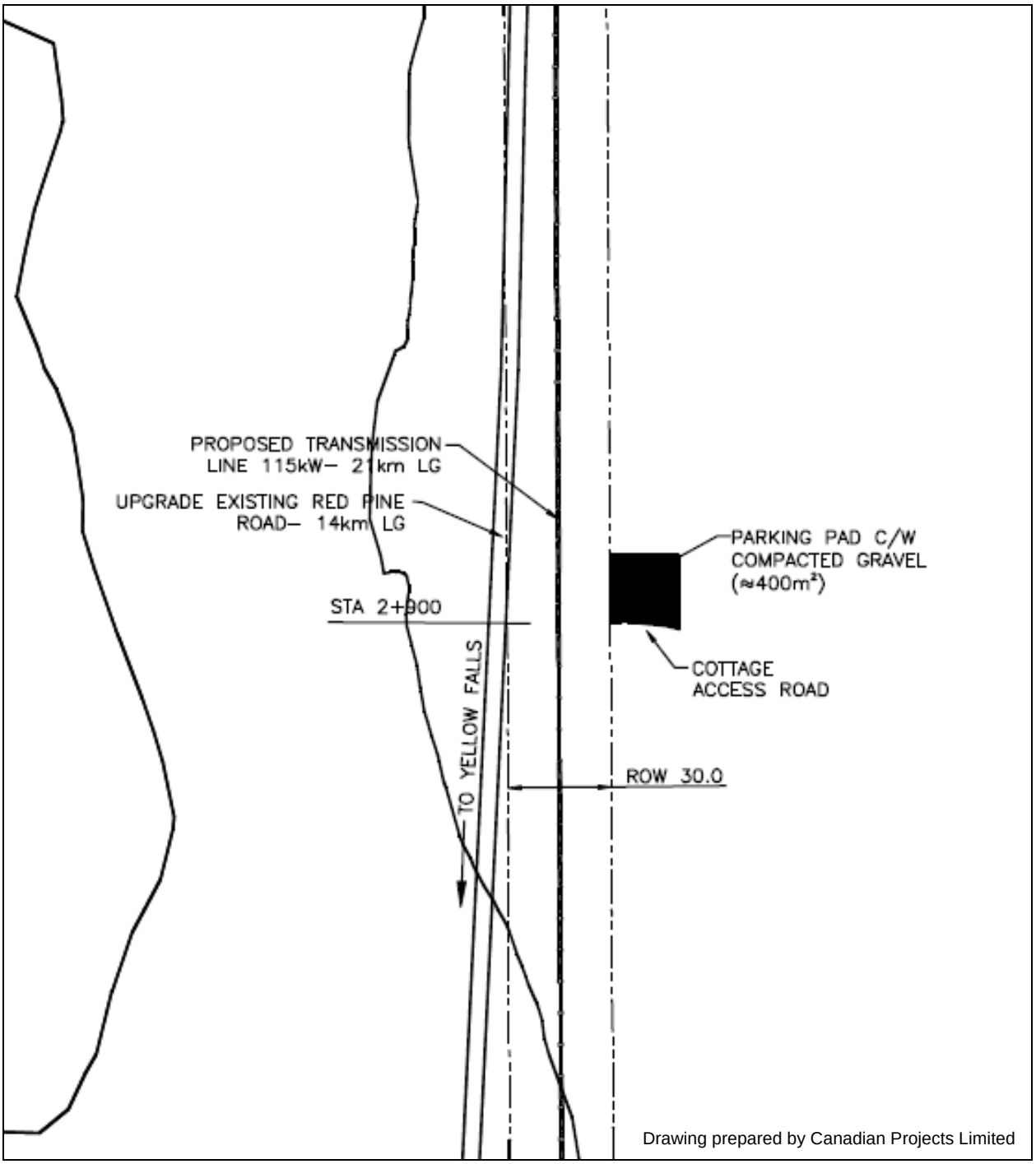

Figure 6.13 North Muskego River Cottage Parking Pad

Operation

Cottaging is a permitted use of the Mattagami River Area in the MNR Crown Land Use Atlas and shoreline cottaging opportunities may be encouraged south of the Town of Smooth Rock Falls (Policy G1744, 2006).

Hydroelectric development and cottaging are not mutually exclusive activities. During operation, the headpond will provide a relatively stable body of water, in which elevation and velocity remain fairly constant. Throughout Central Ontario, numerous cottages are located on lakes formed and controlled by hydroelectric generating facilities. As such, the Project is not likely to affect MNR Crown Land Use Policy in the Mattagami River Area which indicates cottaging opportunities may be encouraged south of the Town of Smooth Rock Falls.

6.7.1.2 Mitigation and Protection Measures

Construction

In order to address questions or concerns raised by the community members of Smooth Rock Falls, and the seasonal residents within the Study Area, YFP representatives will be identified for community members or representatives to discuss any issues or concerns. YFP will ensure the Town of Smooth Rock Falls and the MNR maintain current Project contact information to provide stakeholders with avenues to address their input throughout the construction of the Project. YFP will ensure continued access to cottages via Red Pine Road.

Mitigation and protection measures for noise are addressed in **Section 6.3.3.2**.

The Project is not expected to affect residential, commercial, or industrial land uses, therefore no other mitigation or protection measures are necessary for the construction phase of the Project; however, if this circumstance should change, appropriate measures will be developed with input from interested stakeholders.

Operation

The Project is not expected to affect residential, commercial, or industrial land uses, therefore no other mitigation or protection measures are necessary for the operation phase of the Project; however, if this circumstance should change, appropriate mitigation measures will be developed with input from interested parties.

6.7.1.3 Net Effects and Evaluation of Significance

Some seasonal residents may experience effects due to noise and reduced access along Red Pine Road during the construction phase of the Project. However, this effect will be limited to the construction phase and is therefore rated as minimal in significance (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.7.2 Provincial and Municipal Land Use Policies

Provincial and municipal land use policies assist in determining the types of uses or development that may occur in certain areas. Land use policies include those set out in the MNR Crown Land Use Atlas, designated areas such as ANSIs, ESAs, or parks, or zones delineated in an Official Plan. In addition, land use must be consistent with the PPS.

6.7.2.1 Potential Effects

Construction and Operation

No ANSIs, ESAs, provincial parks, federal parks or candidate parks have been identified in the Study Area. There are three conservation reserves and one forest reserve within the Study Area. These reserves are well outside of the Project footprint (see **Figure F2-7**) and it is not anticipated that the Project will have an effect on these areas during the construction phase of the Project.

Crown land use designations within the Study Area include Critical Aggregate Area, Geary Township Shoreline Bluff, Great Claybelt Agricultural Area, Mahaffy Township Ground Moraine, Mattagami River Land Use Area, and North Muskego Mixed Forest (See **Figure F2-11**).

According to the Ministry of Natural Resources Crown Land Use Policy Atlas (MNR, 2006), hydroelectric power generation is a priority in the Mattagami River Area, and primary uses are public recreation, cottaging, and commercial tourism. Other permitted uses include bait fishing, commercial fishing, commercial fur harvesting, commercial timber harvestings, commercial tourism or facilities that would enhance public recreation or cottaging, mineral exploration, and wild rice harvesting. This Crown Land Use Area borders 120 meters on each shoreline of the Mattagami River, and is the Land Use area in which the Project is situated. It is stipulated within the Mattagami River Area that aggregate development is not permitted. The MNR Crown Land Use Policy and Atlas may require amendment to delineate and manage the 120 m setback from the proposed headpond boundary.

Roads will be managed in compliance with MNR access roads policy. The proposed access road (and the new transmission lines that parallels the road) falls within four Ministry of Natural Resources Crown Land Use Policy Atlas Areas (MNR, 2006).

- Southern Resource Area - road development and maintenance to existing and new roads is permitted;
- Great Claybelt Agricultural Area - roads should be located along property boundaries;
- Critical Aggregate Area – roads should be located on areas where quality crushable aggregate deposits do not occur
- Mattagami River Land Use Area – roads are not encouraged north of Smooth Rock Falls, and are permitted within the area south of Smooth Rock Falls.

The proposed transmission line follows the proposed access road for the most part, and falls within the same Ministry of Natural Resources Crown Land Use Policy Access Area: Southern Resource Area, Great Claybelt Agricultural Area, Critical Aggregate Area, and Mattagami River Land Use Area. Although these land use areas do not specifically stipulate policies for the construction of transmission lines, they all allow for commercial power generation.

The proposed Red Pine access road and transmission line corridor is located within the boundaries of Haggart, Sydere, and Bradburn geographic townships on Crown Land, and are outside the municipal boundary of the Town of Smooth Rock Falls. As such, no municipal land use policies, plans, or zoning by-laws apply to the Project. However, a MOU between the YFP, the MNR, and the SFL holder will be required prior to construction of roads and bridges to determine road use, ownership, and liability.

YFP has maintained communication with the MNR throughout the development of the Project to ensure that provincial government concerns related to Crown Lands are addressed. Furthermore, planning activities are consistent with the 2005 Provincial Policy Statement ("PPS"), and resource management plans (see **Table 6.8)**.

The Project is consistent with the PPS in that it provides some employment opportunities within the community, thus aiding in expanding the employment mix within the area and diversifying the local economy. Furthermore, the Project compliments the PPS's energy plans, as it increases energy generation and supply through renewable energy. The PPS emphasizes the importance of preserving natural areas, open spaces for recreation, and areas with heritage and archaeological resources. The Project is in agreement with these goals, and the outlined mitigation measures are designed to minimize effects and preserve these resources (MMAH, 2005).

As described in Section 6.0 of the PPS, the Project is not considered *Development* as defined by the PPS. Further, the Project is undergoing a federal and provincial environmental screening, and as such will be constructed and operated in accordance with Federal and Provincial requirements. The PPS (2005) contains several key sections related to renewable energy facilities, including hydroelectric generation, which is defined as *Infrastructure* in the PPS.

Table 6.8 Consistency with the Provincial Policy Statement

Relevant Section of the PPS	Consistency
Section 1.1.5 Rural Areas in Territory without Municipal Organization: The focus of development activity shall be activities and land uses related to the management or use of resources and resource-based recreational activities	▪ The Project is located in a territory without municipal organization and takes advantage of a renewable resource (Sections 1.3 and 6.6.1)
Section 1.5.1 Public Spaces, Parks, and Open Spaces: Healthy, active communities should be promoted by: ▪ providing for a full range and equitable distribution of publicly-accessible built and natural settings for recreation, including facilities,	▪ The Project has potentially positive and negative effects on recreation use of public spaces (Crown Land – see

Table 6.8 Consistency with the Provincial Policy Statement

Relevant Section of the PPS	Consistency
parklands, open space areas, trails and, where practical, water-based resources ▪ providing opportunities for public access to shorelines ▪ considering the impacts of planning decisions on provincial parks, conservation reserves and conservation areas	Section 6.7.4) ▪ The Project will result in improved access to Crown Land along Red Pine Road (Section 6.7.4) ▪ The Project will not affect provincial parks, conservation reserves, or conservation areas (Section 6.4.7).
Section 1.7.1 Long-Term Economic Prosperity: should be supported by…providing opportunities for increased energy generation, supply, and conservation, including alternative energy systems and renewable energy systems	▪ The Project provides for long-term economic prosperity by providing increased renewable energy generation to the Province of Ontario (Section 1.9)
Section 1.8 Energy and Air Quality: planning authorities shall support energy efficiency and improved air quality through land-use and development patterns which…promote design and orientation which maximize the use of alternative or renewable energy, such as solar and wind energy…(1.8.1 e); and increased energy supply should be promoted by providing opportunities for energy generation facilities to accommodate current and projected needs, and the use of renewable energy systems and alternative energy systems…(1.8.2).	▪ The Project supports energy efficiency and improved air quality by generating renewable energy (Sections 6.3.2 and 6.6.1).
Section 2.1 Natural Heritage: Natural features and areas shall be protected for the long term. ▪ The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features. ▪ *Development* and *site alteration* shall not be permitted in *fish habitat* except in accordance with *provincial* and *federal requirements*	▪ The Project is planned to minimize effects to natural features (Sections 6.2, 6.4, and 6.5) ▪ The Project will result in improved access to Crown Land along Red Pine Road (Section 6.7.4) ▪ The Project will not affect designated significant natural heritage features (Section 6.4.7) ▪ The Project will meet provincial and federal requirements for development in fish habitat (Section 6.5)
Section 2.2 Water: Planning authorities shall protect, improve or restore the quality and quantity of water by: ▪ Using the watershed as the ecologically meaningful scale for planning ▪ Minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts ▪ Identifying surface water features, ground water features, hydrologic functions and natural heritage features and areas which are	▪ The Project is designed minimize potential negative effects and will not affect other watersheds (Section 6.2) ▪ The Project has taken water features and hydrologic functions into account (Section

Table 6.8 Consistency with the Provincial Policy Statement

Relevant Section of the PPS	Consistency
necessary for the ecological and hydrological integrity of the watershed; ▪ Implementing necessary restrictions on development and site alteration to protect all municipal drinking water supplies and designated vulnerable areas; and protect, improve or restore vulnerable surface and ground water, sensitive surface water features and sensitive ground water features, and their hydrologic functions ▪ Maintaining linkages and related functions among surface water features, ground water features, hydrologic functions and natural heritage features and areas ▪ Promoting efficient and sustainable use of water resources, including practices for water conservation and sustaining water quality ▪ Ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.	6.2) ▪ The Project will not affect municipal drinking water supplies (Section 6.2) ▪ The Project has taken linkages and related functions among hydrologic functions into account (Section 6.2) ▪ The Project will utilize water resources in a sustainable manner ▪ The Project will not affect stormwater management.
2.6 Cultural Heritage and Archaeology: Significant built heritage resources and significant cultural heritage landscapes shall be conserved. ▪ Development and site alteration shall only be permitted on lands containing archaeological resources or areas of archaeological potential if the significant archaeological resources have been conserved by removal and documentation, or by preservation on site. Where significant archaeological resources must be preserved on site, only development and site alteration which maintain the heritage integrity of the site may be permitted.	▪ The Project has taken cultural heritage and archaeological features into account (Section 6.9.1)

No effects on the above mentioned land use policies are anticipated during the operation phase of the Project.

6.7.2.2 Mitigation and Protection Measures

Construction and Operation

To address concerns related to land use, YFP will maintain means of community communication by ensuring the Town of Smooth Rock Falls and the MNR have Project representative's contact information. This will provide stakeholders with avenues to contribute their input throughout construction of the Project. YFP will also adhere to MNR plans and policies throughout the Project lifecycle, as well as the themes presented in the PPS.

As the Project is unlikely to have an effect on protected natural areas, no mitigation measures are required.

No further mitigation measures are required for the operation phase of the Project.

6.7.2.3 Net Effects and Evaluation of Significance

The Project is consistent with existing land use policies in the Study Area, as well as the PPS. Therefore, the significance of Project effects on land use policies is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.7.3 Hazard Lands

6.7.3.1 Potential Effects

Construction and Operation

There are currently no lands within the Study Area designated as hazard or contaminated lands. However, the PPS (2005) identifies hazard lands as "adjacent to river[s], streams[s], and small inland lake systems which are impacted by flooding hazards and/or erosion hazards." There is potential for erosion in areas with long or steep slopes. To address this, an erosion and sedimentation control plan will be developed during the detailed design phase of the Project. In addition, reduced water velocity within the proposed headpond is expected to reduce the potential for erosion of bank areas to occur (see **Sections 6.1** and **6.2**).

The PPS (2005) also states that development is permitted in hazardous lands (i.e. floodplains) where "the development is limited to uses which by their nature must locate within the floodway, including flood and/or erosion control works or minor additions or passive non-structural uses which do not affect flood flows." The Project is designed to handle the 1:10,000 yr flood event at normal operating levels (i.e. no significant increase in headpond level) so that backwater effects do not affect OPG's Lower Sturgeon facility and is expected to remain in compliance with applicable dam safety regulations throughout its lifecycle.

No effects on hazard lands are anticipated during the operation phase of the Project.

6.7.3.2 Mitigation and Protection Measures

Construction and Operation

No hazard or contaminated lands have been identified within the Study Area. In addition, YFP will develop a sediment and erosion control plan prior to construction (see **Sections 6.1** and **6.2,** and **8.0**). Consequently, no further mitigation or protection measures are necessary for the construction phase of the Project.

No mitigation measures are required for the operation phase of the Project.

6.7.3.3 Net Effects and Evaluation of Significance

There is no potential for effects on hazard or contaminated lands as a result of the Project as these land designations have not been identified within the Study Area; therefore, the significance of these effects are rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.7.4 Recreational Use

6.7.4.1 Potential Effects

Construction and Operation

The Project is located within lands designated by the MNR as the Mattagami River Area (MNR, 2006). The primary use of this land, as outlined by the MNR and expressed by members of the Smooth Rock Falls community, is recreation, including fishing, hunting, canoeing, camping, snowmobiling and ATV-riding. These activities have customarily been enjoyed in this area due to its natural character. Consultation with the community, local tourists, and land users has emphasized the importance of these recreational activities in the area. At the second public open house, the questionnaire included an inquiry regarding use of the Mattagami River and its shoreline. Only 14 questionnaires were received, although a total of 29 indications of river use were obtained since many respondents indicated multiple uses. These were counted separately, as follows:

- Fishing (28%)
- Hunting (10%)
- Canoeing/kayaking and boating (20%)
- Camping (3%)
- Hiking (3%)
- ATV/Snowmobile Use (7%)
- Wildlife/nature viewing (7%)
- No use (14%)
- Not indicated (7%)

Since relatively few responses were received, this data is not statistically significant, and may not reflect the population of river users. The data does indicate that the major uses of the Mattagami River and its shoreline are fishing, hunting, canoeing and kayaking, and boating although the sample size is small.

The construction and operation of the Project will have both positive and negative effects on outdoor recreation in and around the Mattagami River **(Table 6.9)**.

Table 6.9 Potential Effects on Recreational Users and Activities

Recreational Activity	Positive or Negative Effect (+/-)	Anticipated Project Effect
Fishing	+/-	▪ Increase in net productivity of sport fish due to slower moving headpond water ▪ Increased navigability upstream of Yellow Falls ▪ Access to boat ramp upstream of Yellow Falls ▪ Improved access along Red Pine Road ▪ Access restriction to the Mattagami River at Yellow Falls due to public safety at powerhouse/dam structure
Hunting	+/-	▪ Decrease in abundance of game species in the immediate vicinity of the Project due to an increase in human presence. However, hunting should not be affected outside of the immediate Project area ▪ Potential increase in moose along shoreline of headpond due to increase in foraging habitat ▪ Access for hunting may be improved along Red Pine Road.
Canoeing/Kayaking Boating	+/-	▪ New portage trail at Yellow Falls ▪ Original portages will no longer be required at Loon Rapids and Davis Rapids ▪ Improved access along Red Pine Road ▪ Access to boat ramp upstream of Yellow Falls ▪ Potential decrease in white water canoeing/ kayaking suitability ▪ Increase in boating opportunities due to removal of barriers to boat travel through areas of inundation ▪ River will maintain its regular flow above and below Project area ▪ Access restriction to areas on the rivers at Island Falls due to public safety at powerhouse/dam structure
Camping	-	▪ Increase in camping activities due to ease of access to area ▪ Decrease in backcountry camping opportunities due to increased human presence during construction ▪ Island Falls bedrock outcrops and inundated areas will remain available for camping
Hiking	+/-	▪ Decrease in natural setting due to dam and associated power transmission lines ▪ Potential increase in other recreational activities may be seen as detracting from the previous natural feel of the area
Snowmobiling/ ATV Riding	+	▪ Improved access road will provide additional trail access points ▪ The proposed transmission line and access road cross an existing snowmobile trail. This trail is maintained by the Arctic Riders ▪ YFP and Arctic Riders Snowmobile Club (“Arctic Riders”) executed a Memorandum of Understanding (“MOU”) to facilitate completion of new snowmobile trail on east side of Mattagami River

Table 6.9 Potential Effects on Recreational Users and Activities

Recreational Activity	Positive or Negative Effect (+/-)	Anticipated Project Effect
		▪ No net negative effects on ATV riding are anticipated as a result of dam construction/upgrading of access roads
Wildlife/Nature Viewing	+/-	▪ Potential to increase Bald Eagle habitat and nesting areas due to increased littoral zone ▪ Potential to increase moose foraging habitats through headpond inundation ▪ Increased ease of access to location ▪ Change in landscape of the area (dam/transmission lines) ▪ Inundation of landscape features such as falls and rapids

Fishing

The Project is located in the MNR Fisheries Management Zone 8. The MNR sets daily catch limits for popular species (MNR, 2007) as shown in **Table 6.10**. Anglers should review MNR regulations or contact the MNR to verify limits before fishing and should not rely on the table below as an accurate record since catch limits may vary from year to year.

Table 6.10 2007 Daily Fish Catch Limits for Game Fish

Species	Open Seasons	Limits (Sport Fishing License)
Walleye & Sauger	January 1 to April 14 3rd Saturday in May to December 31	4 (less than 46 cm)
Northern Pike	Open all year	6 (not more than 2 > 61 cm, not more than 1 > 86 cm)
Lake Sturgeon	January 1 to April 30 July 1 to December 31	1
Exceptions		
Fish sanctuary between Lower Sturgeon GS and the northern boundary of Mahaffy Township – no fishing from April 1 to June 15		

Walleye is the preferred game fish in the Study Reach of the Mattagami River. Other popular game fish include Pike, and Lake Sturgeon. In late summer, walleye may concentrate in river holes, where tributaries join the Mattagami River, sandbars, shores, and in weed beds. During the summer, walleye move to deeper habitat, while walleye are found deeper still in the autumn. Northern Pike can also be found where tributaries join the Mattagami River, and in reedy areas. Northern Pike also move to deeper water during the summer, but are usually found near weedy areas next to deeper water (MNR, 2007).

Recreational fishing efforts would therefore tend to concentrate in areas of higher velocity, and may include confluence between tributaries and the Mattagami River, as well as deeper spots, and in the limited areas of aquatic vegetation along the shoreline. Currently, access to the Mattagami River from the Town of Smooth Rock Falls is limited to power boats launching at the

community dock Smooth Rock Falls, access points off of Red Pine Road possibly reachable by vehicle north of the Muskego River, and access points south of Island Falls (see **Figure 6.14**).

Recreational fishing may be affected during construction by limited access to the Project site. In addition, fishing pressure may increase due to the presence of workers at the Project site (**Section 6.6.3**). Following commencement of operations, fishing at Yellow Falls will be limited to areas outside of safety and log booms. Recreational fishing more than 500 m downstream of the proposed dam/powerhouse structure is unlikely to be affected through construction or operation.

Hunting

During construction, activity and noise may cause game animals to temporarily avoid the area along Red Pine Road, and the powerhouse/dam construction area. Some species may be more affected than others. **Table 6.11** shows typical game and 2007 hunting seasons for the Study Area, located in Wildlife Management Unit ("WMU") 30 (MNR, 2007; Environment Canada, 2007). Hunters should not assume that the seasons below are accurate for all years and should determine the correct hunting season for specific game through the MNR before hunting.

Table 6.11 2007 Hunting Seasons for Game

Type of Game	2007 Hunting Season (Including Gun, Archery and Muzzle-loader)
Big Game	
Black Bear	August 15 to October 31
Moose	September 15 to November 15
Game Birds	
Ruffed Grouse	September 15 to December 31
Common Snipe	September 10 to December 15
Waterfowl and Geese	
American Black Duck	September 10 to December 15
Mallard	September 10 to December 15
Northern Pintail	September 10 to December 15
Common Goldeneye	September 10 to December 15
Green-winged Teal	September 10 to December 15
Canada Goose	September 1 to December 15
Snow Goose	September 10 to December 15
Small Game	
Snowshoe Hare	September 1 to June 15
Red Fox	September 15 to February 29
Wolf	September 15 to March 31
Skunk	All year
Weasel	October 25 to February 29

Black bears are typically shy and retreating animals, found in heavily wooded areas and dense bush near water. Black bears may alter their feeding habits from daytime to nighttime if the

presence of humans is disturbing (Environment Canada, 1993). Typically, wooded areas approximately 120 m away from the Mattagami River are clear-cut or are regenerating and may not provide the best habitat for black bears, although several bear tracks were noted during 2006 field work (**Appendix H**). Moose are usually found near to lakes and ponds in the summer, and may spend up to several hours per day in water during fly season. In winter, moose may move upland to feed on twigs, which are a staple of their winter diet. In winter, regenerating clear-cut areas provide a consistent supply of food.

Construction activity will occur over an approximately 20-month period and bears may adapt their typical use areas or may become nocturnal during this period in the immediate area of disturbance. Moose are likely to avoid areas with considerable disturbance. Following construction, movement and feeding habits are expected to approximate pre-existing conditions. Since considerable habitat is available elsewhere in the study area, the availability of bears and moose for hunting is expected to decrease in the immediate area of disturbance during construction and return to near-baseline conditions following commencement of operations.

The Mattagami River is identified as Capability Class 6 (having severe limitations to the production of waterfowl) in Canada Land Inventory for Waterfowl. Little to no breeding or staging habitat is present along the River. As such, the area proposed for inundation does not represent a prime hunting area for waterfowl or geese. Following inundation, water velocity will be slower and littoral area will increase, potentially increasing the attractiveness of the headpond to waterfowl. Consequently, opportunities to hunt waterfowl may increase over baseline conditions.

Game birds include Ruffed Grouse and Common Snipe. The Ruffed Grouse lives in hardwood forests, does not migrate, and blends well with its surroundings. Common snipe can be found in wet grassy areas of marshes, ponds, flooded meadows, and fields. For the most part, Snipe habitat is outside areas subject to disturbance. Therefore, hunting for this bird is likely to be unaffected. However, the availability of Ruffed Grouse may decrease in the immediate area of disturbance during construction and return to near-baseline conditions following commencement of operations.

Small game species, including the Red Fox and Wolf, will usually avoid human presence and activity and are primarily nocturnal. Since construction will take place during the day, Small game may remain unaffected by disturbance, although their presence in the vicinity of construction activities may temporarily decrease, but is expected to return to near-baseline conditions following commencement of operations.

Canoeing, Kayaking, and Boating

As discussed in **Section 4.7.5**, the Mattagami River is a canoe route designated by the MNR. The Provincial Canoe Route designation was originally designed by the MNR to encourage use of Ontario's waterways for outdoor recreation. Historically, portages were maintained and river features were documented in a series of brochures. Currently, many of the portages shown in the Provincial Canoe Route brochures are overgrown, and brochures are no longer available or

current. The Provincial Canoe Route designation still applies to rivers that may be used for canoe-based travel and recreation.

Through the portion of the Mattagami River Canoe Route that traverses the Study Area, portages are required at Lower Sturgeon GS (250 m), Loon Rapids (135 m), Davis Rapids (135 m), Yellow Falls (185 m), and Island Falls (25 m) for a total portage length of 730 m. Davis Rapids may be run by experienced canoeists at high water levels. Put-out was identified at the CN Rail Bridge across the Mattagami River, 6 km south of Smooth Rock Falls (MNR, 1990) due to the presence of a log storage boom. It is now possible to travel to the community dock in the Town of Smooth Rock Falls. Air-photo interpretation indicates that portages outlined in the 1990 MNR Canoe Route brochures at Lower Sturgeon GS, Davis Rapids, and Yellow Falls are overgrown and are not visible. However, a considerably longer portage appears to exist at Lower Sturgeon GS and a logging road running approximately parallel to the Mattagami River exists within 50 to 75 m of the shoreline at Davis Rapids. Portages at Loon Rapids and Island Falls appear to be in useable condition. **Figure 6.14** shows portage and river access locations

Incidental observations during 2006 field work and the overgrown state of most portages indicate that the reach of the Mattagami River upstream of Island Falls is not heavily used by canoeists or other boaters. Although access points are present upstream of Island Falls, a four-wheel drive or ATV may be required to reach the river (see **Figure 6.14**).

The stretch of river between Island Falls and Smooth Rock Falls is consistently used; perhaps due to ease of access from the community dock in Smooth Rock Falls and the deeper water conditions favourable to small power boats created by the Smooth Rock Falls GS headpond.

During the review period for the Draft EA Report, the Friends of the Mattagami also indicated that there was potential to engage in whitewater recreation using a canoe, kayak, or raft. Whitewater is classified according to an international system based on difficulty as follows (American Whitewater Association, 2006)

Table 6.12 Whitewater Classification

Class	Description
Class I	▪ Fast moving water with riffles and small waves. ▪ Few obstructions, all obvious and easily missed with little training ▪ Risk to swimmers is slight
Class II	▪ Straightforward rapids ▪ Wide, clear channels which are evident without scouting. ▪ Occasional maneuvering may be required, but rocks and medium-sized waves are easily missed by trained paddlers. ▪ Swimmers are seldom injured and group assistance, while helpful, is seldom needed
Class III	▪ Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe ▪ Complex maneuvers in fast current and good boat control in tight passages or around ledges are often required;

Table 6.12 Whitewater Classification

Class	Description
	▪ Large waves or strainers may be present but are easily avoided. ▪ Strong eddies and powerful current effects can be found, particularly on large-volume rivers ▪ Scouting is advisable for inexperienced parties. Injuries while swimming are rare; ▪ self-rescue is usually easy but group assistance may be required to avoid long swims
Class IV	▪ Intense, powerful but predictable rapids requiring precise boat handling in turbulent water. ▪ Depending on the character of the river, it may feature large, unavoidable waves and holes or constricted passages demanding fast maneuvers under pressure. ▪ A fast, reliable eddy turn may be needed to initiate maneuvers, scout rapids, or rest ▪ Rapids may require "must" moves above dangerous hazards ▪ Scouting may be necessary the first time down ▪ Risk of injury to swimmers is moderate to high ▪ Water conditions may make self-rescue difficult. Group assistance for rescue is often essential but requires practiced skills. A strong Eskimo roll is highly recommended
Class V	▪ Extremely long, obstructed, or very violent rapids which expose paddlers to added risk ▪ Drops may contain large, unavoidable waves and holes or steep, congested chutes with complex, demanding routes. ▪ Rapids may continue for long distances between pools, demanding a high level of fitness. ▪ What eddies exist may be small, turbulent, or difficult to reach. ▪ Scouting is recommended but may be difficult. ▪ Swims are dangerous, and rescue is often difficult even for experts. ▪ A very reliable Eskimo roll, proper equipment, extensive experience, and practiced rescue skills are essential
Class VI	▪ These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability and danger ▪ The consequences of errors are very severe and rescue may be impossible ▪ For teams of experts only, at favorable water levels, after close personal inspection and taking all precautions

Whitewater in the Mattagami River between Island Falls and Loon Rapids was evaluated through discussions with field crews, aerial images, and digital photographs, based on classification system above (**Table 6.12**). Based on the subjective evaluation described, whitewater between downstream of Island Falls and upstream of Loon Rapids appears to consist of sections of Class I to II rapids, leading to Class IV to VI sections over falls or sharp drops. The longest Class I-II section is 525 metres, while the longest Class V section is approximately 50 m (**Figure 6.15**).

Several narrow, shallow, and constricted chutes over Yellow Falls are likely completely impassable, even by very experienced whitewater kayakers. However, it may be possible for very experienced kayakers or rafters to survive the approximately 5 m descent over the falls under certain flow conditions. Travel over Loon Rapids, Yellow Falls, and Island Falls in a canoe is not likely possible under most conditions.

For whitewater enthusiast, the most appealing river sections may consist of Davis Rapids, with sections estimated to contain Class I to Class III whitewater, and the estimated Class IV middle channel of Loon Rapids (approximately 50 m in length). However, difficult access, lack of put-in and take-out points, lack of challenging and safe whitewater, and the short length of rapids would likely discourage most whitewater enthusiasts. Consequently, the Project is not likely to have a significant effect on current or future whitewater recreation.

During construction, a portage at Yellow Falls will not be possible because of cofferdam installation and ongoing heavy equipment movement. During operation, the existing portage will be unusable. A safety boom will be placed to ensure the safety of boaters and will prevent boaters from approaching the generating station too closely.

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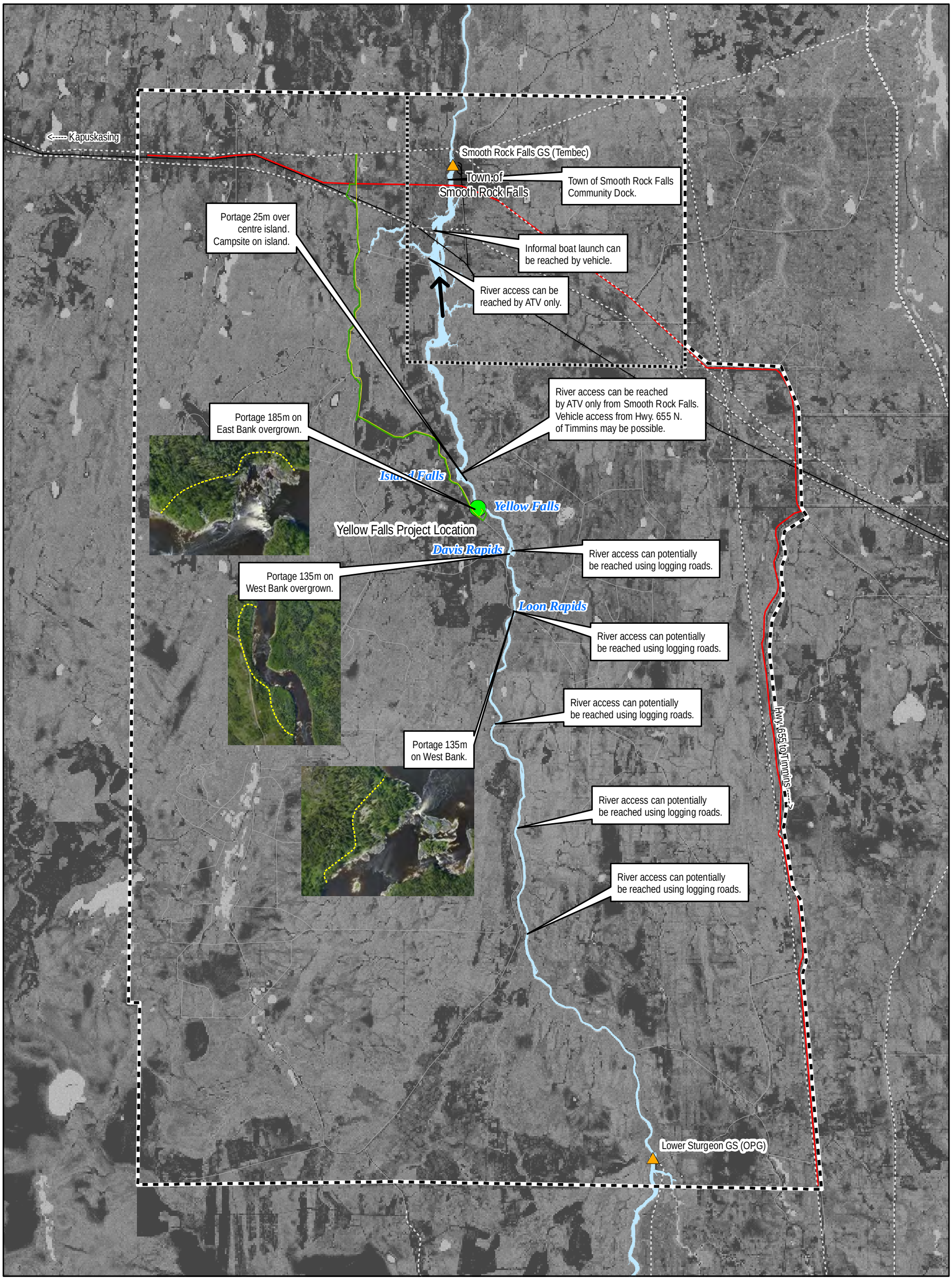

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Source:
Airphoto: LANDSAT 7, 2002.
Base Map: LIDS, 2006.
Portages: MNR, 1990.

Study Area
Smooth Rock Falls Town Limits
Yellow Falls Project Location
Existing 115 kV Power Line
Proposed Transmission Line
Proposed Acess Road

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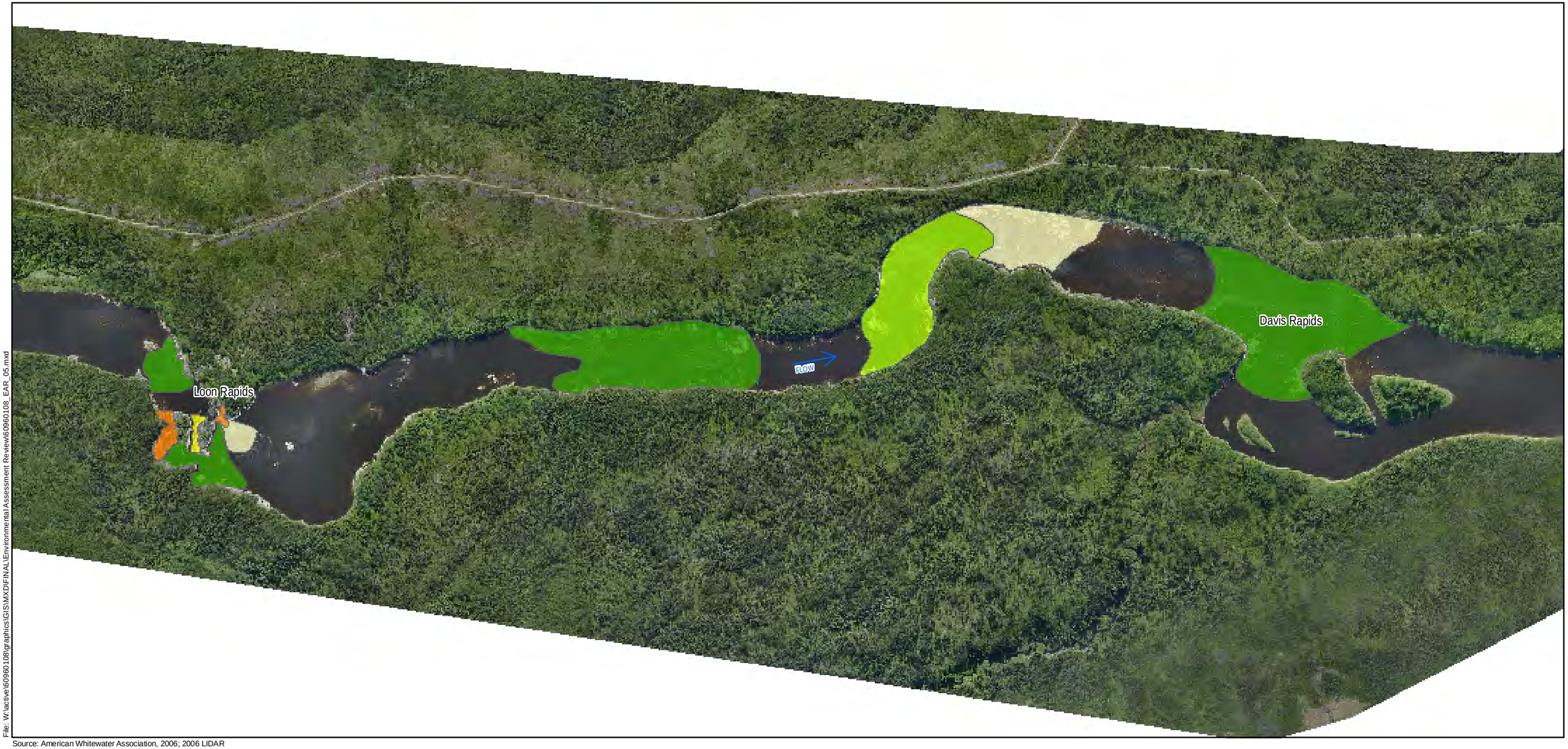
Key Map

PREPARED FOR:
YELLOW FALLS LP
ENVIRONMENTAL ASSESSMENT REPORT

FIGURE NO. 6.14

MATTAGAMI RIVER ACCESS POINTS AND PORTAGES

Initiated: January 28, 2007
Revised: October 2008



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Source: American Whitewater Association, 2006; 2006 LIDAR

Whitewater Classifications

- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VI

Whitewater classifications are estimated through discussion with field crews, aerial images, and digital photographs, based on the international whitewater classification adoped by the American Whitewater Association (2006).

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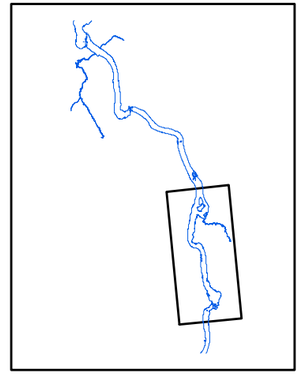

PREPARED FOR:

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FIGURE NO. 6.15b

MATTAGAMI RIVER WHITEWATER CLASSIFICATION

Initiated: February, 2008
Revised: October, 2008

Camping

No designated camping areas will be affected by the Project since the closest commercial camping site is located approximately 6 km west of Red Pine Road (see **Figure F2-10**), but residents often camp at Island Falls. The canoe route description for this stretch of the River also shows camping areas at each portage (MNR, 1990). These campsites, like some of the portages, appear to be overgrown and are indistinguishable from surrounding vegetation on aerial photography. There are numerous areas along the Mattagami River where suitable backcountry campsites could be located.

Hiking

Numerous access roads and trails cross the Study Area. To the west of the Mattagami River, most trails are located in or near the North Muskego mixed forest, accessed from the south. To the east, the majority of trails are located south of Loon Rapids (**Figure F2-10**), also accessed from the south. These trails are unlikely to be affected by the Project. Hiking opportunities along Red Pine Road may be limited during certain portions of the construction schedule for safety reasons (e.g. road improvements on Red Pine Road, and periods of high heavy-truck traffic). Following construction, hiking opportunities are likely to be similar to pre-existing conditions.

Snowmobiling/ATV Riding

Smooth Rock Falls is a popular destination for snowmobilers and there is an excellent network of trails across Northern Ontario maintained by local clubs which are part of the Ontario Federation of Snowmobile Clubs. The Arctic Riders Snowmobile Club maintains approximately 185 km of trails near Smooth Rock Falls. Early in the EA process, it was recognized that the Club's main trail would be in the same corridor as that planned for access and transmission facilities. It was also noted by the Club that two major watercrossings were required to maintain this trail and there were plans to move it 5 km east of the Town of Smooth Rock Falls.

ATV riding is also popular in the area. Local access and logging roads are well suited to this purpose. The Smooth Rock Falls Hunters and Anglers Club constructed an ATV bridge across the Muskego River where Red Pine Road now ends. Similar to hiking opportunities, ATV access along Red Pine Road may be limited during certain portions of the construction schedule for safety reasons (e.g. road improvements on Red Pine Road, and periods of high heavy-truck traffic). Following construction, ATV riding opportunities may slightly improve since Red Pine Road will be extended and maintained, allowing improved access to additional logging roads.

Wildlife and Nature Viewing

Wildlife viewing and bird watching are increasingly popular activities throughout Ontario and are closely associated with the natural aesthetics of an area (see **Section 6.9.4**)

It is assumed that wildlife and nature viewing is primarily associated with non-consumptive recreational uses such as canoeing, hiking, and camping (Hunt and Haider, 2000). Consumptive activities that rely on relatively fast-paced travel and noise from combustion engines would likely reduce enjoyment of natural scenery and inhibit the presence of wildlife.

Figure 6.16 Bald Eagle Nest near North Muskego River (Picture provided by the Friends of the Mattagami)

As expressed by comments received during the Second POH and during the Draft EA Review Period, local users are particularly interested in Bald Eagle viewing (**Figure 6.16**). An internet search for wildlife viewing in Ontario indicated that Moose and birds are also popular for viewing. A Bald Eagle nest is located near the North Muskego River, approximately 13 km downstream of Yellow Falls. During construction, wildlife may avoid the immediate area of activity (see **Section 6.4.4**). During operation, traffic volumes (approximately 1-2 trips to and from the site each day) are not expected to significantly influence wildlife behavior over baseline conditions. Wildlife viewing may improve for some species since the littoral zone will increase and water velocity will be reduced in the headpond (**Section 6.4.4**)

Participants in a study of aesthetic quality in Northern Ontario (Hunt and Haider, 2000) ranked the following vegetation types in order of preference:

1. Red and White Pine
2. Hardwood Species
3. Eastern White Cedar
4. Jack Pine
5. Black Spruce and Jack Pine
6. Black Spruce
7. White Spruce/Balsam Fir
8. Black Spruce Bog

Figure 6.17 Yellow Falls (Picture provided by the Friends of the Mattagami)

Aesthetic preference over a short distance depended on tree size (larger trees are more aesthetically pleasing), slope and topographic variation, species diversity, and fullness of vegetation. Black spruce bogs were least preferred since stunted trees are dispersed over a homogenous landscape.

Additionally, disturbance, such as forest fires, windthrow, and timber harvesting introduced into a natural landscape negatively influence aesthetic value (Hunt and Haider, 2000; Gobster, 1999).

In reviewed literature and through public consultation, it appears that unusual features or species are the most aesthetically valued. For example, large trees and waterfalls are considered aesthetically pleasing elements of a landscape (Gobster, 1999). This viewpoint is also evidenced in the pictures above, received from the Friends of the Mattagami, a local interest group **(Appendix E9**). The presence or absence of these features may influence opportunities for wildlife or nature viewing.

As much of the Study Area has undergone disturbance in the form of timber harvesting, and is a relatively homogenous landscape with few of the most preferred vegetation types, high quality nature viewing opportunities are limited in the Study Area, but may take place in the following areas:

- Along the Mattagami River
- Geary Township Shoreline Bluff
- Mahaffy Township Ground Moraine
- North Muskego Mixed Forest

While not in the Study Area, Greenwater Provincial Park is located approximately 30 km east of the Town of Smooth Rock Falls and provides interpretative trails, natural scenery, and other recreational opportunities.

During construction, the Project will influence nature viewing by introducing disturbance through tree-clearing and construction of Project components. Construction traffic may temporarily limit

access along Red Pine Road because of safety concerns. In addition, some larger trees that may be of interest for nature viewing may be removed.

During operation, water features at Loon Rapids, Davis Rapids, and Yellow Falls will no longer be visible. The dam/powerhouse structure and transmission line will form additional anthropogenic components of the landscape. However, these areas are currently accessible primarily by ATV or canoe and are not utilized on a regular basis for wildlife or nature viewing.

6.7.4.2 Mitigation and Protection Measures

Fishing

Opportunities for recreational fishing at Yellow Falls will be removed for life of the Project as a result of construction and operation activity, changes to river flows patterns at the base of the falls, and safety concerns. No mitigation or protection measures are possible. However, existing high velocity flows in this area generally render fishing by boat or wader unsafe. Following commencement of operation, opportunities for recreational fishing are likely to be available upstream and downstream of safety booms at Yellow Falls and no additional mitigation measures are anticipated to be necessary.

The headpond may provide additional habitat for Walleye and Northern Pike, along with deeper water, which may result in improved recreational fishing opportunities for these species which are currently not prevalent in this river reach. The anticipated increase in habitat is primarily due to the increase in littoral area and is dependent on the growth of aquatic macrophytes (see **Sections 6.5** and **6.6.3**).

Hunting

Construction activity and safety concerns will limit access along Red Pine Road and may cause game animals to avoid the immediate area of construction over approximately two hunting seasons. Mitigation and protection measures to limit the effect of construction activity on wildlife are detailed in **Section 6.4.4.2**. Following construction, access along Red Pine Road will be improved, potentially allowing easier access for local hunters. Consequently, no further mitigation or protection measures are required.

Canoeing, Kayaking and Boating

During construction, canoe access in and around Yellow Falls will be provided and the construction contractor will be required to facilitate canoe movement if no portage is available. Canoeing opportunities will be maintained in the area through the construction of a new 339 m portage trail with a boat ramp on the upstream side. Safety measures such as signs and booms will warn river users of unsafe conditions in close proximity to the dam. The dam and transformer area will be fenced. Portages at Loon Rapids and Davis Rapids will not be required once the Project is operational.

Camping

Camping activities at Yellow Falls will not be available during the life of the Project, however the Project will not affect the most intensively used campsite at Island Falls or commercial camp grounds in the Study Area. No mitigation or protection measures are required.

Hiking

Although access along Red Pine Road may be limited during construction, the majority of hiking trails in the Study Area are not concentrated in the vicinity of construction activity. Following construction, Red Pine Road may allow easier transportation to hiking opportunities along forest access roads near the North Muskego Mixed Forest.

ATV/Snowmobile Use

YFP consulted with the Arctic Riders during the early stages of the Project, and confirmed that the Arctic Riders were interested in securing a snowmobile route on the east side of the Mattagami River in order to avoid the annual maintenance and safety risks associated with construction of ice bridges.

YFP and the Arctic Riders executed a Memorandum of Understanding ("MOU") which will facilitate the completion of the new snowmobile trail on the east side of the Mattagami (i.e. opposite side of the Mattagami River from the Project's access road and transmission line).

YFP will discuss the status of the ATV bridge with the MNR and will notify the Smooth Rock Falls Anglers and Hunters club regarding use of Red Pine Road and potential effects to the ATV bridge which crosses the Muskego River, for which the club has entered into a MOU with the MNR. Although input on the Project has been requested from the Smooth Rock Falls Anglers and Hunters Club, no comments have been received to date.

Wildlife and Nature Viewing

Mitigation and protection measures to limit the effect of construction activity on wildlife are detailed in **Section 6.4.4.2**. Following construction, the natural attributes of the area will change as the result of inundation of falls and rapids, as well as the potential removal of aged and unusual trees. Mitigation and protection measures for vegetation are provided in **Section 6.4.1.2**.

Support for Recreational Activities

During the development of the Project, stakeholders within the Town of Smooth Rock Falls indicated their ongoing interest in the development of recreational activities within the Town, as well as along the Mattagami River.

To this end, YFP has made several commitments to the Town of Smooth Rock Falls for the purposes of promoting recreational activities in Smooth Rock Falls and the Mattagami River. YFP has committed to providing to the Town an annual contribution of $3,000 per year to support local environmental stewardship activities in the area. YFP has also committed to the

installation of a parking lot along the Red Pine Road. Finally, YFP has committed to a one-time contribution of $70,000 to support recreational developments in the Town of Smooth Rock Falls.

6.7.4.3 Net Effects and Evaluation of Significance

During construction, traffic, equipment, and noise will limit recreational opportunities in the vicinity of Yellow Falls and Red Pine Road. During operation, increased accessibility of the area through the improvement of the Red Pine Road, along with improvement to the local snowmobile trail network may allow further recreation opportunities. Fishing activities at Island Falls (a popular local fishing location) will not be affected. However, opportunities in the immediate vicinity of Yellow Falls will be lost, while fishing opportunities may be altered in terms of species present in the headpond. Additionally, opportunities for nature viewing may be altered by the presence of the dam and powerhouse structures, as well as transmission lines.

Through the future and ongoing support from the financial contributions to the Town by YFP, significant recreational benefits to the Town and the Mattagami River are anticipated.

Therefore, the effect of the Project on recreational opportunities is rated as low in significance (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.7.5 Utilities and Infrastructure

6.7.5.1 Potential Effects

Construction

Utilities and Railroads

The Project is located in the vicinity of several linear facilities, including existing transmission lines, pipelines, highways, and a rail line. New and upgraded access roads, including three watercrossings by bridge and a transmission line are part of the Project infrastructure.

The Project will require transmission line construction along Red Pine Road to the Hydro One connection point north of Highway 11 and will connect to the existing Hydro One Networks Inc. ("Hydro One") 115 kV H9K transmission line. A communication cable will be installed on the new transmission line from the Project site for the purposes of system monitoring. YFP will require a Memorandum of Understanding ("MOU") and Crown land tenure, administered by the MNR, to construct the transmission line.

The transmission line will cross natural gas pipelines (**Figure F2-11**) south of Highway 11 that are owned and operated by TransCanada Pipelines Ltd ("TCPL"). The transmission line will also cross the Ontario Northland Transportation Commission ("ONTC") tracks east of the existing crossing by Red Pine Road. YFP is currently working with ONTC to execute a crossing agreement to permit improvement and use of the existing Red Pine Road Crossing of the ONTC system. YFP will also obtain the required approvals from TCPL for construction of an access

road and transmission line crossing TCPL pipelines. No adverse effects on utilities and railroads are anticipated as YFP will obtain necessary approvals.

Roads and Highways

It is estimated that most passenger vehicles, concrete trucks, miscellaneous vehicles, will utilize Highway 11, which is currently utilized for local, regional, and inter-provincial truck traffic. Some of these trips also use Red Pine Road. There may also be instances during construction where overweight or oversize loads will require special traffic planning or permits. Large truck traffic will not pass through residential areas of Smooth Rock Falls.

YFP will require a Memorandum of Understanding ("MOU") and Crown land tenure, administered by the MNR, to upgrade Red Pine Road and construct additional access roads.

Traffic associated with the construction phase has the potential to result in short-term localized disturbance to traffic patterns, wear and tear on the roads, and the potential for traffic safety hazards.

Municipal/Emergency Services

Emergency services may be required by the Project. Although YFP and the Construction Contractor will have strict safety policies in place, an increase in workers along with the nature of the work indicates that mishaps may occur that will require medical care for some workers. Increases in the use of municipal services, such as waste disposal and water/sewer care not anticipated during the construction phase of the Project due to the absence of these services at the Project site.

A septic system will be installed on site to dispose of wastewater from the dam/powerhouse structure at Yellow Falls. Domestic water will be obtained from the powerhouse intake and potable water will be delivered to the site in containers. As a result, the Project will not place additional demand on existing water supply infrastructure in the area.

Operation

Utilities and Railways

TCPL and Ontario Northland may require crossing agreements that stipulate monitoring and maintenance of crossings. No further effects on utilities and railways are anticipated throughout the operation phase of the Project.

Roads and Highways

No further effects on local roads and highways area anticipated during the operation phase of the Project as operation phase related traffic will be limited to operator vehicles and intermittent traffic associated with maintenance.

Municipal/Emergency Services

Throughout the operation and maintenance phase of the Project, road usage will be similar to any other business and no additional road maintenance is anticipated as a result of the Project.

The Project is not anticipated to generate any additional demand for local emergency services. Additional information on accidents and malfunctions is provided in **Section 6.12.**

The Project will not be physically connected to community services or infrastructure; hence no increases for these services are anticipated.

6.7.5.2 Mitigation and Protection Measures

Construction

Highway 11 is designed for truck traffic and currently extensively used for inter-provincial goods transportation, as well as local and regional intensive use by the forest industry. Potential for traffic safety effects are anticipated to be greatest in the vicinity of Highway 11, due to the higher traffic volumes along the highway. When construction is occurring in the vicinity of Highway 11, equipment will be stored as far from the edge of the traveled portion of the roadway as possible. To reduce the risk of vehicle accidents or pedestrian injury, warning signs and construction barricades will be erected at all areas of construction activity near the intersection of Red Pine Road and Highway 11. Appropriate traffic control measures must be used if construction activity occurs before dawn or after dusk.

YFP will obtain the required crossing agreement from TCPL prior to construction of the access road and transmission line crossing within 30 m of the existing pipelines. YFP and TCPL will determine the crossing design requirements based on expected loads, cover requirements, etc.

YFP is currently working towards execution of a crossing agreement with the ONTC. The crossing of the ONTC rail line by Red Pine Road will be improved to permit crossing of construction traffic. The crossing will be constructed in accordance with Ontario Northland specifications.

YFP will require a Memorandum of Understanding (“MOU”) and crown land tenure administered by the MNR to construct transmission lines, upgrade Red Pine Road, and construct additional access roads.

Operation

YFP will commit to monitoring and maintenance of crossings as required by TCPL or ONTC. No further mitigation measures are required during the operation phase of the Project due to the limited traffic associated with operation and the lack of use of municipal services.

6.7.5.3 Net Effects and Evaluation of Significance

Although short-term disruptions in traffic may result from construction, no long-term significant adverse effects on roadways, pipelines, railways or municipal services are anticipated with proper implementation of the measures described above. Therefore, the significance of the effects is evaluated as minimal.

Continued low-level use of municipal infrastructure (waste disposal and roads) will be required for the duration of the Project; however, this effect is anticipated to be minimal (Potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.7.6 Waste Materials

6.7.6.1 Potential Effects

Construction

YFP will retain an MOE-licensed waste disposal contractor to remove waste and recycling during construction. The waste disposal contractor will dispose of material at an MOE-licensed facility in accordance with the facility's CofA.

The Smooth Rock Falls Landfill may be used to dispose of non-hazardous waste provided that the facility is licensed to accept construction waste and at the discretion of the waste disposal contractor.

Materials currently disposed of at the Landfill consist of paper and paper products (45%; 1,346 tonnes/year), organic waste (25%; 749 tonnes/year), metals (10%; 299 tonnes/year), glass (10%; 299 tonnes/year), and miscellaneous (10%; 299 tonnes/year). The Smooth Rock Falls Landfill has a remaining capacity of approximately 9 years assuming current filling rates (Pers. comm. with the Town of Smooth Rock Falls, May 16, 2007).

A slight decrease in capacity at the Town of Smooth Rock Falls Landfill may occur if used to dispose of construction waste.

Hazardous materials used during Project construction are limited to fuels, oils, and lubricants that will be on-site for use in equipment. Hazardous waste materials will not be generated in large quantities and will be disposed of through conventional waste-oil and hazardous waste disposal streams. There is no anticipated permanent storage of hazardous materials on-site and poly-chlorinated biphenyls ("PCBs") will not be present in the oils and lubricants used on-site.

No known active or closed waste disposal sites exist within 500 m of proposed Project components.

Operation

There are limited waste by-products created from the hydroelectric generation process, waste materials are limited to ongoing maintenance for the powerhouse facilities (e.g., lubricants and hydraulic oils). Minimal amounts of normal household waste will be generated, and will be disposed of through the normal waste stream.

6.7.6.2 Mitigation and Protection Measures

Construction

The construction contractor is required to develop and adhere to an Emergency and Spills Clean-Up Management Plan. Emergency spill kits and absorbent material will be on hand throughout construction. In the event of an accidental spill during construction, the MOE Spills Action Centre (**1-800-268-6060**) must be contacted and emergency spill procedures initiated immediately (**Section 6.12**).

It is anticipated that the local landfill, located 14 kilometres south-east of Smooth Rock Falls (Public Works, 2007, personal communication) will be used to dispose of construction related wastes generated during the construction phase. Construction waste will be limited to packaging and construction material such as small amounts of leftover wood, cardboard, or other common materials. In order to minimize the amount of waste added to the local landfill, materials will be reused or recycled to the greatest extent possible.

During construction the Construction Manager will implement a site-specific Waste Collection and Disposal Management Plan, which will include good site practices such as:

- Systematic collection of waste with any associated on-site storage in weather-protected areas
- Contractors will be required to remove their excess materials from the site (e.g., extra cable, formwork, scrap metals, pallets, etc.)
- Excess materials generated during the course of construction of access roads will be handled in accordance with the MOE's Protocol for the Management of Excess Materials in Road Construction and Maintenance
- Labelling and proper storage of liquid wastes (e.g., used oil, drained hydraulic fluid, and used solvents) in a secure area that will ensure containment of the material in the event of a spill – all material spills will be reported to the MOE's Spills Action Centre (1-800-268-6060), except those exempted in Ontario Regulation 675/98
- Spill kits (e.g., containing absorbent cloths and disposal containers) will be provided on-site during construction. Affected soil and clean-up material will be treated as hazardous material and managed in accordance with the applicable sections of the Environmental Protection Act and Ontario Regulation 347/90.
- Prohibition of dumping or burying wastes within the Project sites
- Should contaminated soil be encountered during the course of excavations, it will be treated as hazardous material and managed in accordance with the applicable sections of the Environmental Protection Act and Ontario Regulation 347/90. .
- Subject waste will be registered on MOE's Hazardous Waste Information Network
- Disposal of non-hazardous waste at a registered waste disposal site(s)
- Waste will be transported by haulers licensed with a Certificate of Approval – Waste Management System.

- If waste is classified as other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator will have obligations regarding manifesting of waste. Compliance with Schedule 4 of Ontario Regulation 347/90 is mandatory when determining waste category.
- Implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials.

Operation

YFP will implement a waste collection and disposal system which may include good site practices such as:

- Systematic collection of waste with any associated on-site storage in weather-protected areas
- Labelling and proper storage of liquid wastes (e.g., used oil, drained hydraulic fluid, and spent solvents) in a secure area that will ensure containment of the material in the event of a spill. Spills will be reported to the MOE's Spills Action Centre (1-800-268-6060), as required by Ontario Regulation 675/98
- Waste lubricating and hydraulic oils associated with maintenance and operation will be removed from the Project site and recycled or disposed of as per provincial waste management regulations. In keeping with Ontario Regulation 347/90 of the Environmental Protection Act, YFP will submit a Generator Registration Report for each waste generated at the facility.
- Disposal of waste at a registered waste disposal site(s)
- Implementation of an on-going waste management program consisting of reduction, reuse, and recycling of materials
- Subject waste will be registered on MOE's Hazardous Waste Information Network

6.7.6.3 Net Effects and Evaluation of Significance

The Project will require minimal use of waste disposal facilities, and will contribute to municipal waste disposal operations through recycling or tipping fees. The use of the local waste disposal facility will generally be restricted to the construction phase of the Project, and therefore the significance of the effect is minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.8 SOCIO-ECONOMIC FEATURES

This section refers to the criterion described in **Section 6 - Socio-Economic Features** in the integrated screening checklist, including:

- Nature and organization of local governments
- Population
- Effects on neighbourhood or community character

- Effects on local businesses, institutions or public facilities
- Effects on the economic base of a municipality or community
- Effects on local employment and labour supply
- Effects related to increases in the demands on community services and infrastructure
- Housing
- Effects related to traffic

6.8.1 Nature and Organization of Local Governments

6.8.1.1 Potential Effects

Construction

The Project is located on Crown Land in the unincorporated townships of Haggart, Sydere, and Bradburn, and is outside the municipal boundary of the Town of Smooth Rock Falls. The Project will not have an effect on the nature or organization of the town government during the construction phase of the Project.

Operation

No effects on the nature and organization of the town council are anticipated during the operation phase of the Project.

6.8.1.2 Mitigation and Protection Measures

Construction

Prior to commencing construction, YFP will consult with the Town of Smooth Rock Falls and the MNR to identify any additional specific concerns and mitigation measures (such as traffic). The Project is not expected to have an effect on the nature and organization of local governments, therefore no further mitigation or protection measures are necessary.

Operation

No further mitigation measures are required for the operation phase of the Project.

6.8.1.3 Net Effects and Evaluation of Significance

No effects on the nature and organization of local governments are expected as a result of the Project and significance is rated as neutral (No effect is anticipated to occur following implementation of mitigation measures).

6.8.2 Population

6.8.2.1 Potential Effects

Construction

The Project will require approximately 100,000 person-hours to construct. The use of local workers during the construction phase will be maximized. Consequently, an influx of temporary workers from elsewhere is not anticipated to significantly affect local population level. The increase in temporary workers could create a short-term increase in demand for rental housing during the construction phase. There is also potential for some additional demand on local public services such as waste disposal, health care, housing, and education (**Section 6.8.8**) during construction.

Operation

During the operation period, two people will be employed as operators. No effects on population levels are expected.

6.8.2.2 Mitigation and Protection Measures

Construction

The Project is expected to have a short-term effect on the size of the local population, therefore no mitigation or protection measures are necessary during the construction phase of the Project.

Operation

No mitigation measures are necessary for the operation phase of the Project.

6.8.2.3 Net Effects and Evaluation of Significance

Effects on the size and structure of the local population are expected to be restricted to the construction phase of the Project, and the significance of the effects is considered to be minimal (Potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels) since use of local workers will be maximized.

6.8.3 Local Economy

6.8.3.1 Potential Effects

Construction

The Town of Smooth Rock Falls is the closest community to the Project and will likely supply a significant portion of the labour force and materials required for construction, resulting in direct, indirect, and induced economic benefits. The local economy is primarily resource-based and few local economic or employment opportunities continue to exist since the Tembec Mallette

pulp and paper mill closure in 2006. However, the Town continues to serve as a regional centre for health-care and education.

The total Project budget is $72 million, and expenditures will include:

- Regulatory processes, and Project approval
- Specialty Project components (e.g. transformer, power line, turbines, generators, control units, etc.)
- Project materials, including standard construction materials such as wood, concrete, and fasteners
- Construction equipment such as cranes, heavy machinery, and personal vehicles
- Salaries for construction and operation staff

Specialty Project components and services (i.e. turbines, generators, electrical control equipment) must be sourced outside of the Study Area. Therefore, purchase of these items is not expected to benefit the local economy. However, during construction and operation of the Project, local sourcing of materials and services will be encouraged, provided that they are available in sufficient quality and quantity at competitive prices.

An Economic Benefits Assessment was prepared by IBI Group (**Appendix C**) to determine the effect of the Project on the local economy. The assessment was undertaken for the Island Falls Project concept, however due to constantly increasing construction costs, the construction cost estimates and related labour estimates are similar to those expected for the Yellow Falls Project. As a result, the capital cost estimates and labour requirements shown in **Appendix C** are representative of the Yellow Falls Project.

Economic effects can occur as direct, indirect and induced effects, described below in terms of employment:

- Direct employment impacts refer to the employment created in the construction industry (usually on-site) as a result of the development of the Project. The ongoing operations of the Project will also result in direct employment generation.
- Indirect employment refers to the employment created in other industries in order to produce the materials (goods) and other inputs (services) necessary for the construction work.
- Induced employment refers to the employment created in the total economy as a result of employment generated throughout the economy resulting from the expenditure of income generated through the direct and indirect impacts.

In terms of the scale of effects on local and regional economies, direct impacts are the most significant. Indirect and induced impacts are more broadly dispersed throughout the wider economy. In the case of a northern environment such as the Smooth Rock Falls area, the potential scale of benefit to the local community may be distributed over a wider area by the

very nature of the source of employment for the Project. The extent to which local/regional versus out-of-region labour is required will only be known once the Project is underway and employment contracts advertised.

In the case of construction projects, the estimation of economic effect in terms of jobs created is often expressed in terms of person-years of employment. Person-year of employment is a unit of measure that allows for a consistent definition of the scale of employment impact. Person-years of employment relates to the employment of a single person for one full year. As an example, 10 person-years of employment conceptually indicates that 10 people can be employed for one year or one person can be employed for a period of 10 years. Several other combinations are also possible.

The value of direct, indirect, and induced economic effects can be calculated by multiplying direct effects by a ratio reflecting the value added to the local economy. The ratio, referred to as a "multiplier," reflects the size and diversity, geographic extent, and nature of the local economy. The multiplier also reflects the value of a project to the local economy, and how much "leaks out" to other areas.

Table 6.13 shows one-time job creation (person-years of employment) during construction. A total of 95 direct jobs are estimated to be created from installation of the hydroelectricity generating station and from consulting employment related to the installation (on-site design and development) aspects of the Project.

The indirect and induced employment multiplier for the construction industry is 1.51. The consulting employment multiplier is estimated at 1.26. **Table 6.13** shows that approximately 134 jobs are created as a result of indirect and induced impacts.

Table 6.13 Direct and Indirect/Induced Employment

Hard Installation Cost[1]	Construction Employment (Person-Years)			Soft Cost Relating to Consulting	Consulting Employment (Person-Years)[2]			Total Number of Person-Years of Employment		
	Direct	Indirect and Induced	Total		Direct	Indirect and Induced	Total	Direct	Indirect and Induced	Total
$10,992,677	55	84	139	$2,934,524	40	50	90	95	134	229

Source: IBI Group
[1]Includes Options/Extras Work
[2]It is assumed Consulting Payroll equals 40% of total soft costs

In addition to direct and indirect and induced employment, income taxes will be generated by persons involved in construction of the Project. The combined taxes generated from direct and indirect/induced employment is estimated at $5,092,000.

Road improvements will also result in economic benefits. During construction, YFP will be improve the existing public road (Red Pine Road) south from Highway 11 for a distance of approximately 14 km and construct a new 9.4 km road to Yellow Falls. The upgrade will also include three new bridges. These improvements will be permanent in nature.

Operation

Two full-time positions will be required to manage and operate the facility year-round. It is estimated that each full-time equivalent position will be remunerated on the basis of a total salary (excluding benefits) of $60,000 per year. The indirect and induced employment multiplier for the utilities industry is estimated at a ratio of approximately 1.67. Hence, the indirect and induced employment is three more full time equivalent positions. The additional employment gain is equivalent to wage benefits of $39,900 per person per annum. The total economic impact is an additional $99,900 of gross employment income to the economy. The federal and provincial income tax generated by full-time positions as well as indirect and induced employment is approximately $35,800.

Ongoing labour requirements for routine maintenance such as access road repair and transmission line vegetation clearing will create additional direct, indirect, and induced employment. As was the case during construction, YFP will place a strong preference on local material and labour supplies.

YFP will pay water rental and property taxes totaling $336,480 per year (subject to any legislated increases) beginning in the 10th year of operation (there is a 10-year holiday on taxes for new generation).

6.8.3.2 Mitigation and Protection Measures

Construction

A positive effect will be encouraged by promoting the use of local labour, goods and services provided they are available in sufficient quantity and quantity and at competitive cost throughout the construction phase of the Project.

Operation

As with the construction phase of the Project, local goods and services will also be used provided they are available in sufficient quantity and quantity and at competitive cost throughout the duration of the operation phase of the Project.

6.8.3.3 Net Effects and Evaluation of Significance

The economic benefits assessment of the construction and operation of the Project (**Appendix C**) confirms labour requirements of over 100,000 person-hours during construction of the Project. Key conclusions of the Economic Benefits Assessment are provided below:

- The Project will result in potentially significant construction related employment gains. A proportion of these gains can be expected to be sourced from the local labour market while a proportion will be sourced from the broader Northern Ontario regional economy

- The Project is unlikely to result in any labour shortages in the local community and may result in some improvement in the skills training associated with workers in the region

- Project construction will result in an estimated 55 direct on-site full-time equivalent jobs and 84 indirect and induced full-time equivalent jobs (one job is equivalent to one year of employment for one person).

- The Project is unlikely to generate any negative effects on local private property interests and will not place a burden on the Provincial Government by way of any operating costs associated with the facility or access roads

- The Project will generate some capital improvements in public roads.

The Project will have a positive effect on the local economy during the two-year construction period and, to a lesser degree, during the operation phase due to construction and maintenance employment opportunities, as well as expenditures for material. Therefore the significance of net effects is rated as positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project)

6.8.4 Local Business, Institutions or Public Facilities

6.8.4.1 Potential Effects

Construction and Operation

One business, Polar Bear Outfitters, holds an MNR Land Use Permit immediately south of the Project near Loon Rapids, but will not be affected by construction or operation of the Project. YFP has discussed the Project with the operator. Trappers also operate in Study Area. There is potential for the Project to affect trapping businesses by altering movement of wildlife during construction (**Section 6.4.4**) or directly by locating Project infrastructure near trap lines.

Two existing hydroelectric generating stations are located upstream and downstream of the Project. Lower Sturgeon Generating Station, owned by OPG, is located upstream, while Smooth Rock Falls Generating Station, owned by Tembec, is located downstream. YFP has discussed construction and operation of the Project with OPG and Tembec. The Project will not affect the dam safety rating or operation of either facility. YFP will work with Tembec and OPG during future amendments to the Mattagami River Water Management Plan.

During construction, there may be a small influx of workers from outside the Smooth Rock Falls area. As construction will last for approximately two years, people may choose to live in the area during the construction period. With the closure of the Tembec Mill, and resulting population decline in the Smooth Rock Falls area, there will likely be a sufficient amount of rental properties to accommodate the influx of temporary workers during the construction phase. Furthermore, local institutions such as schools and health care facilities may also experience a limited additional demand for services.

Due to Project spending for equipment services and supplies, businesses such as food providers, fuel retailers, mechanical shops, lodging facilities in Smooth Rock Falls and the

surrounding region are anticipated to experience positive economic benefits during the construction phase of the Project.

No further effects are anticipated during the operation phase of the Project.

6.8.4.2 Mitigation and Protection Measures

Construction and Operation

In order to maximize positive effects on local businesses, local goods and services will be used whenever possible if they are available in sufficient quality, quantity, and at competitive prices. Institutions, suppliers and area businesses should be made aware of the short-term nature of construction. Throughout the construction period, community members and local business owners should be kept advised of the Project schedule in order to ensure that inventory and staffing levels are appropriate for the demand. Local businesses have been inquiring about services required for the Project, as well as the Project schedule, during consultation activities.

A local trapline operator currently traps in the vicinity of the Red Pine Road. The ability of the trapline operator to maintain traps in this area will be temporarily affected during construction of the Project. YFP has consulted directly with the registered trapper regarding his business concerns and these have been addressed.

As the majority of the effects will be experienced during the construction phase of the Project, no further mitigation measures will be required for the duration of the operation phase.

6.8.4.3 Net Effects and Evaluation of Significance

The Project will have a positive effect on local businesses during the two-year construction period and to a lesser degree during the operation phase. Therefore, a positive low significance has been assigned (potential effect may result in a slight improvement in resource in Study area during the life of the Project).

6.8.5 Tourism

6.8.5.1 Potential Effects

Construction

Tourism in the region is resource-based. The James Bay Travel Association (2001) advertises Smooth Rock Falls as an ideal travel location due to its abundance of fish and wildlife, as well as easy access to Fraserdale, Abitibi Canyon, and the Abitibi River.

Polar Bear Outfitters, located in Cochrane, is a tourist establishment providing approximately 30 fly-in, drive-in, and boat-in camps throughout the area, primarily to take advantage of hunting and fishing opportunities. A campground exists near the Village of Departure Lake. The Project is not expected to have an effect on Land Use Permit holders with the MNR.

During the Draft EA Report review period, the Project Team was made aware of two companies (Howling Wolf Expeditions and Northern Spirit Adventure) proposing operations in the Study Area (**Appendix E9**).

Additionally, it was requested by the Friends of the Mattagami and the MOE during the Draft EA Report review period that consideration be given to the potential for eco-tourism operations in the affected river reach. Currently, no eco-tourism operations have been identified through ongoing consultation efforts in the affected River reach. Further, the *Smooth Rock Falls Community Adjust Committee Final Report* (2005) did not identify eco-tourism as a potential area for considerable growth. Tourism and eco-tourism are not mentioned in the 1979 Town of Smooth Rock Falls Official Plan.

Ecotourism takes advantage of non-consumptive recreational opportunities in a natural setting. Criteria and a ranking system to determine suitability for ecotourism was proposed by Boyd and Butler, 1993 (Boyd, Butler, and Haider, n.d.).

Using the criteria shown in **Table 6.14**, it is assumed that ecotourism participants desire a natural experience where the presence of few roads, towns, or other infrastructure gives an impression of remoteness. Ecotourism participants also desire a diversity of natural plant and animal life, as well as landscape diversity. Thus, most of the study area does not provide an ideal location for ecotourism ventures since numerous logging and access roads mark the landscape. In addition, several clear-cut areas or areas where re-growth is occurring may affect sentiments of naturalness and remoteness in ecotourism participants.

Table 6.14 Ecotourism Score - Characteristics and Values

Primary Characteristics

Community Type	Population Size	Score	Study Area Score
Absence of permanent settlement	0	5	2
Unincorporated communities	1-1000	3	
Small towns	1001-10,000	2	
Urban settlements (industrial based)	>10,000	1	
Resource Related Activity (Forestry)	**% of Area**	**Score**	**Study Area Score**
No presence of forestry activities	100	5	1
Forestry practices I	<20% cut over 30-40 years	3	
Forestry practices II	>20% cut over 20-30 years	2	
Forestry practices III	>20% cut over 10-20 years	1	
Vegetation Coverage	**% of Area**	**Score**	**Study Area Score**
Mixed forest (type 1)	>50% coniferous >10 % white and red pine	5	2
Mixed forest (type 2)	>50% deciduous/coniferous, <10% white or red pine	4	
Dense coniferous forest	>80% jack pine, black spruce	3	
Sparse coniferous forest burns and	>80% deciduous, >10 years old	2	

Table 6.14 Ecotourism Score - Characteristics and Values

cutover			
Clearcuts, burns	shrub cover, <10 years old	1	
Access Characteristics	Value Range	Score	Study Area Score
Access area I	area outside of any buffers around roads	5	1
Access area II	area within 2km of logging roads	3	
Access area III	area within 5km of loose surface roads	2	
Access area IV	area within 10 km of paved/major roads	1	
Wildlife Setting	Value Range (used CLI for Ungulates)	Score	Study Area Score
Wildlife setting I	ARDA class areas 1-2	5	3
Wildlife setting II	ARDA class areas 3-5	3	
Wildlife setting III	ARDA class areas 6-7	1	
Secondary Characteristics			
Landscape (Relative Relief)	Measure	Score	Study Area Score
High relative relief	>25 m	5	2
Medium relative relief	10-25 m	3	
Low relative relief	<10 m	1	
Landscape (Water Content)	% of Area	Score	Study Area Score
Presence of water	5-20%	5	5
Presence of water	20-50%	3	
Presence of water	>50%	1	
Study Area Total			16

Boyd, Butler, and Haider suggest that total scores may be used to define the "Type of Naturalness" and suitability for ecotourism (**Table 6.15**). "Type of Naturalness" is ranked from I (highest suitability) to V (lowest suitability) with the caveat that a ranking of III is not possible if the area scores 2 or less in three or more categories. Consequently, the Study Area would be ranked as Type IV in terms of naturalness.

Table 6.15 Ecotourism Ranking – Type of Naturalness

Type of Naturalness	Score Range	Study Area Score
I	31 – 35	
II	21 – 30	
III	15 – 20	
IV	8 – 14	16 (score 2 or less in several categories)
V	1- 7	

Using the above ranking for ecotourism, it is apparent that most of the Study Area exhibits low potential for ecotourism. However, opportunities for tourism based on hunting and fishing that do not depend on "naturalness" or "remoteness" may also be viable. Winter outdoor tourism

operations such as snowmobiling are also viable as exhibited by the popularity of the Arctic Riders Snowmobile Club trail network.

Any tourism taking place during the construction phase may be affected due to increased levels of noise, and in-water works requiring booms and dams. Potential effects associated with tourism would include effects on fishing, hunting, and wildlife observation activities, as well as other outdoor recreation activities which have been described in **Section 6.8.5**. The majority of the effects would be experienced as a result of construction related activities of the Project.

Operation

The Project is not expected to affect areas currently used by tourists. Therefore there are no foreseeable effects on tourism in the area during the operation phase of the Project. The new access road may positively affect tourism by opening up new areas to snowmobile or ATV users, as well as improving access to the river for tourism operations promoting fishing and hunting or other forms of outdoor recreation.

6.8.5.2 Mitigation and Protection Measures

Construction

Mitigation and protection measures associated with noise levels which are outlined in detail in **Section 6.3.3**.

A new 339 m portage route will be constructed to maintain the crossing at Yellow Falls for local canoeists. Portages at Loon and Davis Rapids will no longer be required.

YFP consulted with the Arctic Riders during the planning stage of the Project, and confirmed that the Arctic Riders were interested in securing a snowmobile route on the east side of the Mattagami River in order to avoid the annual maintenance associated with construction of an ice bridge across the Mattagami at Loon Rapids.

YFP and the Arctic Riders executed a Memorandum of Understanding (“MOU”) which facilitated the completion of the new snowmobile trail on the east side of the Mattagami (i.e. opposite side of the Mattagami River from the Project’s access road and transmission line), and clarified how any remaining potential interaction between snowmobiles and construction/operation activity will be managed.

Operation

During the development of the Project, stakeholders within the Town of Smooth Rock Falls indicated their ongoing interest in the development of recreational activities within the Town, as well as along the Mattagami River.

To this end, YFP has made several commitments to the Town of Smooth Rock Falls for the purposes of promoting recreational activities in Smooth Rock Falls and the Mattagami River. YFP has committed to providing to the Town an annual contribution of $3,000 per year to support local environmental stewardship activities in the area. YFP has also committed to the

installation of a parking lot along the Red Pine Road. Finally, YFP has committed to a one-time contribution of $70,000 to support recreational developments in the Town of Smooth Rock Falls.

No further mitigation measures will be required during the operation phase of the Project.

6.8.5.3 Net Effects and Evaluation of Significance

Due to the increased amount of noise and in-water works during the construction phase, some temporary effects to tourists such as reduction in enjoyment because of noise, dust, or human presence may occur during construction. The operation of the Project will not affect areas currently used by tourist outfitters. In addition, the development of ecotourism in the Study Area as it exists now is scored as low and the Project will not affect current ecotourism potential. Consequently, Project effects on tourism are rated as minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.8.6 Navigability of Waterways

6.8.6.1 Potential Effects

Construction

In-water work such as cofferdam installation may affect navigability of the Mattagami River. Construction activity will prevent use of the current portage around Yellow Falls and may affect the safety or difficulty of portaging around Yellow Falls. In addition, bridge installation over the North Muskego River may affect navigability of this watercourse.

Operation

Following construction, the dam/powerhouse structure will prevent small craft such as canoes and kayaks from portaging directly over Yellow Falls. The navigability of the Mattagami River between Yellow Falls and Loon Rapids will be improved as a result of increased water depths and reduced obstruction due to boulders and rapids. .

6.8.6.2 Mitigation and Protection Measures

Construction

Warning signs will be placed at least 100 m upstream and downstream of work locations to warn river users of construction activities.

Immediately following installation of in-water works, all materials, equipment, vehicles, temporary structures, and any other items used for construction must be removed from the watercourse.

Any structures or materials that are placed on the bed or the surface of the Mattagami River or the North Muskego River during construction will be removed immediately following construction so that navigability is maintained.

The bridge over the North Muskego River will be at a height (approximately 2 metres) above the water surface elevation (under normal flows) to provide sufficient clearance to permit passage of small craft such as canoes, kayaks, and rafts without requiring a portage. Additionally, YFP will obtain the necessary *Navigable Water Act* permits prior to construction of the dam or the bridge structures.

Small vessels (i.e. canoes, kayaks, and motorboats) seeking passage past Yellow Falls will be permitted safe passage through or around the construction site. A temporary portage route will be demarcated. The temporary portage route may be longer than the final 339 m proposed portage route shown in **Figure 2.3**, and its location may change as construction activities progress.

Operation

An appropriately signed portage (see **Figure 2.3**), including clearly marked entry and exit points will be installed on the upstream and downstream sides of the powerhouse/dam structure. Portage signs must be placed 100 m upstream and downstream of the portage entry/exit locations to advise river users of the portage location. Portages at Loon and Davis Rapids will no longer be required.

Safety booms, coloured international orange, must be placed a minimum of 50 m upstream and downstream from the powerhouse/dam structure. All signage will be installed in accordance with Transport Canada requirements.

6.8.6.3 Net Effects and Evaluation of Significance

During construction, small craft seeking downstream passage past Yellow Falls will be directed to a safe over-land portage. Following commencement of operations, the proposed boat ramp upstream of Yellow Falls will be accessible. In addition, portages at Loon Rapids and Davis Rapids will no longer be required, thus eliminating two take-outs and put-ins for recreational canoeists. Consequently, the significance of net Project effects on navigability of waterways has been rated as positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).

6.8.7 Local Employment and Labour

6.8.7.1 Potential Effects

Construction

During the construction phase of the Project, YFP will require the employment of local persons. In 2001, 42% of the population of Smooth Rock Falls was employed in the manufacturing and construction industry. It is anticipated that suitable skill sets are available in the community.

Operation

During operation, two operators will be directly employed, with ongoing additional labour, requirements for routine maintenance such as access road repair and transmission line vegetation clearing.

6.8.7.2 Mitigation and Protection Measures

Construction

Positive effects on local employment can be augmented by ensuring local labour, goods and services are used to the fullest extent possible throughout the construction phase of the Project.

Operation

As was the case during construction, YFP will place a strong preference on local labour and supplies.

6.8.7.3 Net Effects and Evaluation of Significance

Employment of local persons is expected to have a positive effect on the economic base of the community during the construction phase. Following the two-year construction period, two full-time positions will be created. Local employment and labour is therefore expected to return to near-baseline levels for the duration of the Project's lifecycle with the exception of potentially increased employment during maintenance operations. Consequently, the significance of net Project effects on local employment and labour is rated as positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).

6.8.8 Community Services and Infrastructure

6.8.8.1 Potential Effects

Construction

The Project will not require the use of community services or infrastructure such as electricity, potable water, or wastewater treatment. Although workers during the construction phase of the Project may require lodging, it is anticipated that these services can be provided by existing infrastructure (i.e. existing motels, rental units) and not additional municipal infrastructure will be required. An increased presence of workers may slightly increase demand for community services including fire, police and medical treatment during construction.

Operation

Limited use will be made of the community services and infrastructure during operation. No further effects are anticipated during the operation phase.

6.8.8.2 Mitigation and Protection Measures

Construction

Since potential effects on community services and infrastructure are minimal, no mitigation or protection measures are required for the construction phase of the Project.

Operation

No mitigation measures are required for the operation phase of the Project.

6.8.8.3 Net Effects and Evaluation of Significance

The Project is expected to have a short-term, minimal effect on the demand for community services and infrastructure during construction. Following commencement of operations, minimal demand will be made on community services. Therefore the significance of net Project effects has been rated as minimal (Potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.8.9 Housing

6.8.9.1 Potential Effects

Construction

It is expected that the demand for temporary or rental housing will increase within the Town of Smooth Rock Falls during the construction phase of the Project.

Operation

During the operation phase of the Project no significant additional demand for housing is expected.

6.8.9.2 Mitigation and Protection Measures

Construction

No mitigation or protection measures related to community services and infrastructure are necessary. Recent closure of the Tembec Mill in Smooth Rock Falls has resulted in increased availability of rental residential spaces, thus undesirable effects associated with low vacancy rates, such as increasing rental costs, are not anticipated.

Operation

No mitigation measures are required during the operation phase of the Project.

6.8.9.3 Net Effects and Evaluation of Significance

No long-term or significant effects on housing are expected for the operation phase of the Project. Therefore, the significance of net effects is rated as neutral (No effect is anticipated to occur following implementation of mitigation measures).

6.8.10 Traffic

6.8.10.1 Potential Effects

Construction

The construction phase will require numerous truck trips to transport personnel, equipment and materials. The majority of these trips will be along Red Pine Road. Highway 11 may also handle a large portion of the truck travel associated with the Project. There may also be instances during construction where overweight or oversize loads will require special traffic planning. The increase in traffic, including excess load traffic, results in the potential for short-term, localized disturbance to traffic patterns, and wear and tear on roads.

It is anticipated that most passenger vehicles, concrete trucks, and miscellaneous vehicles will travel along Highway 11 through Smooth Rock Falls. In addition, it is estimated that half of the gravel trips will also utilize Highway 11. This will increase usage on Highway 11 from an annual average daily traffic count ("AADT") of 2550 (MTO, 2005) to a minimum of 2575 (approximately a 1% increase), and a maximum of 3070 (approximately a 21% increase) during peak activity.

Construction traffic will be approximately equivalent to one truck every ten minutes. Over a ten-hour work day, this will amount to approximately 60 trucks. At some point, almost all construction traffic will use Red Pine Road. The amounts of traffic on access roads to the Project site will depend on the final selection of borrow areas, staging areas, and concrete batch plant locations.

Operation

Once the Project is in operation, additional effects on traffic are not anticipated as Project related traffic would be restricted to operation and maintenance transportation. Traffic associated with maintenance activities is lower in terms of volume and frequency than construction related traffic.

6.8.10.2 Mitigation and Protection Measures

Construction

In order to reduce the effects associated with the increased volume of traffic, the proponent will implement a road safety program to deal with specific traffic planning issues in consultation with the MTO and MNR. The program will consider the use of signage (as prescribed by the Ontario Provincial Standards for Roads and Public Works), road closures, speed restrictions, truck lighting, load restrictions, and equipment inspections as required.

Particular attention will be given to intersection or crossing locations. Due to anticipated traffic volume during peak construction activity periods, the intersection between Highway 11 and Red Pine Road must be signed and controlled using a stop sign to prevent traffic from proceeding directly onto the highway, and flag people if required. Upgrades to the intersection or an intersection control plan will be developed as required in consultation with the MTO.

Construction and operation traffic will be required to stop and ensure that a train is not passing at the railway crossing on Red Pine Road.

Access on Red Pine Road will be limited during the construction period, and the presence of construction vehicles must be clearly indicated via appropriate signage.

Construction traffic will avoid residential streets to the greatest extent possible thereby reducing the geographic extent of the effect of construction traffic on the community.

Appropriate permits will be obtained from provincial agencies to implement traffic related activities including road improvements or alterations to compensate for any deterioration of the existing roads due to the increase in traffic volume or to mitigate for any additional hazards identified by agencies. Potential permits include:

- Excess Load – MTO
- Special Vehicle Configuration – MTO
- Temporary Construction Access – MTO
- Commercial Permanent Access – MTO

Operation

The above mentioned mitigation measures will also be applied to the operation and maintenance phase of the Project when required.

6.8.10.3 Net Effects and Evaluation of Significance

Effects associated with increased traffic volume will primarily occur during the construction phase of the Project. These effects will be temporary and limited in geographical extent. Provided that the above-mentioned mitigation and protection measures are properly implemented, the significance of net Project effects on traffic are rated as minimal (Potential effect may result in a slight decline/improvement in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.8.11 Public Health and Safety

6.8.11.1 Potential Effects

Construction

The Project is not located in a highly populated or heavily used area, therefore potential health and safety concerns are greatly reduced. Potential public health and safety risks are generally related to construction traffic and unauthorized public access the facility. Safety precautions (e.g. warning signs, fencing, etc.) will be employed to limit such risks. The Project poses no foreseeable risks associated with sanitation.

Accidents or malfunctions during the construction, operation, and decommissioning phases of the dam or other Project related infrastructure could be hazardous to the public. These accidents vary in severity and could include accidental spills, watercourse siltation, or dam failure. Furthermore, unexpected events could result in dam malfunction, such as; extreme climatic events or third party damage. Contingency plans will be developed to ensure immediate response to any unexpected event, accident, or malfunction (**Section 6.12**).

Operation

Within the immediate vicinity of the dam outlets, such as the sluiceway, spillway, and tailrace, reduced visibility and slippery surfaces may pose safety risks for operation and maintenance works. These conditions are a result of water spray, frost mist, and the resultant fog in the immediate vicinity of the dam site.

Lastly, mercury methylation, resulting from the decay of organic materials in inundated areas (**Section 6.5.4**), may present health hazards for individuals who consume large quantities of fish.

6.8.11.2 Mitigation and Protection Measures

Construction

Implementation of transportation planning and safety measures during construction will minimize the potential for traffic related safety concerns (**Section 6.8.10.2**). The construction contractor will also construct all roadwork following MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990).

The primary protective measure for accidents and equipment malfunctions is the safe design, construction, operation, maintenance, and decommissioning of the Project and ancillary facilities. Accidents and malfunctions can also be minimized through proper training and education of employees.

Operation

Safety measures will be employed around the Project site to inform the public of health and safety risks and to prevent access to hazardous areas such as the powerhouse and dam. This includes posting warning signs and fencing off hazard areas in accordance with MNR and Transport Canada (navigation) regulations.

To minimize risk to operation and maintenance workers associated with reduced visibility and slippery surfaces at the dam outlets, non-slip surfaces and railings will be incorporated into the construction plans, and proper attire such as non-slip shoes must be worn by operators.

YFP will ensure that emergency responders within the Study Area are aware of the Project location and the procedures to be followed in the event of an emergency. Response to malfunctions or accidents, which may occur as a result of the operation of the turbines, will be addressed in YFP's Emergency Response Plan (**Section 9.3.2.4**) and through the water management planning process.

To mitigate the potential for mercury mobilization within the headpond area, pre-impoundment clearing will take place to limit nutrient supply and mercury methylation. Water quality monitoring requirements will be implemented following construction in consultation with relevant agencies.

6.8.11.3 Net Effects and Evaluation of Significance

Following implementation of mitigation and protection measures such as fencing off hazard areas and posting warning signs, along with the immediate implementation of the Emergency Response Plan in the event of an accident or malfunction, risk will be minimal and restricted to the immediate Project Area (**Section 6.12**). Risks for operation and maintenance crews can be reduced through proper employee training and attire, as well as incorporating plans for non-slip surfaces and handrails in the construction of the powerhouse and dam. Safety risks for recreational users are considered minimal as posting warning signs and limiting access to Project components will greatly reduce risk. Accordingly, the significance of net effects of the Project on public health and safety is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.9 HERITAGE, CULTURE, LANDSCAPE AND ARCHAEOLOGICAL RESOURCES

This section refers to the criterion described in **Section 8 - Heritage and Culture** in the integrated screening checklist, including:

- Effects on heritage buildings, structures or sites, archaeological resources, or cultural heritage landscapes
- Locally, regionally and provincially significant features
- Lifestyle
- Effects on scenic or aesthetically pleasing landscapes or views

6.9.1 Heritage and Archaeological Features

6.9.1.1 Potential Effects

The Ontario Environmental Assessment Act (RSO 1990, S. 6.1 (2) c) requires heritage aspects of the environment to be affected by the Project to be identified. The Archaeological Assessment process is undertaken in a number of stages by a licensed archaeologist in accordance with the Ontario Heritage Act (Ministry of Citizenship, Culture and Recreation, 1997). Archaeological assessment works undertaken for the Project were completed with involvement from the Taykwa Tagamou First Nation. The stages of the Archaeological Assessment process include:

Stage 1: An initial desktop review of archaeological and historical information is survey is undertaken

Stage 2: If archaeological or cultural heritage features are likely to exist in the Study Area, the licensed archaeologist may recommend a Stage 2 Assessment, which includes field work to identify potential archaeological sites

Stage 3: If locations containing archaeological features are identified during Stage 2 investigations, further work is undertaken to determine the age, size, and artifact frequency of the sites.

Following Stage 3 investigations (if required), a report is submitted to the Ministry of Culture ("MOC") by the licensed archeologist that details potential effects to archaeological sites and makes recommendations to mitigate effects or protect the site. The MOC will approve or modify the archaeologist's recommendations.

A Stage 3 Assessment has been submitted to the MOC for the Project. The MOC has reviewed and accepted the report, provided that recommended mitigation and protection measures are undertaken. A summary of potential effects and recommendations contained in the Stage 3 Archaeological Assessment is provided below. All recommendations described in the Archaeological Assessment and in correspondence with the MOC (**Appendix E8**) will be undertaken by the proponent.

The Taykwa Tagamou First Nation, Mattagami First Nation, Flying Post First Nation, and Wahgoshig First Nation communities have indicated that they have traditionally used the Mattagami River area in the vicinity of Yellow Falls for fishing, hunting and trapping. Accordingly, pre-contact archaeological resources of interest to these communities may exist in the vicinity of the Project.

Construction

Construction has the potential to affect archaeological and heritage resource sites. Stages I through III Archaeological/Cultural Heritage Assessments were conducted in the vicinity of the proposed dam/powerhouse structures and headpond by Woodland Heritage Services Limited. A copy of the Assessment was provided to the MCL and a response was received on September 24, 2007 (**Appendix E8**), concurring with recommendations in the Archaeological/Cultural Heritage Report).

The assessments have identified archaeological resources in the vicinity of Yellow Falls, Davis Rapids, and Loon Rapids. A pre-contact and historic site at Yellow Falls will not be affected by headpond formation, but it may be subject to disturbance during construction. Of the above sites, only the Yellow Falls site will require mitigation and protection measures.

Archaeological assessment works completed for the Project found that a First Nations cemetery has also been reported approximately 4 km downstream of the headpond terminus (OPG WMP Process Papers, MNR Cochrane District; Taykwa Tagamou First Nation).

Project construction also has the potential to affect currently unknown archaeological features along the proposed access roads and transmission line route which were not included in the Stage I to III Archaeological/Cultural Heritage Assessments.

Following release of the Draft EA, the MNR was contacted by a local First Nation community member with experience related to the identification and management of First Nation burial sites. This individual indicated his interest in discussing and participating in additional investigations of potential burial sites that may be affected by the Project.

In response to this request for involvement, a meeting was held between YFP, TTN, MNR, Woodland Heritage Services (Project archaeologist), and the interested First Nations member. During the meeting, YFP provided additional detail on the Project, and an overview of the MOC assessment process and other regulatory requirements was provided by Woodland Heritage Services and the MNR.

YFP facilitated a number of visits to Yellow Falls by First Nations representatives. The site visits occurred on three separate occasions. On November 6, 2006, the MNR, TTN, and Mr. William Iserhoff visited Yellow Falls to investigate potential archaeological resources. No specific archaeological resources were identified as a result of the visit, however additional clarification was provided to Mr. Iserhoff regarding the future archaeological works that would be required prior to construction (i.e. Stage IV investigations).

A second First Nations site visit was carried out on November 18, 2008. This site visit was attended by representatives from the Wahgoshig First Nation, Flying Post First Nation, Matachewan First Nation, Woodland Heritage Services (consultant archaeologist), MNR, and YFP. The visit included a walking tour of the site, and a traditional First Nations ceremony, led by representatives from the Wahgoshig First Nation, and participated in by all attendees.

The third First Nations site visit was carried out on January 20, 2009. This site visit was attended by Chief and Councillors from the Mattagami First Nation, Woodland Heritage Services (consultant archaeologist), MNR, and YFP. The visit included a walking tour of the site, discussion of the Project plans, as well as archaeological works that had been conducted to-date, as well as those planned prior to construction. Chief Walter Naveau conducted a ceremony at the site.

Operation

Once the Project is constructed there is limited potential for disturbance, and therefore, no additional effects on archaeological, heritage or cultural resources are expected.

6.9.1.2 Mitigation and Protection Measures

Construction

As with all construction projects, there is a possibility that deeply buried, undetected archaeological remains or other cultural heritage values exist within the Project footprint. In the event that archaeological or cultural heritage resources are discovered during construction, all activity in the vicinity of the discovery will immediately cease and the MOC archaeologist and interested First Nations will be contacted. If deemed necessary by the Ministry of Culture and interested First Nations, a licensed archaeologist may be required to develop site-specific mitigation measures and oversee site salvage operations in consultation with First Nations.

Should potential human remains be encountered during construction, all work in the vicinity of the discovery must be suspended immediately. Notification must be made to the Ontario Provincial Police who will conduct a site investigation and contact the district coroner. Notification must also be made to the Ministry of Culture and the Registrar of Cemeteries.

As outlined in the Archaeological/Cultural Heritage Assessment and the Ministry of Culture letter dated September 24, 2007 (**Appendix E8**), the following mitigation or protection measures will be required for existing sites:

- The location of the reported Aboriginal cemetery about four km south of Loon Rapids will be confirmed and documented by a field visit prior to construction.
- Confirm the reported location of an old portage landing on the east side below Loon Rapids
- Undertake a Stage 1 assessment of new Project access roads, aggregate pits and transmission lines following detailed design activities. Ancillary facilities proposed in areas of high archaeological potential will undergo a Stage 2 field assessment as required in consultation with the Ministry of Culture.
- A site protection plan for the Yellow Falls archaeological site will be developed in consultation with a licensed archaeologist and the MOC. Due to the quantity and age (up to 5,000 years ago) of aboriginal and historic cultural materials excavated from the multi-component Yellow Falls site, there are ongoing archaeological/cultural heritage concerns.

There are unconfirmed reports of a burial ground south of Loon Rapids, outside of the Project footprint. Despite being located outside of the Project footprint, YFP will committed to retaining an archaeologist to investigate this potential burial ground location following start of construction of the Project.

Any potential sites or archeological resources identified during subsequent Project-related activities/investigations will be reported to the MOC and addressed in accordance with MOC guidelines.

YFP is committed to working with interested First Nations and the MOC to ensure potential and known archeological resources are appropriately protected or preserved.

Operation

There are no significant additional excavations or disturbances associated with operation of the Project. Accordingly, no protection or mitigation measures are required for the operation phase of the Project due to the previous identification of heritage and/or archaeological resources prior to and during the course of construction. During the operation phase, YFP will continue to implement any site protection plans that may be developed.

6.9.1.3 Net Effects and Evaluation of Significance

Through implementation of the mitigation and protection measures outlined above and in the Archaeological Assessment, and incorporating the recommendations outlined in the Yellow Falls site protection plan into the construction and operation phase of the Project, effects on heritage or archaeological resources are expected to be neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.9.2 Community Character

6.9.2.1 Potential Effects

Construction

Construction of the Project has the potential to affect the community character of the Town of Smooth Rock Falls. There is potential to temporarily affect the local viewscape due to increased traffic volumes and the presence of construction machinery. Short-term effects associated with an increased population of non-resident construction workers, and noise due to the increased traffic volume and frequency is also possible.

Operation

Since the Project is located approximately 18 km from Smooth Rock Falls, community character will not be affected during the operation phase.

6.9.2.2 Mitigation and Protection Measures

Construction

Environmental noise will be reduced through the standard operating practices described in **Section 6.3.3**. Effects from increased traffic in Smooth Rock Falls will be reduced through mitigation measures described in **Section 6.8.9**.

Operation

There are no anticipated effects to the community character of Smooth Rock Falls during the operation phase of the Project.

6.9.2.3 Net Effects and Evaluation of Significance

Community character in the Town of Smooth Rock Falls may be temporary affected through traffic and noise during the construction phase. However, no long term effects on the community character of Smooth Rock Falls are expected during operations. Net effects are therefore rated as minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.9.3 Lifestyle

6.9.3.1 Potential Effects

Construction

Project construction will have an effect on recreation, such as angling, hunting, camping, ATV riding, boating, snowmobiling, canoeing, kayaking, hiking, and cottaging (see **Section 6.7.4**.).

Recreational activities have been identified as major components of the lifestyle of local residents, during consultation activities for the Project. Additionally, these activities form a major part of the resource-based tourism industry of the area. Therefore, potential effects on these activities during construction will also affect the tourism industry during this time period (see **Section 6.8.5**).

Although disrupted in certain areas due to site access restrictions, headpond inundation, and increased noise associated with construction activities, most construction-related disruptions will be temporary, and recreational activities can continue in the local area unimpeded.

Operation

The Project has the potential to affect local recreational activities, such as hunting, fishing, boating, ATV riding, snowmobiling, camping, hiking, canoeing and kayaking during the operation phase (see **Section 6.7.4**).

Access to Project infrastructure, such as the dam and associated buildings, will be restricted to ensure public safety and prevent vandalism. Access to the Mattagami River, for canoeing and kayaking upstream of the facility, will be improved since two portages will no longer be required. In addition Red Pine Road improvements and construction of a boat ramp upstream of Yellow Falls will allow improved boat access to this stretch of river.

Snowmobile activities will be positively affected through the construction of new snowmobile trails in partnerships between YFP and local snowmobile groups. Positive effects to snowmobiling and ATV-riding are anticipated during the operation phase.

As expressed by members of the community, angling is a central component of the lifestyle of Smooth Rock Falls' residents. Studies were conducted over several years (**Appendix G**) to define the baseline aquatic environment, as well as to identify potential effects of the Project. The Project will inundate areas used for angling approximately 6 km upstream of Yellow Falls,

including Davis Rapids and Loon Rapids. These rapids are a popular location for local anglers. Although new fish habitat may be created within the headpond, angling in the area will be altered for the life of the Project. The Project is expected to increase the net productivity of some sport fish species in the area.

A stretch of the Mattagami River between Gogama and Smooth Rock Falls is designated as a provincial canoe route (MNR, 1990). The inundation of Loon Rapids and Davis Rapids will permanently alter canoeing activities in the area by submerging whitewater conditions; however it is noted that this section of the river is not heavily used by canoeists (Acres, 1990). Portage routes currently exist at Island Falls, Yellow Falls, Davis Rapids, and Loon Rapids for users to by-pass these sites; the need for portages at Davis Rapids and Loon Rapids will be eliminated. The current portage route at Yellow Falls will be replaced during Project construction and will be maintained at better conditions than currently exists.

Boating activities will be positively affected in the inundated areas due to the removal of barriers; however there will be access restrictions to areas on the river at Yellow Falls due to public safety at the powerhouse/dam structure.

Due to the creation of the headpond and fluctuating water levels within the headpond, cottaging between Yellow Falls and Loon Rapids may be positively affected. It is expected that once the headpond has been established, and normal operating levels reached, new cottaging opportunities along the shoreline could be possible.

The number of furbearing animals should not change as a result of Project operation. However alterations to the Red Pine Road may require modification to trap locations. These changes have been discussed with the registered trapper.

There are no negative foreseeable effects on tourism in the area during the operation and maintenance phase of the Project. The new snowmobiling trails may positively affect tourism by opening up new areas or improved routes to snowmobile or ATV users.

6.9.3.2 Mitigation and Protection Measures

Construction

Mitigation measures for potential effects to the lifestyle of local residents during construction are largely in the form of protection and enhancement of recreational use of the area to the extent possible and traffic management during construction. YFP recognizes the importance of recreational activities to members of the Smooth Rock Falls community, local tourists and land users. Mitigation measures incorporated into the Project to ensure that recreational activities continue to flourish in the area are described in **Section 6.7.4.2**.

Operation

Mitigation measures implemented during the construction phase of the Project will also address potential effects during the operation phase. Therefore, no further mitigation measures are required.

6.9.3.3 Net Effects and Evaluation of Significance

Recreational activities of local residents may be disturbed during construction. During operation, the locations in which these activities take place may be altered. Fishing activities can continue downstream and upstream of Yellow Falls outside the safety booms (**Figure 2.3**). Improved access along Red Pine Road and construction of a boat ramp at Yellow Falls may facilitate recreational activities important to the Smooth Rock Falls lifestyle. The remaining local area will continue to be appropriate for recreational use. Therefore, the actual recreational activities that can be performed will not change, and the lifestyle of local residents will be unaltered. This effect is therefore rated as minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

6.9.4 Scenic or Aesthetically Pleasing Views

6.9.4.1 Potential Effects

Construction

There is potential to temporarily affect the local viewscape in the Town of Smooth Rock Falls due to increased traffic volumes and the presence of construction machinery.

Activities during construction that will result in changes to the viewscape at the Project site include dam construction, removal of vegetation along the shoreline, construction of access roads, transmission lines, aggregate extraction, and construction staging areas. The majority of construction activities will take place at Yellow Falls, approximately 18 km from Smooth Rock Falls. There are no permanent residents in proximity to the Project site. Therefore, it is expected that viewscape alterations during construction will primarily affect local recreational users and seasonal residents. Polar Bear Outfitters, a local tourist establishment, holds a land use permit for a commercial outpost camp upstream of Loon Rapids, and may also be affected by alterations to the viewscape during construction.

Operation

The Project will permanently alter the local landscape by inundating the Mattagami River between Yellow Falls and Loon Rapids, as well as the tailwaters of Rat Creek and some ephemeral tributaries. Access roads and transmission lines will also alter the viewscape in the local area. The powerhouse/dam structure will change the local landscape in the immediate vicinity of Yellow Falls.

6.9.4.2 Mitigation and Protection Measures

Construction

During construction, good site practices and a traffic management plan will contain construction equipment in appropriately designated work areas. Immediately following construction, construction sites including quarries will be rehabilitated or re-vegetated to reduce the potential for erosion as described in **Sections 6.1.3**, **6.4.1** and applicable permits. Otherwise, effects on

the viewscape during the construction phase will be temporary and localized. No further mitigation measures are required.

Operation

Once construction is completed, vegetation will be reestablished. However, due to safety and line maintenance requirements, vegetation will be maintained below the height of the transmission line. Some vegetation will also be permanently removed for the construction of new access roads.

The permanent inundation of rapids will change the viewscape, and although no mitigation measure can be implemented to avoid this, the headpond, along with revegetation and replanting initiatives on the shoreline, will create a new viewscape for recreational users, tourists, and seasonal residents. These initiatives will be completed with the objective to retain the natural character of the area as much as possible, a priority expressed by many interested parties and members of the community.

The landscape of the Mattagami River will be altered at the dam site and within the headpond with few mitigation measures available to decrease the effect of these changes. However, mitigation measures are available with respect to the terrestrial vegetation component of the landscape. This includes vegetated areas along the shoreline, access road and transmission line route. Existing forest floor cover is to be avoided and maintained to the extent possible (**Section 6.4**). This includes the felling of trees into previously cleared areas as to prevent effects to remaining vegetation.

6.9.4.3 Net Effects and Evaluation of Significance

Visual effects associated with this Project will include the inundation of rapids, removal of vegetation along the shoreline during the construction phase, the removal of vegetation to construct access roads and the transmission line corridor, and construction of a dam structure.

The visual effects on the shoreline are expected to be low since alterations are reversible, are limited to the area of the shoreline, and will last only during the construction phase of the Project up to the time when revegetation activities commence. Removing vegetation to construct access roads and transmission line corridors will result in visual alterations, as access roads and transmission lines will be constructed in areas currently occupied by smaller trails. Although the transmission line corridor will be revegetated, the new infrastructure will alter the area for the life of the Project.

The inundation of the rapids and construction of the dam will result in visual alterations to the area. Although the effect is confined to the area of the headpond (as expressed through the consultation process), the viewscape is valued by those who use the area for recreational purposes. Although the headpond and revegetation initiatives along the shoreline will maintain the natural character of the area, the viewscape will still differ from what current recreational users are accustomed to.

The net effects to the landscape will be both temporary and long-term. Temporary short-term removal of vegetation along the shoreline will be required during the construction phase of the Project, however through proper mitigation measures noted above (i.e. revegetation), the site should return to near baseline conditions. The creation of the access road and transmission line will result in the loss of some terrestrial vegetation and will affect the landscape in these areas (mainly along existing corridors). Long-term net effects to the landscape of the Mattagami River at Yellow Falls and within the headpond will be experienced. These resources will be altered significantly from their current state throughout the life of the Project. However, the effects are localized to Yellow Falls and the headpond area and changes to the natural character of the area will be limited following revegetation. Therefore the significance of net effects has been rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.10 FIRST NATIONS

This section refers to the criterion described in **Section 9 - Aboriginal** of the environmental screening checklist, including:

- Effects on First Nations or other Aboriginal communities
- Treaty and Aboriginal rights
- First Nation Land Claims

6.10.1 Effects on First Nations Communities

6.10.1.1 Potential Effects

Construction

As discussed in **Section 5.6.2**, interested First Nations have been contacted by YFP and their input on the Project has been encouraged. Through consultation activities with the Taykwa Tagamou Nation (“TTN”), an Impact Benefit Agreement (“IBA”) was developed and signed. First Nation involvement in the collection of on-site data such as fish surveys and background information has also been utilized for the preparation of the EA. The TTN fully supports the development of the Project.

In autumn 2006 YFP was advised by the MNR that the Mattagami First Nation expressed an interest in the Project. Then, later in the consultation process (February 6, 2007) for the Project, YFP was advised by the Ontario Secretariat for Aboriginal Affairs (“OSAA”) to contact three additional First Nations, including the Matachewan First Nation, Flying Post First Nation, and Wahgoshig First Nation. These First Nations were subsequently contacted by YFP and Flying Post and Wahgoshig First Nation have indicated an interest in the Project. Mattagami First Nation, Wahgoshig First Nation, Flying Post First Nation, and Matachewan First Nation are all member of the Wabun Tribal Council.

There are no First Nation reserve lands within the Study Area. Distances between Yellow Falls and several of the closest First Nation Reserves are provided in **Table 6.16**.

Table 6.16 First Nation Reserves

First Nation	Reserve	Distance from Yellow Falls (km)
New Post	New Post IR No. 69A	59
Flying Post	Flying Post IR No. 73 (unoccupied reserve)	69
New Post	New Post IR No. 69	81
Wahgoshig	Abitibi IR No. 70	129
Matachewan	Matachewan IR No. 72	136
Mattagami	Mattagami IR No. 71	140

YFP is committed to continuing good-faith discussions with the First Nations expressing an interest in the Project. YFP and TTN will continue to engage these First Nations as the Project moves forward.

Engagement of the TTN and Wabun communities has not identified any specific environmental concerns associated with operation of the Project. YFP has not received any traditional knowledge or other comments from the TTN that indicate any ongoing environmental concerns associated with the construction of the Project. The TTN fully supports the development of the Project. In accordance with the IBA between the TTN and YFP, TTN will be heavily involved in the construction of the Project.

Comments received from the Wabun communities regarding the Project have been focused on the location of the Project within their traditional territories. Comments related to specific environmental effects have not been received to-date.

Operation

Engagement of the TTN and Wabun communities has not identified any specific environmental concerns associated with operation of the Project. YFP has not received any traditional knowledge or other comments from the TTN that indicate any ongoing environmental concern associated with the operation of the Project. The TTN fully supports the development of the Project.

Concerns received to-date from the Wabun communities are focused on their interest in receiving Project economic benefits as a consequence of their understanding that the Project is located within their traditional territory.

6.10.1.2 Mitigation and Protection Measures

Construction

It was recommended in the Archaeological Assessment that further field and archival investigations be conducted. Investigation of the potential burial ground south of Loon Rapids will be undertaken.

In the event that human remains are encountered before or during construction, all work will stop immediately. The Ministry of Culture and the Cemeteries Regulation Unit of the Ministry of Consumer and Commercial Relations will also be notified, as well as the appropriate police and local medical officer of health. First Nations will also be contacted if buried archaeological resources are found. Throughout construction of the Project, heritage or archaeological resources identified will be avoided and the site protection plan followed.

The Archaeological Assessment also recommended that the identified archaeological site at Yellow Falls be protected from any disturbances and that a site protection plan is undertaken in partnership with First Nations. In the event that buried archaeological resources are found during construction, the Ministry of Culture will be notified as appropriate. If deemed necessary by the Ministry of Culture, a licensed archaeologist may be required to develop site-specific mitigation measures and oversee site salvage operations.

YFP has actively engaged Taykwa Tagamou Nation to determine potential Project effects, benefits and mitigation measures. The Taykwa Tagamou Nation fully supports the Project.

To-date, the Wabun communities (Matachewan, Flying Post, Wahgoshig, and Mattagami First Nations) are requiring economic benefits from the Project as a consequence of their understanding that the Project is located within their traditional territory. The Taykwa Tagamou Nation is continuing to engage these communities in Nation-to-Nation discussions in an effort to reach an understanding regarding territories.

In addition, YFP is committed, as the Project proponent, to continuing good-faith discussions with the First Nations expressing an interest in the Project. To-date no specific natural environment-related concerns have been raised by First Nations regarding the construction of the Project on their community or community members. Additionally, YFP has, through the ESP and Federal Screening, completed an intensive and thorough assessment of potential environmental effects associated with construction of the Project, and identified appropriate mitigation measures as proposed in this EA Report.

Consultation with First Nations is ongoing and will continue throughout the Project's lifecycle to identify and mitigate any concerns or effects that arise. In addition, regulatory agencies have a duty to consult with First Nations prior to issuance of approvals as per recent Supreme Court decisions.

Operation

To-date no specific natural environment-related concerns have been raised by First Nations regarding the operation of the Project on their community or community members. Additionally, YFP has, through the ESP and Federal Screening, completed an intensive and thorough assessment of potential environmental effects associated with operation of the Project, and identified appropriate mitigation measures as proposed in this EA Report.

No protection or mitigation measures are required for the operation phase of the Project due to the previous identification and involvement of First Nation interests in the Study Area prior to

and during the course of construction. As mentioned above, consultation with First Nations is an iterative process and will continue throughout the Project's lifecycle.

6.10.1.3 Net Effects and Evaluation of Significance

Through the ongoing consultation process with the First Nations, there is significant potential benefit to the TTN as a result of the economic benefits that will flow to that community through the construction and operation of the Project. There are no anticipated adverse net effects to First Nations communities as a result of the Project. The construction and operation of the Project will not result in any costs to the Wabun communities. However the Wabun communities have indicated that they are seeking economic benefits from the Project.

Since the TTN will benefit from the Project, the level of effect after protection and mitigation measures have been employed is rated as low and positive (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).

6.10.2 Traditional Land Use

6.10.2.1 Potential Effects

Construction

The Project has the potential to affect traditional land use practices such as hunting, fishing and trapping during construction.

Several First Nation communities have indicated that they have traditionally used the Mattagami River area in the vicinity of Yellow Falls for fishing, hunting and trapping.

Project construction will have an effect on angling since access to the Project site for recreational activities will be restricted during the construction phase for safety purposes. Disruptions to angling will also occur during headpond inundation in the areas that will be inundated.

Hunting activities may be affected during construction in the immediate Project area due to an increase in human presence and traffic, resulting in game species avoiding the area. This effect is expected to be restricted to Project construction areas and the headpond area during inundation, and hunting levels will remain the same outside of these areas.

Three trapline areas have been identified adjacent to the immediate Project Area. YFP has contacted trapline permit holders through the MNR. YFP has met with the registered trapper in the vicinity of the Project. YFP provided a description of the proposed construction and operations activities. A potential effect on trapping operations along the Red Pine Road was identified as a result of impeded access by the trapper, as well as localized and temporary disturbance of fur-bearing animals as a result of increased levels of human activity along the Red Pine Road.

Discussions with the TTN, Mattagami First Nation, Matachewan First Nation, Wahgoshig First Nation, and Flying Post First Nation did not identify any specific concerns associated with traditional activities such as hunting, fishing, trapping or gathering of wild foods by First Nation communities. Concerns raised by the Wabun Communities were focused on the concept of traditional territory, and consequences for economic benefit to their community on that basis.

Operation

Due to inundation of the local rapids, fishing activities will be affected as the rapids are a popular location for local anglers. New fish habitat will be created within the headpond, and some species of sport fish are expected to increase.

Presence of game is expected to be similar to baseline conditions. The Project may have a positive effect on moose in the area as the vegetation along the headpond will create new foraging habitat.

Through discussions with the registered trapper, it has been determined that trapping can continue through the operational phase of the Project.

6.10.2.2 Mitigation and Protection Measures

Construction

Mitigation measures such as the construction of the boat launch and portage route will be implemented during the construction phase to ensure that activities such as angling and hunting may continue unimpeded are described in **Section 6.7.4.2**.

YFP has actively engaged Taykwa Tagamou Nation and Wabun communities to determine potential Project effects, benefits and mitigation measures. In addition, YFP is committed to continuing good-faith discussions with the First Nations expressing an interest in the Project. Consultation with First Nations is ongoing and will continue throughout the Project's lifecycle to identify and mitigate any concerns or effects that arise.

YFP engaged the registered trapper in the vicinity of the Project to identify potential impacts on trapping in the area, as well as to determine appropriate mitigation measures. An agreement has been reached with the registered trapper to address potential effect on his operations during the construction period.

To-date no specific concerns related to hunting, fishing, trapping, or food gathering have been raised by First Nations regarding the construction of the Project on their community or community members. Additionally, YFP has, through the ESP and Federal Screening, completed an intensive and thorough assessment of potential environmental effects associated with construction of the Project, and identified appropriate mitigation measures as proposed in this EA Report.

Operation

Mitigation measures implemented during the construction phase of the Project will also address potential effects during the operation phase. Therefore, no further mitigation measures are required.

To-date no specific concerns related to continuing hunting, fishing, trapping, or food gathering have been raised by First Nations regarding the operation of the Project on their community or community members. Additionally, YFP has, through the ESP and Federal Screening, completed an intensive and thorough assessment of potential environmental effects associated with operation of the Project, and identified appropriate mitigation measures as proposed in this EA Report.

6.10.2.3 Net Effects and Evaluation of Significance

In addition to consultation with all stakeholders, YFP has also engaged the registered trapper and First Nations regarding effects on traditional land uses. Potential effects on traditional lands and traditional uses are expected to primarily occur during construction. However, First Nations have not brought forward any concerns related to traditional land use to date. Therefore, a significance rating of minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels) has been assigned. Consultation activities will be on-going to identify any effects as they arise, and reach and implement mutually accepted mitigation measures.

6.10.3 Land Claims

6.10.3.1 Potential Effects

The following First Nations groups and government agencies were contacted to identify any land claims within the Project's Study Area:

- Taykwa Tagamou Nation
- Mushkegowuk Council
- Wahgoshig First Nation
- Flying Post First Nation
- Nishnawbe-Aski Nation
- Matachewan First Nation
- Mattagami First Nation
- Indian and Northern Affairs Canada
- Union of Ontario Indians
- Ontario Secretariat for Aboriginal Affairs
- Ministry of the Attorney General

The Study Team was informed by the MNR early in the Project development process (July 2005) that the proposed Project is located within lands traditionally used by the Taykwa Tagamou Nation. YFP therefore engaged the Taykwa Tagamou Nation, as well as the Mushkegowuk Council, in consultation activities to address their concerns, and work in partnership to identify agreed upon mitigation measures. The Mushkegowuk Council is a governing body providing a political voice for a total of seven First Nations communities (Mushkegowuk Council, n.d). Due to their role of providing political leadership and community guidance to the Nations they represent, the Mushkegowuk Council was included in the consultation process for the Project.

In consultation with Indian and Northern Affairs Canada's ("INAC") Litigation Management and Resolution Branch regarding land claims within the Study Area, two current land claims were initially identified. The first involved the Missanabie Cree First Nation, the second, the Mushkegowuk Council. After further legal investigation, it has been determined the former claim has been discontinued by formal Notice of Discontinuance dated August 14, 1995. The latter litigation has been resolved by court decision dated August 28, 1999 and pertained to dispute over the implementation of social assistance legislation.

The Ontario Secretariat for Aboriginal Affairs ("OSAA") noted that both Matachewan First Nation and Flying Post First Nation have submitted land claims to OSAA with regard to land in Northern Ontario. The lands in question are not located within the Study Area.

6.10.3.2 Mitigation and Protection Measures

YFP has actively engaged Taykwa Tagamou Nation and Wabun communities to determine potential Project effects, benefits and mitigation measures. In addition, YFP is committed to continuing good-faith discussions with the First Nations expressing an interest in the Project. Consultation with First Nations is ongoing and will continue throughout the Project's lifecycle to identify and mitigate any concerns or effects that arise. Engagement of these First Nation communities has not identified any specific land claim involving the Project lands. The TTN and four Wabun communities have stated that the Project is located within their traditional territory

6.10.3.3 Net Effects and Evaluation of Significance

No on-going land claims have been identified in the Study Area. As such, no negative net effects are anticipated to land claims and significance of net effects has been rated as neutral (No effect is anticipated to occur following implementation of mitigation measures).

6.11 CONFORMITY WITH AGENCY PLANS

This section refers to the criterion described in **Section 11 – Conformity with Agency Plans** of the environmental screening checklist, including:

- Conformity with existing MNR plans
- Conformity with other agency plans

6.11.1 Potential Effects

The Ontario Ministry of the Environment ("MOE"), Ontario Ministry of Natural Resources ("MNR"), the Ontario Power Authority ("OPA"), the Independent Electricity System Operator ("IESO"), the Ontario Ministry of Energy and Natural Resources Canada are the entities that play the most prominent roles in providing support for renewable electricity projects such as the Yellow Falls Hydroelectric Project. Each of these agencies have individual, sometimes integrated, policies and plans set out in order to direct development to ensure economic and social vitality, as well as environmental sustainability.

The MOE is the government entity which guides the provincial EA process through the *Environmental Assessment Act, O. Reg. 116/01*, and the *Guide to Environmental Assessment Requirements for Electricity Projects*, which set out EA requirements through the proponent-driven process. The MOE also issues CofAs for various emissions and issues permits for taking water. The Project is not expected to affect agency plans.

The MNR's document entitled *Our Sustainable Future* outlines their vision "…a healthy environment that is naturally diverse and supports a high quality of life for the people of Ontario through sustainable development". The mission of the ministry is to "…manage our natural resources in an ecologically sustainable way to ensure that they are available for the enjoyment and use of future generations". This document states that the Ministry's renewed strategic directions will include enhanced efforts for supporting new renewable energy supply and also outlines the steps needed for supporting development of renewable energy (water, wind, co-generation, biofuels), which include implementing site release policies in order to stimulate new opportunities.

The MNR's *Crown Land Use Atlas* for the Mattagami River, detailed in Policy Report number G1744, states that Yellow Falls, south of the town of Smooth Rock Falls is an identified area for a potential hydroelectric power generating site as a result of the MNR land use designation of this area for hydroelectric power generation. The *Crown Land Use Atlas* also states that the MNR "…will consider the Land Use Intent and Management Direction outlined in this policy report when reviewing applications for permitted activities that require licences, leases, permits, or other forms of approval".

The government of Ontario created the OPA in order to give direction on the Province's energy policies. The OPA is responsible for ensuring a long-term supply of electricity and offering advice to the Government of Ontario on its future energy mix. Renewable sources, according to the OPA, offer considerable long-term potential to provide a significant share of future electricity needs. OPA plans are outlined in the *Supply Mix Advice Report* (OPA, 2005), which includes recommendations for the future development of Ontario's electricity system. The report concludes the province should "pursue an aggressive course for renewables within current constraints, while looking at ways to reduce these constraints." Currently, renewable sources, including hydropower and wind, account for 23% of Ontario's energy production. The OPA recommends increasing that amount to 43% by 2025.

The IESO also gives direction on energy matters in a document entitled *10-Year Outlook: An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario, From January 2006 to December 2015*. This report (August, 2005) outlines significant challenges over the next ten years, stating that the phase out of coal-fired generation, aging generation facilities, and the continued increase in demand for electricity will contribute to the need for new generation and transmission facilities.

In response to predicted electricity shortfalls, and after reviewing various power generation alternatives, the Ontario Ministry of Energy announced the second and third Renewables RFPs in April 2005. The second Renewables RFP ("RFP II") called for up to 1,000 MW of new renewable energy supply from generation facilities between 20 MW and 200 MW. The nine winning projects for RFP II were announced on 21 November 2005, totaling 975.25 MW of new renewable supply. On June 13, 2006 the Minister of Energy directed the OPA to develop an Integrated Power System Plan ("IPSP") that includes the development of 2,700 MW of new renewable electricity generation, including hydropower, by 2010. The OPA has since released a series of discussion papers regarding Ontario's electricity supply. In Discussion Paper 4 (OPA, 2006a), the OPA includes potential new hydroelectric capacity of 728 MW by end of 2015 in their supply resource considerations. The OPA (2006b) considers renewable electricity resources to be an important pillar of environmental sustainability. As such, renewables are expected to feature prominently in the IPSP currently under consultation.

The Government of Ontario (2007) has directed the OPA to plan for coal-fired generation in Ontario to be replaced by cleaner sources in the earliest practical time frame. Renewables, along with natural gas-fired generation, are expected to make up for a shortfall in generating capacity as a result of the closure of coal-fired generating stations (OPA, 2005).

The federal government, through Natural Resources Canada (NRCan), promotes renewable energy through a system of incentives. NRCan manages a program called ecoENERGY for Renewable Power, which will invest $1.48 billion in renewable power from sources such as wind, biomass, low-impact hydro, geothermal, solar photovoltaic and ocean energy in order to increase Canada's supply of environmentally friendly electricity. This program aims to encourage the annual generation of 14.3 terawatt hours of electricity from renewable energy, which will provide power for approximately one million homes. The ecoENERGY program for Renewable Power provides an incentive of one cent per kilowatt-hour for up to 10 years to eligible low-impact, renewable electricity projects constructed over the next four years (April 1, 2007 to March 31, 2011).

6.11.2 Mitigation and Protection Measures

Through consultations with the administering agencies, YFP has ensured that the proposed Project adheres or will adhere to all of the above-mentioned agency plans. The potential for conflicts of interest to arise as a result of this Project is expected to be minimal since this Project complies with the MNR Crown Land Use Atlas, along with the directives of the OPA, the IESO, the MOE, the Ontario Ministry of Energy, and NRCan.

6.11.3 Net Effects and Evaluation of Significance

As a result of informing and consulting with all appropriate agency stakeholders as well as adhering to all of the plans and policies set out by these authorities, no negative effects on agency plans are expected as a result of the Project. Moreover, the Project assists the Government of Ontario in meeting its goals regarding supply of renewable energy and closure of coal-fired generating stations. The Project also assists the Government of Canada in its goals of reducing greenhouse gas emissions. As such, the significance of net effects has been rated as low and positive (potential effect may result in a slight improvement in resource in Study Area during the life of the project).

6.12 ACCIDENTS AND MALFUNCTIONS

Accidents and malfunctions include unpredictable events ranging in scale from small accidental spills to dam failure. While these events are unlikely, contingency planning is necessary to prevent a delayed or ineffective response to unexpected events or conditions that may occur during construction or operation. An essential element of contingency planning is the preparation of emergency plans and procedures that can be activated if unexpected events occur. The absence of contingency plans may result in short or long term environmental effects and possibly threaten public safety.

6.12.1 Potential Effects

Unexpected events requiring contingency planning that may occur during construction or operation of the Project include:

- Extreme climatic events
- Cofferdam failure
- Dam failure
- Watercourse siltation
- Construction delays
- Accidental spills
- Unexpected finds of heritage resources or contaminated material
- Third party damage

The primary protective measure for accidents and equipment malfunctions is the safe design, construction and operation of the Project and ancillary facilities. Accidents and malfunctions can also be minimized through proper training and education of employees.

YFP will ensure that emergency responders within the Study Area are aware of the Project location and the procedures to be followed in the event of an emergency. Response to malfunctions or accidents, which may occur as a result of the operation of the turbines, will be addressed in YFP's Emergency Response Plan (**Section 9.3.2.4**).

The risk of accidental spills or release of undesirable materials to water-bodies and soil is greatest during construction due to the amount of equipment present and consequent fuel and maintenance requirements. Once the generating station is functioning, hazardous materials will be used for maintenance and operation of on-site equipment and Project components such as the turbines, generators, crane, transformer substation, and sluice gate motors. Permanent storage of hazardous materials on-site will be limited to lubricants and fuels necessary for day-to-day maintenance of the plant and ancillary equipment.

In addition, there is potential for sediment to be introduced during construction through complete or partial failure of erosion control measures resulting in bank slumping or introduction of excessive sediment into watercourses, as well as potential for road or culvert washouts to introduce excessive sediment into watercourse.

There are no known hazardous by-products of the hydroelectric generation process. However, hazardous materials, primarily fuel, oil, lubricants, and cooling fluids, will be used throughout the life cycle of the Project. Explosives and other materials that pose a risk to human health are addressed in **Section 6.8.11**.

There is potential for road or culvert washouts to introduce sediment into watercourses. Failure of erosion control measures left in place during operation may also cause excessive sediment to enter watercourses.

6.12.2 Mitigation and Protection Measures

Where unexpected problems occur during construction or operation, YFP and the Construction Contractor must be prepared to take appropriate action quickly. Situations where contingency plans must be implemented need to be identified quickly. The Contractor must also know when to immediately cease operations, for example in the case of watercourse siltation or unexpected finds. All staff must be made aware of and know how to implement contingency emergency response measures.

6.12.2.1 Construction Delays

Delays in the construction schedule may be necessary due to field conditions or work progress. To minimize the effect of a construction delay, and if field conditions permit, equipment should be moved and construction should be undertaken on other Project aspects. Once field conditions permit, construction should commence or resume at problem areas.

6.12.2.2 Dam Failure

Dam safety analyses will be carried in accordance with the Ontario Dam Safety Guidelines, the Canadian Dam Association Dam Safety Guidelines, and the Lakes and River Improvement Act.

In accordance with the above requirements, the Inflow Design Flood based on the hazard classification of the Project was selected as the 1:10,000 yr flood. However, the Project is able

to handle the PMF without freeboard. Therefore, it is considered that there is more than sufficient capacity to pass larger than the design flood.

Stability analysis will be demonstrated by means of adequate safety factors, the ability of the structure to resist the forces tending to cause overturning, sliding, uplift, and differential settlement without exceeding allowable foundation bearing values. The stability analysis will clearly show the individual exterior loadings for the various cases during and after construction, the assumed area of base, the magnitude and distribution of the normal and shearing forces at the foundation level, the location of the contraction and expansion joints, the uplift assumptions, and any other factors entering into the calculations.

A dam break analysis will be used to determine the potential hazard classification of the structure. This analysis will take into consideration impacts on external stakeholders such as OPG, Tembec (Smooth Rock Falls GS located downstream of the site), Ontario Northern Railway (bridge), MTO (bridge) and cottage owners on the Mattagami River. The hazard classification is based on no increased incremental damage due to a potential dam failure over what would have occurred under natural circumstances.

Dam safety requirements include safety booms, which will be located upstream and downstream of the Project to restrict boat access to the structures. Signage will also be posted advising of potential hazards in the area in accordance with Navigable Waters criteria. Security fencing will be provided to restrict pedestrian and vehicular access to the facilities.

The units will be linked to a bypass system such that in the event of a plant trip, the bypass system will operate to maintain constant flows in the river downstream of the plant. As the plant operates as a run-of-river system the flows will be relatively constant with no sudden changes in discharge from the plant.

The spillway gates will be operated locally if they are required during a flood or debris sluicing activity so that operators can first check for any boat activity in the immediate vicinity of the structure. The gates will be designed to fail in place if there are any mechanical problems experienced during operation. Fail in place means that the gates will not close should there be mechanical problems (i.e. they will stay in the position that they were in at the time of failure).

6.12.2.3 Watercourse Siltation

Even with appropriately installed erosion and siltation control measures, extreme runoff events could result in collapse of silt fencing, overflow or bypass of sandbag barriers, slope or trench failures and other problems which could lead to siltation of watercourses. If siltation to a watercourse (or to a wetland or woodlot) occurs, construction will cease immediately until the situation is rectified. Immediate action should be taken to install temporary measures to contain the extent of erosion and siltation as quickly as possible. Temporary protection measures such as silt fencing, sand bags, riprap, logs or planks should be utilized.

When site conditions permit, permanent protection measures will be installed on erodible surfaces including cross slope diversion berms, hydroseeding, erosion control matting, riprap, and live stakes or whips. Additional layers of silt fencing or a more sturdy type of base fencing may be appropriate in erosion prone areas until vegetative cover is established.

If siltation has occurred due to a construction related activity (e.g. dewatering), the activity must be halted immediately until the situation is rectified. A supply of emergency materials (i.e., silt fencing, rip rap, shovels, etc.) must be available on-site at all times. The Contractor must be fully prepared to respond quickly to siltation events.

6.12.2.4 Accidental Spills

Construction

During construction, an accidental spill of construction fluids may occur. Fluids may include fuels, lubricating oil and grease, and hydraulic fluids. Upon release of a fluid, YFP or the Construction Contractor must immediately determine the magnitude and extent of the spill and rapidly take measures to contain it. Release of sediment will also be treated as a potential spill depending on the magnitude and extent. If necessary, the MOE Spills Action Center (**1-800-268-6060**) will be notified immediately. In addition, the following precautions will be taken:

- Refer to container labels and material safety data sheets (MSDS) to identify any potential health or flammability hazards
- Wear appropriate personal protective equipment when handling or working near hazardous substances
- If the substance is flammable, eliminate ignition sources and secure the area
- Coat any flammable substances with fire-fighting foam to prevent ignition.

During construction, all equipment containing grease, oil, or fuel must be stored in designated areas at least 30 metres away from watercourses. All construction equipment must be checked at least daily for leaks. If a leak is noticed during equipment inspection or operation, spilled liquid must be contained immediately. The affected piece of equipment will be repaired before recommencing work. Leaking equipment that requires transportation to repair facilities will be moved by flatbed or equipment hauler with appropriate spill containment in place and will not be operated until repaired.

Fuelling and lubrication of construction equipment will be carried out in a manner that minimizes the possibility of spills. Refueling activities will be monitored at all times; vehicles must never be left unattended while being refueled. Refueling of mobile construction equipment will not occur within 30 metres of any surface receptor or body of water. All containers, hoses and nozzles must be free of leaks. All fuel nozzles are to be equipped with functional automatic shut-off devices. Appropriate spill management equipment must be readily available and maintained within the refueling area.

Stationary construction equipment and storage units containing oil, grease, fuel, or other hazardous fluids (such as large generators, on-site fuel tanks, oil barrels, etc) will be placed in a containment area capable of holding the entire amount of oil, grease, or fuel contained in the equipment. On-site fuel tanks and generators will be situated in a designated area that has been bermed, lined with an impermeable barrier and located at least 30 metres away from waterbodies. Smaller, portable construction equipment (such as a portable gas-powered pump) must be placed in a portable containment unit (i.e. polyethylene tub) prior to operation. Where water velocity permits, oil containment booms will be placed across the Mattagami River downstream of the Project site during construction.

The construction contractor is required to develop and adhere to an Emergency and Spills Clean-Up Management Plan that will be monitored. Emergency spill kits and absorbent material should be on hand throughout construction and operation.

Contact information for the Town of Smooth Rock Falls water treatment plant operations manager will be kept on hand at all times, and the operations manager immediately notified in the event that an accidental spill or release occurs so that the appropriate mitigation or protection measures can be taken.

Excessive sedimentation of a watercourse will be treated as any other spill or accidental release to the environment. In addition to contacting the MOE and the Town of Smooth Rock Falls water treatment plant operations manager, the construction contractor will cease construction and identify the source of the sediment as quickly as possible. Corrective action, including installation of additional silt fence, rip-rap, re-grading, installation of geotextile, or other appropriate measures must be taken immediately to prevent further introduction of sediment into watercourses. In the event that a road or culvert washout occurs, the contractor will install a larger culvert capable of handling greater discharge in addition to taking corrective action and repairs to ensure sediment does not continue to enter watercourses and to prevent reoccurrence of the problem.

Operation

During operation, transmission and generating equipment will be housed in structures capable of retaining 110% of fluid capacity to prevent a spill from entering the environment. No discharge will be intentionally released from transformers.

No fertilizers, pesticides or herbicides will be used during construction or operation. No hazardous materials listed in Environment Canada's Toxic Substances Management Policy ("TSMP") will be used during construction or operation.

If a hazardous substance is spilled, safety precautions outlined in **Section 6.12** must be observed. In the event of an accidental spill that is determined to have an impact upon the environment, the MOE Spills Action Centre should be contacted and emergency spill procedures initiated immediately. All contaminated soil and spill clean-up material will be treated as hazardous material and disposed of in accordance with MOE Regulations (**Section 6.7.6**).

Contact information for the Town of Smooth Rock Falls water treatment plant operations manager will be kept on hand at all times, and the operations manager immediately notified in the event that an accidental spill or release occurs so that the appropriate mitigation or protection measures can be taken.

6.12.2.5 Unexpected Finds

Heritage and Archaeological

Every reasonable effort will be made to identify archaeological or heritage resources in the construction area prior to construction. However, it is possible that such resources could be encountered during construction. Should buried archaeological material be encountered, construction in the vicinity should cease immediately. The Ministry of Culture and an archaeologist licensed in the Province of Ontario will be notified. If the archaeological material includes possible human remains, the local OPP branch, and the Office of the Chief Coroner must be contacted as well. An appropriate site-specific response plan will then be developed in consultation with a licensed archaeologist, First Nations, and the Ministry of Culture before construction resumes in the immediate vicinity.

Contaminated Sites

Although efforts have been made to identify potential sites in the vicinity of the Project through a review of landfill records and contact with MOE, the potential exists for unknown material to be encountered during construction. If evidence of potential contamination is found, such as buried tanks, drums, oil residue or gaseous odour, construction will immediately cease until the source of the material is further investigated. The MOE will be notified as soon as possible if the source is not immediately obvious or containable.

6.12.3 Net Effects and Evaluation of Significance

Given the mostly rural nature of the Study Area, current transportation, storage, and operational practices followed by YFP, and the unlikelihood of catastrophic accidents and malfunctions, no significant net negative effects are anticipated from accidents and malfunctions over the life of the Project. Therefore the significance of net effects resulting from accidents and malfunctions is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.13 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

6.13.1 Climate Change

Modeling undertaken jointly by the MNR and the Canadian Forest Service (Colombo et al, 2007) to describe potential climate change in Ontario indicates that precipitation and temperature will increase over three time periods (2011 to 2040, 2041 to 2070, and 2071 to 2100). Climate change modeling is based on two climate change scenarios developed using Version 2 of the Canadian Coupled Global Circulation Model (“CCGCM”) created by Environment Canada – Canadian Centre for Climate Modelling and Analysis. The two scenarios are termed “A2” and

"B2". The A2 scenario assumes higher atmospheric concentration of GHGs, greater population, and higher reliance on fossil fuels than the B2 scenario.

Modeled results for the MNR Cochrane District (obtained from the Government of Ontario Climate Change Map Browser - http://www.web2.mnr.gov.on.ca/mnr/ccmapbrowser/climate.html) are shown in **Figures 6.18** and **6.19**.

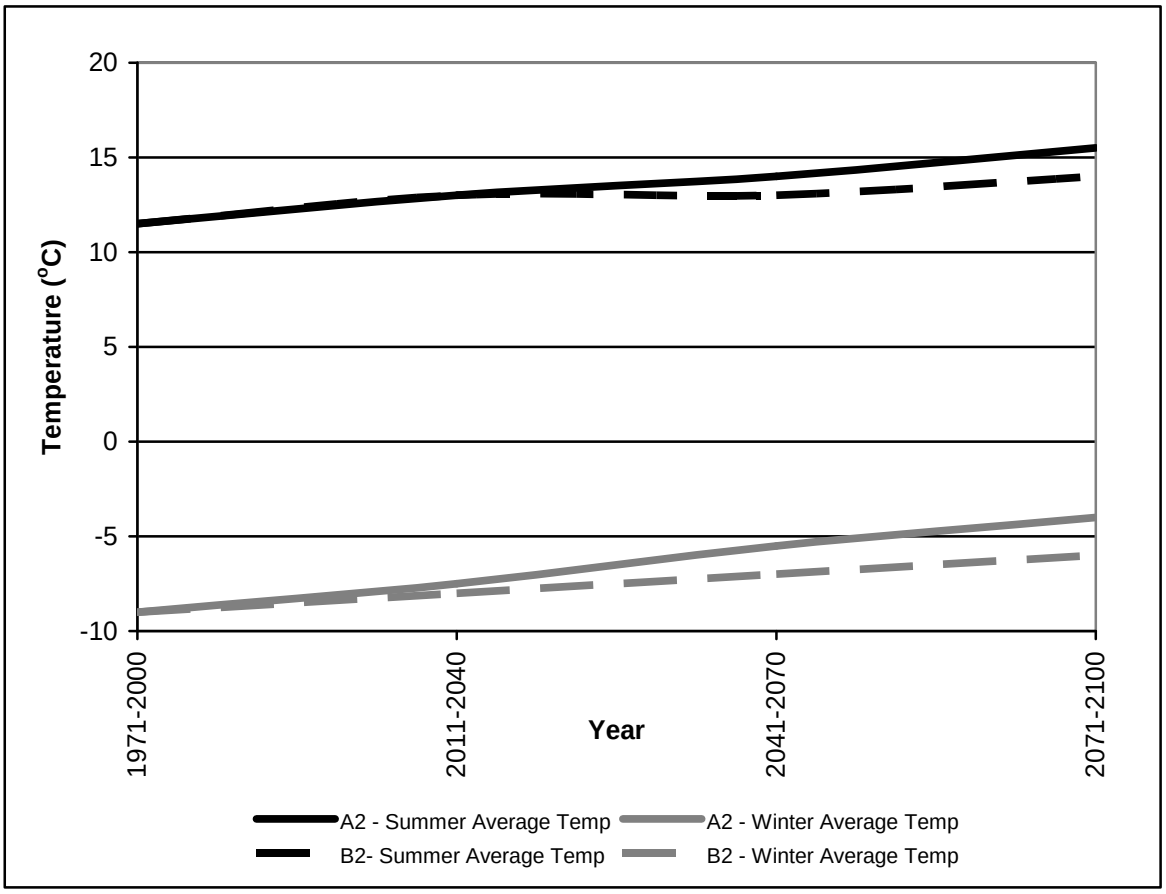

Figure 6.18 Cochrane District Modelled Temperature (1971-2100)

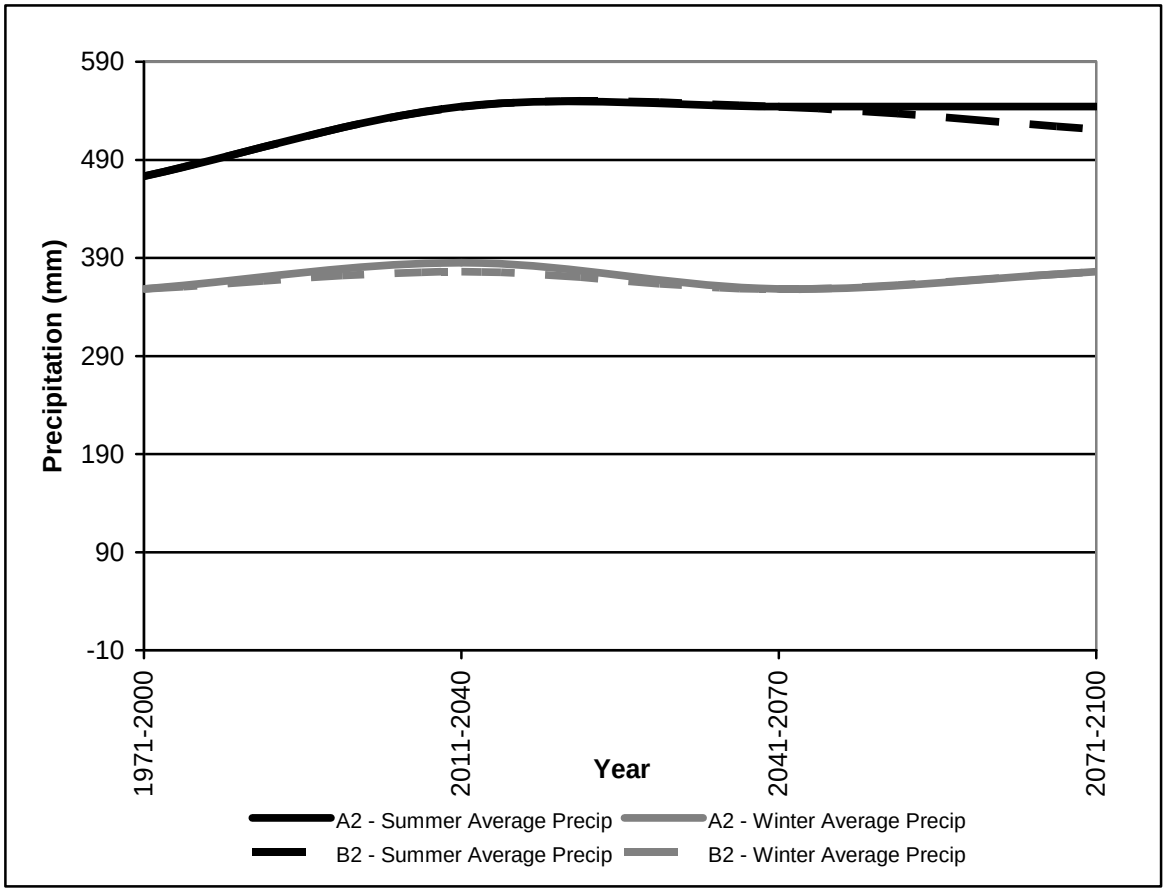

Figure 6.19 Cochrane District Modelled Precipitation (1971 to 2100)

Figure 6.18 indicates that, according to the Version 2 CCGCM, temperature will rise gradually over time, while **Figure 6.19** indicates that precipitation will remain relatively static during the winter and increase from 2011 to 2040 during the warmer months.

It should be noted that climate models are based on complex global algorithms for a number of variables. Version 2 of the CCGCM represents possible scenarios that may or may not occur. In this case, historical climate data from 1955 to 2003 (EC, 2003) and historical discharge data from the Smooth Rock Falls Gauging Station indicate that the average daily discharge of the Mattagami River is slightly declining (**Figure 6.20**). Similar to discharge, precipitation appears to be highly variable from year to year. Monthly trends indicate that, on average, precipitation is decreasing in summer and winter, and increasing in the spring and fall. Average daily temperature appears to be slightly declining on a yearly basis (**Figure 6.21**).

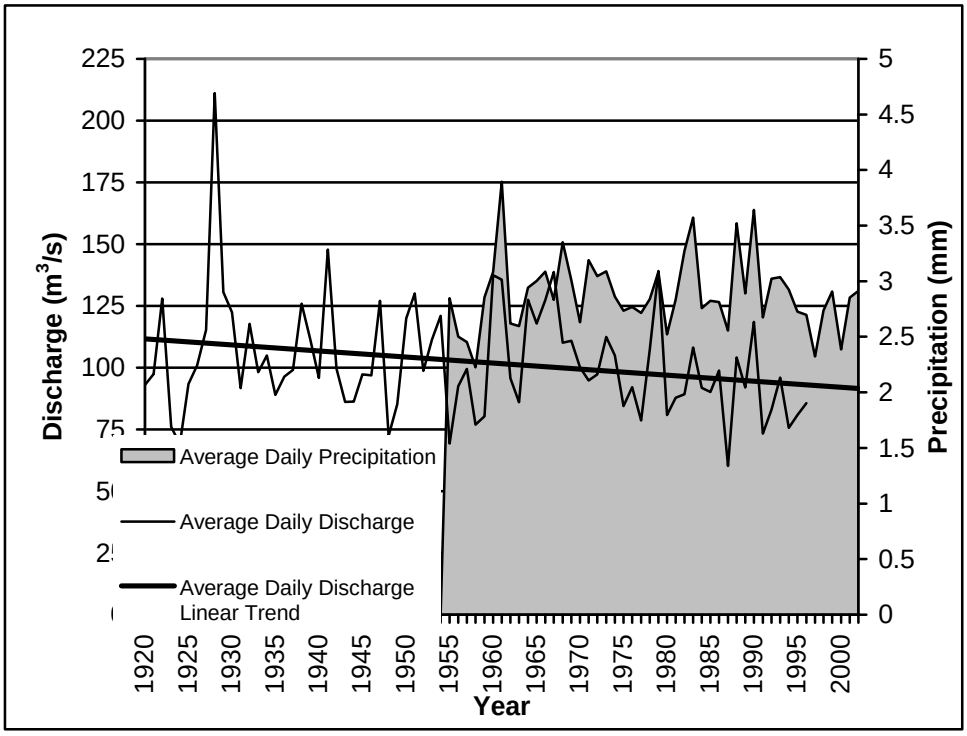

Figure 6.20 Average Daily Precipitation and Discharge

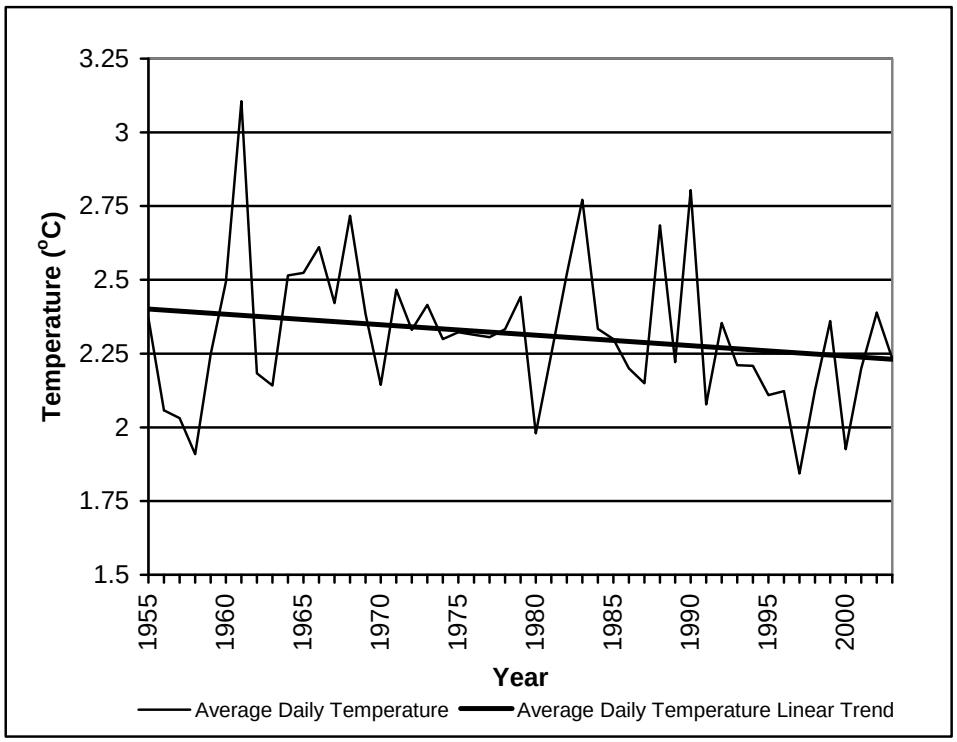

Figure 6.21 Average Daily Temperature (1955 - 2003)

Monthly trends indicate that, on average, precipitation is decreasing in summer and winter, and increasing in the spring and fall. Average daily temperature appears to be slightly declining on a yearly basis. Since historical data indicates that discharge and temperature are declining, it is possible that global climate change is affecting the Smooth Rock Falls area in ways not considered by the CCGCM. Additionally, the declining trends indicate that using average historical values for flood analysis would result in slightly conservative results.

However, global climate models also indicate an increase in the variability of world-wide weather patterns (e.g. more frequent low and high temperature events). Overall, an increase in average annual temperatures is projected with an increase in precipitation amounts (Climate Change Science Program et al., 2004), making extreme weather events more likely.

6.13.2 Extreme Events

Extreme events include rain, hail, ice storms, fire, tornadoes, earthquakes, and lightning strikes. The following events have been considered and are included within the various Project design components:

Rain – Abnormally high amounts of precipitation may result in highly elevated river discharge. The Project is equipped with spill facilities capable of passing discharge rates resulting from a 1 in 10,000 year flood event. The Project has additional capacity without freeboard to handle the probable maximum flood discharge rate of 3,893 m^3/s.

Hail – The Project will be constructed of material easily capable of withstanding damage from the impact of hail (concrete). However, transmission lines or poles may be damaged during extreme hail events. Transmission lines will be monitored on a continuous basis and shut down should a fault be detected.

Ice storms and freezing rain – Ice storms or freezing rain may cause damage to transmission lines or poles. Transmission lines will be monitored on a continuous basis and shut down should a fault be detected. Operating equipment for spill facilities will be designed so that it remains useable during ice storms. Spill facilities have the capability to be operated remotely and will not be affected should site access become difficult or dangerous. Ice events are not expected to affect the Project powerhouse or dams.

Fire - The Project may be affected by forest fires, resulting in loss of transmission lines, poles, or ancillary facilities. The MNR monitors forest fires in Northern Ontario on a continuous basis. In the event that a forest fire occurs in the immediate vicinity of the Project, YFP will follow direction from the MNR to ensure safety of operators and the Project. YFP should implement a policy requiring ongoing monitoring of forest fire conditions to ensure operators are not trapped at the Project site in the event of a major forest fire.

Tornadoes – the Project is designed to withstand the forces of a Level 2 tornado. However, damage to transmission lines and poles is likely if a tornado should hit the area. Transmission lines will be monitored on a continuous basis and shut down should a fault be detected.

Earthquakes – Structures will be designed to meet or exceed potential seismic loads in the Study Area as per the National Building Code and Ontario Dam Safety Guidelines.

Lightning – The transformer substation, interconnect with the Hydro-One Transmission Network, and powerhouse will be equipped with lightning protection systems in compliance with applicable building codes. These systems are designed to accept the electrical charge and transfer it to the ground; the systems may be equipped with lightning strike sensors to determine the number of strikes and whether inspection is necessary.

6.13.3 Net Effects and Evaluation of Significance

The Project will be designed and constructed in compliance with applicable building codes and dam safety guidelines. Consequently, no net effects resulting from effects of the environment on the Project are expected and the significance of net effects resulting from accidents and malfunctions is rated as neutral (no effect is anticipated to occur following implementation of mitigation measures).

6.14 REPOWERING/DECOMMISSIONING

When the Yellow Falls Hydroelectric Project reaches the end of its useful life, it may be repowered or decommissioned. Repowering would involve overhauling or upgrading Project infrastructure and equipment including:

- Turbines
- Generators
- Controls and communication devices
- Spill facilities
- Physical structures
- Transformer substation

Should decommissioning be required, the Project, including in-stream works and all ancillary facilities, may be abandoned or removed depending on regulatory, economic, or environmental requirements at that time. At this time, repowering of the Project is seen as the most probable occurrence.

6.14.1 Potential Effects

It should be noted that there is a high degree of uncertainty regarding activities occurring as part of the repowering or decommissioning process since the Project will reach its useful life 50 or more years in the future.

It is expected that repowering will result in primarily socio-economic effects similar to those for construction of the Project, including:

- Increased traffic to the Project site
- Transportation of oversize or heavy loads on Provincial Highways
- Increased labour requirements
- Increased demand for local temporary housing
- Increased local expenditures

In-stream work is not envisaged as part of the repowering process. Alterations to water discharge rates, headpond size, or headpond elevation as outlined in this EA report are also unlikely.

Since the Project is a run-of-river facility, abandonment would not result in significant changes to the aquatic environment in the affected reach of the Mattagami River, but indefinite inspection and limited maintenance would be required. The abandonment process includes:

- Removal of all excess equipment
- Fully opening all spill facilities to provide unhindered water flow
- Installation of security measures such as continuous fencing around the perimeter of the site, video cameras, and signage
- Indefinite periodic inspection and maintenance

Probable effects resulting from abandonment include:

- Loss of local employment opportunities
- Loss of tax income
- Possible changes to river flow and morphology
- Potential safety hazards if the facility is allowed to deteriorate

Since removal of the Project would occur in a similar manner to construction, associated effects are potentially greater than repowering or abandonment. Decommissioning activities for the Project would involve the following activities:

- Removal of mechanical and electrical equipment
- Removal of ancillary facilities including transformer substation, access road, transmission lines and poles, and storage buildings
- Construction and removal of cofferdams to allow for removal of in-stream works under dry conditions
- Removal of dam and spillway structures to below the pre-existing river bed level
- Demolition of remaining site structures
- Restoration of river substrate
- Fill and grade the river banks with suitable engineered fill

- Replace topsoil and cultivate, seed, and plant as required.

The potential effects of removal include:

- Alterations to river morphology
- Alterations to fish habitat as a result of changes from a somewhat lentic (slower moving) to a lotic (faster moving) system
- Loss of productivity in the headpond area
- Alterations to river morphology
- Loss of local employment opportunities
- Loss of tax income
- Increase in water turbidity resulting from construction
- Recreational use limitations resulting from headpond removal and reduced site access
- Increased use of local waste disposal facilities

Since the Project is designed to minimize the risk of contamination during its operational lifespan, remedial clean-up during decommissioning is anticipated to be minimal to non-existent. The Project will be operated and maintained according to industry best practices; as such, there should be no significant environmental liabilities associated with clean-up or remediation.

6.14.2 Mitigation and Protection Measures

Regardless of whether YFP chooses to repower or decommission the Project at the end of its lifecycle, the regulations, policies, or guidelines of the time will be adhered to. The proponent will undertake appropriate consultation activities and procure all necessary permits and approvals prior to repowering or decommissioning the Project.

Repowering would potentially result in net benefits including short-term employment opportunities, local expenditures, and the continued generation of clean, renewable energy.

Should decommissioning occur, YFP will develop a plan to remove or otherwise stabilize all sediments deposited in the headpond area during inundation. Monitoring of the aquatic environment, including water quality, will occur prior to, during, and after decommissioning activities to ensure that aquatic fauna are not affected by potential in-stream works or water level and flow alterations. In addition, a site restoration plan, including soil stabilization, planting, and seeding will be developed in consultation with the MNR or the relevant agency of the time. The Proponent will consider retaining site access and boat launch facilities to limit potential effects on recreational users.

All decommissioning activities will be performed in compliance with the applicable regulations in force at the time and may include the MOE *Guidelines for the Decommissioning and Cleanup of Sites in Ontario* (1993) or equivalent guidelines or regulations.

6.14.3 Net Effects and Evaluation of Significance

Although repowering or decommissioning may occur approximately 50 years in the future, significant adverse effects are not likely to occur provided that the mitigation and protection measures above, as well as current or future laws, regulations, policies, and guidelines, are followed. Therefore, significance has been rated as low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

6.15 SUMMARY OF EFFECTS ASSESSMENT

A summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects is provided in **Table 6.17** below.

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Land					
Geology	Construction	• Potential to affect unique or significant geological formations • Effects from blasting to excavate bedrock including: o Bedrock fracture o Fly rock damage and dispersal • Aggregate use and extraction	• No unique or significant geological formations located near the Project • Licensed blasting contractor will undertake all blasting, handling, transportation, and storage of explosives • Use of proper blasting techniques to decrease bedrock fracturing • Use bedrock grout to seal bedrock fractures • Use of blasting mats as required to control blasts and limit dispersal of fly rock • Collect fly rock and stockpile immediately after blasting • Transportation of stockpiled or unusable excavated material to a local aggregate produced if possible • No aggregate extraction will occur within 120 m of the Mattagami River • Acquire necessary permits under the *Aggregate Resources Act* for development of a pit or quarry if required • Rehabilitate aggregate extraction area in accordance with permit under the *Aggregate Resources Act* • Re-use of excavated or left-over aggregate material on site to the extent possible	• Slight decline in availability of aggregate material in the Study Area	Low (may result in a slight decline in resource in Study Area during life of the Project)
	Operation	• Use of relatively small quantities of aggregate to maintain access road	• Obtain aggregate from local suppliers or existing stockpiles • If aggregate material cannot be obtained locally, renewed or additional permits may be required under the *Aggregate Resources Act*		
Physiography	Construction	• No significant physiographic features will be affected • Topography will be altered as a result of re-grading and construction of Project components	• Improve and/or construct access road along existing right of ways (e.g. Red Pine Road) where possible • Limit cut and fill to necessary areas	• The Project will not affect any rare or significant physiographic features • Minimal changes to topography will result from access road re-grading, transmission line construction, and construction work areas • The headpond area is limited and will	Low (may result in a slight decline in resource in Study Area during life of the Project)
	Operation	• Change to topography as a result of headpond formation	• The extent of the headpond has been limited through facility design and selection of an		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• Reduction in area available for water storage during high flow events • Decreased water velocity in the headpond will result in a reduction of the rate and extent of lateral erosion to the valley toe	appropriate headpond elevation.	result in minimal changes to topography within the Study Area	
Soils	Construction	• Potential for increased soil erosion with the removal and/or disturbance of vegetative cover • Improper topsoil removal and storage during construction can result in topsoil/subsoil mixing • Topsoil storage for extended lengths of time can increase bulk density, decrease water-holding capacity, and reduce microbial activity • Soil compaction may increase due to construction vehicle traffic • Eroded soil may enter watercourses • There is no potential for effects to soils used for agricultural purposes.	• Minimal travel on soil once access roads and construction staging areas are developed. • No disturbance of vegetation will occur within 3 m of a watercourse except where required for construction • Silt fencing, supported by staked straw bales installed at least 3 m from potentially affected watercourses or sensitive areas • Silt fence will be kept in good repair throughout construction and until rehabilitation efforts have become established. • Additional protection measures may be required on long or steep slopes (e.g. multiple silt fences, flow diversion berms) • Geotextile fabric or erosion matting will be used to cover soils where there is risk of erosion • Erosion control measures and materials will meet OPSS 577 • Geotextile fabric will meet criteria defined in OPSS 1860. • Mitigation measures described in OPSS 182 will be implemented where applicable • Construction on wet soil should be suspended following periods of excessive rainfall or saturated soil conditions • Wide-tracked or low ground pressure vehicles should be used during wet soil conditions if possible. • Topsoil will be stripped and stored separately from subsoil to prevent mixing and maintain soil characteristics for subsequent revegetation. • The depth of soil stockpiles should be minimized • In the event that stockpiles must remain for more	• Minimal effects are expected to soil during construction with implementation of mitigation and protection measures	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			than a few months, the surface of the pile will be vegetated • Soil is to be spread at the same depth or greater than pre-existing conditions • Disturbed areas should be seeded as soon as possible following site re-grading. • Seed mixes composed of fast-growing, non-invasive native species will be developed for Project use in consultation with the MNR. • Erosion control matting will be installed over disturbed areas immediately after seeding • Erosion control matting must use a biodegradable weave that does not trap wildlife. • If watercourse banks are disturbed, coir (coconut fibre) matting or a similar product will be used between low and high water levels		
	Operation	• Unsuccessful revegetation or erosion control during construction may result in continued erosion of soil	• If revegetation is required, or where erosion is occurring, the above mitigation measures outlined above will be implemented as required to prevent further soil loss or sedimentation of watercourses.		
Climate	Construction	• No effects on local climate are anticipated during construction.	• Effects to the local climate are not anticipated during construction, therefore no mitigation or protection measures are required.	• Microclimatic effects are not expected to occur. • Effects on visibility resulting from water spray and frost mists will be similar to existing conditions.	Neutral (no effect is anticipated to occur following implementation of mitigation measures).
	Operation	• Water spray from various outlets such as the spillway, sluices, and tailrace may affect the potential for fog • In winter months, water spray may freeze and become frost mist (tiny ice particles), coating nearby (i.e. within a few metres) surfaces with ice • Spray may affect surrounding vegetation by increasing the amount of water received by plants • Spray is expected to be similar to existing conditions resulting from water falling over Yellow Falls • Microclimatic effects are not expected to occur due to the small headpond size (160 ha)	• Water spray, frost mist, and resulting fog will be reduced through a properly designed tailrace • The low energy of powerhouse outflow reduces the potential for spray creation downstream of the powerhouse		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Seismicity	Construction Operation	• Seismic events (i.e. earthquakes) can occur as a result of natural or induced events. • The Project is located within an area of naturally low seismic ground motion. • The possibility of natural seismic events in the Study Area is very low, and the proposed headpond area is relatively small, therefore the risk of induced seismicity is limited.	• The Project is designed to meet all applicable requirements of the Ontario Dam Safety Guidelines, The Canadian Dam Association Dam Safety Guidelines, the Lakes and River Improvement Act, and the National Building Code of Canada. • Adherence to these guidelines requires that the Project consider the natural seismic risk (low).	• No net effects are expected	Neutral (no effect is anticipated to occur following implementation of mitigation measures)
Water					
Upstream Flow Alteration	Construction	• Cofferdam installation during construction will constrict the passage of water at Yellow Falls, resulting in an increase in upstream water levels • Backwater effects are not expected to extend further downstream than Davis Rapids	• Cofferdams will constrict water flow over Yellow Falls, and may result in limited inundation. No mitigation or protection measures are necessary.	• The proposed headpond will result in altered water elevation and velocity between Yellow Falls and Loon Rapids • Flood control systems designed into the Project will allow passage of a 1 in 10,000 year flood event without altering the headpond level. • Backwater is not expected to affect the tail-waters of the Lower Sturgeon Generating Station, or the Abitibi Freehold. • The headpond will not affect the fish sanctuary at Lower Sturgeon GS.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).
	Operation	• The Project operate as a run-of-river facility with a near-constant headpond level and will not be operated as a peaking facility • Approximately 71 ha of land over a 5.7 km stretch of the Mattagami River from the Project site at Yellow Falls upstream to Loon Rapids will be inundated. • Shoreline length in the headpond will increase from approximately 16 km to 24 km • The average amount of water present in the headpond reach will increase from approximately 1.3 million m^3 to 7.4 million m^3. • Retention time will increase from approximately 3.3 hours to 19 hours • Water velocities throughout the proposed headpond are substantially lower than existing • The Project will not have an effect on operations at Lower Sturgeon GS.	• Flow through turbines will vary with river flow and sluiceways will be used to maintain a static headpond water level. • There are no expected backwater effects on the Lower Sturgeon GS under normal operating conditions as a result of the Project • YFP has consulted with OPG to discuss potential effects to dam safety ratings and plant operations		
Downstream Flow Alteration	Construction	• Construction of the cofferdam may affect the quantity and location of water moving downstream. • Pumps will be required to move water from the cofferdams. In the event of pump failure, the	• Cofferdams will be designed for the 1:20 year flood event. • Seepage through the cofferdam will be handled using settling ponds to remove sediment • A Permit to Take Water (“PTTW”) will be required	• Downstream flow patterns will not be significantly altered beyond approximately 500 m downstream of the powerhouse/dam structure, and is unlikely to affect other river users outside of this	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		work area could be flooded. • Water discharged from the work area could increase downstream turbidity. • Removal of cofferdam may increase potential for sedimentation. • Approximately 3 m^3/s of the inflow will need to be retained over a 1-month period to fill the headpond. • The minimum 15 m^3/s flow to Smooth Rock Falls GS will be adhered to as specified in the Mattagami River Water Management Plan.	from the MOE to dewater following cofferdam • A CofA for wastewater discharge from the MOE will be required to discharge water from the settling ponds. • Pumps will be placed in bermed areas covered with impermeable geotextile fabric to prevent fuel or lubricants from entering watercourses. • A minimum of two main and two back-up pumps, which combined are capable of handling at least 100% of the expected seepage rate will be used n case of failure of main pumps. • The cofferdam structures do not have the capacity to store water; therefore downstream discharge will not be affected. • In the event of unusual low-flow conditions (i.e. less than 31.71 m^3/s), headpond filling will be suspended.	vicinity. • During normal operation, the discharge (m^3/s) released downstream by the Project will be the same as under pre-existing conditions at Yellow Falls.	
	Operation	• Operation of the powerhouse and spillway facilities has the potential to affect downstream flows through manipulation of facility discharges • In the event of emergency unit tripping or shut down, there is potential for flows to be disrupted. • Water velocity will be altered at the spillway and immediately downstream of the dam structure.	• The spillway will allow for level adjustment and control of the headpond • Spill facilities will be used to maintain headpond levels, ensuring that inflow is equal to outflow in the event that all water cannot be passed through the turbines. • The proposed hydroelectric facility is not designed to operate effectively as a peaking plant. As a run-of-river facility, the discharge rate will equal inflow unless under normal operating conditions • The control system of the facility will be designed to maintain headpond water levels within upper and lower operating bands as specified by the Water Management Plan for the facility. • In the event of emergency unit shut-down or tripping, two gates on the spillway will be automated such that when the plant trips the gates will open the corresponding amount to maintain downstream flows • The Project will require a PTTW to divert water from the Mattagami River through the powerhouse and		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			spill facilities.		
River Morphology	Construction	• Cofferdam installation may change flow characteristics in the vicinity of Yellow Falls, • During spillway construction, downstream flow pattern changes will occur immediately below the powerhouse structure as a result of the increased volume of water exiting the powerhouse. • Yellow Falls already exhibits increased flow over the south side of the river bend, as evidenced by depositional formation on the east river bank. This flow pattern is not expected to substantially change during the period that the cofferdam is in place. • Flow patterns will return to preconstruction conditions by approximately 500 m downstream of Yellow Falls and 2 km upstream of Island Falls.	• Upstream water velocities and discharge rates will remain within historic values, as the river will maintain its original cross-section and natural flow rates. • Although limited inundation may occur after cofferdams are installed, no mitigation or protection measures are required.	• The Project will increase sediment loading throughout the headpond. • The Project is unlikely to affect the bank opposite the tailrace since it is primarily composed of bedrock. • Cycling of woody debris will closely approximate pre-construction conditions	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).
	Operation	**River Depth** • The littoral zone within the headpond will increase approximately 30,000m^2 (16.2%). • Buildup of fine sediments may reduce headpond depth over time **Sedimentation and Siltation** • During low flow conditions, smaller sediment carried by the river waters would be deposited in the headpond • The dam will prevent larger river sediments from moving downstream and this has the potential to degrade the quality of fish spawning substrate below the dam. • The Mattagami River does not usually exhibit a high degree of sediment transport • Sedimentation of the headpond may occur during the initial inundation period, and will continue to a lesser extent during operation, with water level and flow fluctuations. • Significant alterations to existing upstream river	• Headpond depth will be monitored periodically in accordance with the Environmental Inspection and Monitoring Plan • If excess siltation occurs, dredging or other mitigation options as discussed with relevant agencies will be considered • Excavation and disposal of dredged material must occur in accordance with the MOE *Guidelines for Evaluating Construction Activities Impacting on Water Resources Part III A, B, and C* (1994). • The MNR and DFO must be consulted prior to undertaking dredging activities and applicable permits and authorizations obtained • The opposing shoreline will be visually monitored to determine if significant erosion is occurring following initial start-up of the plant and large flow events. If erosion is identified, YFP will work with the MNR and DFO to identify potential bank protection measures. • Sections of river above and below the proposed		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		bed morphology are not expected. • The headpond will experience a certain degree of siltation over the duration of the facility's existence. Over time, this siltation may result in a decrease in average headpond depth in some locations. **Erosion** • Bank erosion downstream of the facility is expected to be minimal due to the physical features of the existing shoreline as well as the nature of the flow patterns and velocities of the waters below the facility. **Movement of Woody Debris** • There is potential to prevent the movement of downed woody debris downstream, which may result in a deterioration of fish habitat cover. • Cycling of large wood debris in riverine ecosystems occurs over centuries and potential effects would only become evident after many years. **Wave Action** • Additional wave action may occur as a result of an increase in water surface area in the headpond and may result in erosion of river banks.	facility are lined with trees and continue to produce sufficient woody debris to provide adequate shoreline cover as natural shore-line erosion occurs. • Due to the small size of the headpond (160 ha), wind-induced wave action is anticipated to be minimal. Significant wave-induced erosion is unlikely to occur		
Surface Water Quality	Construction	• Sedimentation may be introduced by installation of cofferdams • Blasting during excavation may introduce fine sediment and fly rock into watercourses • Increased turbidity during construction • Introduction of contaminants through dam construction, including wastewater from cleaning of concrete truck drums. • Effects on creeks and wetlands due to installation of docks, transmission poles and stringing transmission wires • Washouts of roads due to inappropriate design (e.g. inadequate culvert sizes).	▪ No material will be stockpiled within 30 m of a watercourse ▪ No refueling will take place within 30 m of a watercourse ▪ No vegetation removal will take place within 3 m of a watercourse crossing unless necessary for construction ▪ No understorey vegetation will be removed within 3 m of the Mattagami River during headpond clearing ▪ No grubbing will occur within 3 m of the Mattagami River during headpond clearing. ▪ No vegetation removal or clearing will occur above 244 m in elevation	• Water quality may be moderately degraded due to nutrient enrichment and increased suspended sediment in the short term, but is anticipated to return to background quality within 2 to 5 yrs.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project.

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• Sedimentation or siltation due to road construction and/or improper silt fence installation. • Acid Rock Drainage ("ARD") may occur when acid bearing rock is exposed to chemical weathering for long periods	• Silt curtains will be implemented when water velocities permit installation. • Turbidity monitoring during construction will also take place at the Project site and at all water crossings along access roads. Sediment introduced to watercourses during construction must not cause more than a 10% change to background level secchi disk readings as described in *Provincial Water Quality Objectives* • During cofferdam installation and removal, silt curtains will be installed approximately 25 m downstream if water velocity permits • Sediment control measures and materials will meet OPSS 577 • Additional mitigation measures described in OPSS 182 will also be implemented as required • Any fill required to be placed into a watercourse will meet criteria for "lowest effect level" as described in *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* MOE, 1993) • Approval will be obtained under Section 53 of the *Ontario Water Resources Act* (OWRA) to collect, treat, and dispose of waste water contained between or seeping into cofferdams. • Approval under Section 53 of the OWRA will be obtained by the contractor responsible for supplying concrete, as water used to clean concrete truck drums is considered waste water. • Contact information for the Smooth Rock Falls water treatment plant operations manager will be kept on hand at all times • Blasting will be confined within cofferdams and will take place under dry conditions according to applicable regulations and standards, including DFO Guidelines. • Transmission line installation across waterbodies and wetlands will follow the DFO's *Overhead Line Construction Ontario Operational Statement* (undated).		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			• Access road installation will comply with the MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990). • All culverts and bridges used for watercrossings will be designed in accordance with MNR and DFO requirements. • Culverts will be placed underneath access roads where swales or low areas exist to assist in maintaining hydrologic connectivity • Use of a cellular confinement system ("geogrid") will be considered where appropriate • Clear span bridges proposed for river or stream crossings will be constructed according to the DFO's *Clear Span Bridges Ontario Operational Statement* (undated). • The boat ramp will be constructed according to the DFO *Dock and Boathouse Construction Operational Statement* (2007) and an application for construction of the boat ramp will be submitted to Transport Canada prior to construction. • Grout will be used to prevent water seepage around powerhouse and dam foundation joints. • Exposed rock, such as that used for rip-rap, road bed, or waste/spoil rock materials will be tested to ensure that ARD will not occur prior to being used or spoiled as recommended by EC. • In the event that rock exhibits potential for ARD, mitigation becomes necessary, measures will be discussed with relevant agencies prior to implementation. • Rock exhibiting potential to contribute to ARD will not be used in locations where it will be exposed to weathering.		
	Operation	**Water Temperature** • The temperature of water in the headpond is expected to increase slightly above baseline conditions (less than 1^{o}C) • Stratification is not expected to occur in the headpond of the proposed facility because of	**Water Temperature** • The relatively small size of the headpond the low retention time of the water flowing through the headpond limit changes to water temperature • Formation of the headpond will create a surface area less than twice the size of the original river.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		the low average retention time **Nutrients** • An increase in nutrient loading is expected to occur as a result of headpond formation. • Since high nutrient concentrations are not continuously added to the headpond, nutrient concentrations are expected to lessen once these nutrients become fixed through the growth of bacteria and vegetation. • Aquatic primary producers typically benefit from the flooding of the terrestrial environment, **Dissolved Oxygen** • Discharging water through and over hydroelectric facilities is known to cause super-saturation of oxygen in rivers in certain instances. • Nutrient loading and temperature increases can lower the dissolved oxygen content of the waters downstream of the headpond • The reduction in dissolved oxygen is mitigated for as a result of several features inherent in the facility's design. **Contaminants** • The potential for adverse effects exists if chemically treated wood is to be used in the Project, since chemicals (such as arsenic) may leach into the surrounding water. • Potable water to supply the powerhouse will be taken from the Mattagami River and may not comply with *Ontario Drinking Water Standards*.	• Retention time of the headpond is well below that typical of lakes of the same size. **Nutrients** • The extent of nutrient loading will be reduced through the clearing of trees and brush in the areas to be inundated. **Dissolved Oxygen** • Ensuring that a new riparian zone is established and remains intact will aid in mitigating increases in temperature in the headpond, which will subsequently aid in sustaining dissolved oxygen concentrations. • The hydraulic head of 12 meters is typical for run-of-river facilities in Ontario and will reduce potential for super-saturation. Super-saturation usually occurs at high head dams only (Stokes et al., 1999). • Turbines are designed with high operational efficiencies which limit the potential for cavitation and the tail-waters will be equipped with dissipaters, minimizing the potential for dissolved gas super-saturation. **Contaminants** • Only untreated plywood and wood formwork materials will be used during construction in accordance with Canadian Standards Association (CSA) standards • Debris booms will be constructed from untreated timber and will be replaced on a regular basis • All other miscellaneous timber exposed to water will not be treated. • Water taken from the Mattagami River to supply the powerhouse will be treated on site • Approval for the potable water supply may be required under the *Safe Drinking Water Act* • Periodic water testing will be undertaken by the proponent during operation as required by the applicable regulations.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Ice	Construction	• The Project is unlikely to affect ice formation on the Mattagami River during construction	• No mitigation or protection measures are required.	• The extent to which the Project will prevent ice formation downstream of the dam is expected to be very low. • Formation of the headpond will create ice with increased uniformity and continuity within the headpond and may reduce frazil ice, which may have beneficial ecological effects, since frazil ice can abrade gills, can cause hemorrhaging, and may result in suffocation of fish.	Neutral (no effect is anticipated to occur following implementation of mitigation measures).
	Operation	• Potential effects of ice formation include damage to ecosystems, permanent alterations to river flow paths and damage to infrastructure such as bridges, roads and homes. • Operation of the Project can affect ice depths and formation rates, resulting in changes to water levels, evaporation, and wave action. • Increased turbulence and water velocity will decrease the rate of ice formation immediately above the dam, while increased turbulence at the tail-waters of the dam will prevent ice formation downstream • Decreased velocities and changes to flow dynamics in the headpond will promote ice formation. • Ice formation presents problems for hydroelectric dam operation in that it has the ability to form around or flow into the turbine water intakes • Formation of the headpond will result in reduced velocities and substantially reduce flow turbulence at Davis Rapids and Loon Rapids, reducing potential for frazil ice	• The extent to which this facility will prevent ice formation downstream of the dam is expected to be very low. • Formation of the headpond will create ice with increased uniformity and continuity within the headpond. • Water temperatures and ice conditions will be monitored so that intakes may be operated more efficiently in order to prevent ice build up or ingestion into the turbines. • Due to the static headpond level associated with run-of-river operations, dramatic fluctuations to water levels and velocities which would free river ice, force ice downstream, or prevent the formation of ice all together, will not occur.		
Groundwater	Construction	• Excavation and blasting activities may contact the ground water table, requiring dewatering. • Excavation and blasting has the potential to temporarily increase turbidity of the local ground water supply, • Dewatering could temporarily reduce the local water table level • No wells have been identified in the immediate Project area • Locally altered groundwater flow regimes may have localised effects on upland vegetation bordering the headpond • A potential effect exists from accidental spills of	• The construction contractor will use standard containment facilities and emergency response materials will be maintained on-site • The construction contractor will strictly adhere to the Emergency and Spills Clean-Up Management Plan. • If dewatering rates are expected to exceed 50,000 L per day, a PTTW will be required from the MOE.	• Dewatering during construction may result in localized temporary changes to groundwater flow and levels. • Groundwater may also be affected by elevated surface water levels in the headpond during operation.	Low (Potential effect may result in a slight decline/improvement in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		fuel and lubricating fluid • Surface water run-off may be locally altered as a result of construction including site grading, which may change locations of infiltration.			
	Operation	• Project operation is not expected to affect ground water quality, levels or flow within the Study Area. • Local changes to groundwater levels and flows could occur in the vicinity of the headpond as a result of elevated surface water levels. • Installation and use of a septic system with a capacity of less than 10,000 L/day to service the powerhouse may affect ground water quality in the local vicinity	• The septic system will require approval from the local Health Unit prior to installation and will be designed to meet all regulatory requirements. • During operation, YFP will strictly adhere to the Emergency and Spills Clean-Up Management Plan.		
Air and Noise					
Air Quality	Construction	• Dust production is related to the movement of vehicles and disturbance of soil during construction under dry conditions, • During high wind conditions, dust and sand particles can damage surrounding vegetation by sand blasting. • Fine dust may be deposited on plant leaves, causing impairment of the photosynthesis process. • Operation of the concrete batching plant may increase emissions. • Nuisance effects due to dust are likely to be minimal since seasonal residences and trapping cabins are outside the likely zone of influence.	• The concrete batching plant will comply with its CofA (Air) • During dry conditions, water will be sprayed on areas with heavy vehicle traffic • Dust control agents such as oil that may contaminate watercourses or vegetation will not be used • Vehicle speed will be limited in construction areas to reduce dust creation. • The contractor will consider covering soil piles with geotextile to reduce wind erosion under extremely dry or windy conditions • Prior to blasting operations, rock will be thoroughly pre-dampened using water only. • Blasting activities with the potential for dust creation will not occur under extremely windy conditions • If more than 50,000 L/day of water is required for dust suppression, a PTTW will be required from the MOE.	• Construction activities may have a localized, temporary effect on air quality due to dust • No effects on air quality during operation are expected.	Minimal (potential effect may result in a slight decline/improvement in resource in Study Area during construction phase, but the resource should return to baseline levels).
	Operation	• The operation of hydroelectric generating facilities usually results in limited effects on air quality	• No mitigation or protection measures are required.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Greenhouse Gases	Construction	• Hydropower is one of the few sources of electricity that does not directly produce GHGs during generation, • Emissions will originate from vehicles and equipment (such as water pumps, chainsaws, generators, etc.) during construction and maintenance. • Effects are limited to construction and ongoing maintenance and will not significantly influence the regional airshed.	• Construction equipment and other vehicles will be kept in good repair, including engines and exhaust systems, and must meet MOE and MTO standards • Unnecessary idling of vehicles will be limited during construction • Low sulphur diesel or biodiesel should be used if available • Local suppliers should be used whenever available at sufficient quantity and quality and at competitive cost to minimize the distance that goods and materials must be transported to the site.	• Vehicle emissions during construction and operation are expected to be short-term in duration and are not likely to have a significant effect on the regional airshed • GHG emissions from the headpond are expected to be similar to those from natural lakes in the area. • Small hydroelectric facilities typically have extremely low emissions throughout their lifecycle when compared with other forms of electricity generation • The Yellow Falls Hydroelectric Project will help offset GHG emissions from other sources of electricity.	Positive and low (potential effect may result in a slight improvement in resource in Study Area during life of Project)
	Operation	• During operation, CO_2 and CH_4, may be created through the decomposition of submerged vegetation and organic matter in the headpond. • Clearing and formation of the headpond will remove trees and other vegetation that act as natural carbon sinks. • Trans-boundary effects are not anticipated, as the scale of potential GHG emissions will not influence the regional airshed. •	• The primary method of reducing GHG emissions from the anaerobic decomposition of vegetation in the headpond is to remove vegetation prior to commencing headpond formation. • Climatic and operating conditions of the Project indicate that decomposition will not occur at an accelerated pace after the headpond is filled. • Where possible, loose woody debris will be chipped and removed from the construction site for landscaping or compost use • Unnecessary idling of vehicles will be limited • GHG emissions from run-of-river headponds are limited due to minimal headpond area and maintenance of static headpond level		
Noise and Vibration	Construction	• The Project is located in a Class 3 Rural Area, defined by the MOE as having natural sounds with little or no road traffic (MOE, 1997). • The nearest population centre, Smooth Rock Falls, is approximately 18 km north of Yellow Falls. • Vehicles, equipment, and blasting activities will be the primary sources of noise and vibration during construction. • The concrete batching plant will comply with its CofA - Air, which will define a limit for environmental noise levels at any receptors in the vicinity of that facility.	• All vehicles and equipment with combustion engines used during construction must use effective exhaust and intake mufflers. • Construction equipment must meet sound level requirements set out in MOE publication *NPC-115 - Construction Equipment*. • Whenever possible, work activity will be scheduled during daylight hours (e.g. 7 am to 7 pm) to limit potential effects on nearby people and wildlife. • Blasting must comply with the guidelines outlined in MOE Publication *NPC-119 - Blasting*	• Noise and vibration will primarily be associated with Project construction. • Noise emissions will be generally associated with water flow from the facility, similar to the existing falls during operation • No significant or long-term adverse effects resulting from noise and vibration are expected	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
	Operation	• Potential noise sources include the generator, transformer, turbine, and falling water • Maintenance activities may intermittently introduce vehicle and equipment noise to the area. • Based on conservative calculations, the Project will comply with MOE publication *NPC-232 – Sound Level Limits for Stationary Sources in Class 3 Areas (Rural).* • Noise will also be generated by the switching station. The nearest receptor to the switching station is approximately 3 km southeast of the point of interconnection and is unlikely to be affected.	• All vehicles and equipment with combustion engines used during operation or maintenance must use effective exhaust and intake mufflers. • Noise emissions from stationary equipment, such as the powerhouse, transformer, and switching station, must comply with MOE publication *NPC-232 – Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)* • Preliminary noise analysis indicates that the Project will satisfy these requirements • Prior to commencing operation, a CofA - Noise must be obtained from the MOE		
Terrestrial Environment					
Terrestrial Vegetation	Construction	• Vegetation clearing and grubbing including tree and understorey species, will be required for several Project components. • The proposed headpond area will require removal of existing vegetation to reduce the potential for mercury methylation. • Access roads, transmission line route, and construction staging areas will require clearing to enable construction and ongoing maintenance. • All merchantable timber will be harvested in accordance with the *Crown Forest Sustainability Act* and agreements with Tembec. • Vegetation clearing may result in increased potential for erosion, alterations to the amount of shade on the river and nearby watercourses, increased run-off and changes to nutrient inputs and outputs • Vegetation clearing could also result in loss or fragmentation of habitat for native plant species and wildlife • Vegetation clearing can result in an accumulation of fine debris such as leaves,	• Following relocation of the Project from Island Falls to Yellow Falls, additional lengths of access road and transmission line will be required. A botanist will undertake a survey of additional transmission line and access road lengths to ensure no rare plants or vegetation types will be affected by construction. • Vegetation will only be cleared where absolutely necessary. • Areas to be cleared must be clearly marked using flagging tape, fencing, spray paint, or other signage prior to beginning any clearing activities. • Trees will be felled into the area to be cleared to prevent damage to surrounding vegetation. • Where possible, tree clearing will take place during winter months while the ground is frozen • Timber will be removed in the areas to be inundated in order to reduce mercury methylation. • Final vegetation removal will take place immediately before construction begins to minimize soil exposure. • A 3 m buffer of undisturbed understory vegetation (aside from tree species) must be left next to the banks of watercourses, including the Mattagami	• Headpond formation, construction of the powerhouse and dam structure, access roads, transmission lines, and ancillary facilities will result in the removal of an area of vegetation for the life of the Project. • Vegetation removed as a result of the Project represents a small portion of habitat available in the Study Area. • Routing of access routes and the transmission line along existing linear features further reduces potential effects of the Project on vegetation.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		twigs, chips, and branches. • Vegetation clearing could also lead to a loss of vegetation biodiversity, changes to vegetation community types, introduction of edge effects (i.e., sunscald, wind-throw, and soil drying) to retained vegetation, or increase noxious or invasive plant species. • Although old growth forests and forest reserves have been identified in the Study Area, these areas are well outside the zone of potential influence • One rare plant species (yellow rattle) was identified through existing background information and during field programs	River. Heavy equipment should not be operated within the buffer. No grubbing is to occur and extra long winch cables should be used to remove felled trees in the buffer. • Grubbing will not occur within or adjacent to the proposed operational shoreline level to limit the potential for soil erosion. This area is encompassed generally between 243 and 244 m contour levels. • Construction crews will be educated about buffer zones and adhere to corresponding guidelines. • Trees will be felled away from watercourses to prevent debris loading and impairment of fish passage • Temporary roads for clearing access will not be established in riparian areas. Skid trails will be avoided near watercourses. • Slash and other clearing debris will not be piled near watercourses. • Timber stockpiling will take place away from water and drainage ways and designated construction machinery storage or refueling areas. • If clearing or grubbing activities expose mineral soil slopes, re-grading will be considered to limit the potential for erosion. • Silt fence and staked straw bales must be installed adjacent to potentially affected watercourses or sensitive areas • Silt fence will be kept in good repair throughout construction until vegetation is reestablished. • Revegetation should take place as soon as possible following construction. • A seed mix containing non-invasive, native species for use in these areas will be developed in consultation with the District MNR office. • Erosion control measures and materials will meet OPSS 577. • Additional mitigation measures described in OPSS		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			182 will also be implemented as required. • Construction methods outlined in the MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990) will be followed for installation of access roads. • Temporary access roads will be removed as soon they are no longer required. • Biologically appropriate seedlings and whips will be planted as part of the revegetation program. • Fertilizers will not be used to limit increased nutrient concentrations within watercourses. • Erosion control matting will be used on steep slopes to prevent migration of soil and subsequent impairment of vegetation re-growth		
	Operation	• Increased run-off may occur because of an increase in water yield in cleared areas • Application of herbicide to control vegetation during operations may result in effects to water or soil quality. • Trees and vegetation along the Project access road and transmission line right-of-way (“ROW”) may require periodic trimming or removal.	• During operation, the success of revegetation efforts will be monitored in accordance with the Environmental Inspection and Monitoring Plan • Areas where vegetation failed to grow or where erosion is occurring will be repaired and revegetated as soon as practicable using the mitigation measures described above. • Only mechanical methods will be used to maintain vegetation. • Application of herbicide will not occur.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Wetlands	Construction Operation	• No PSWs are located in the Study Area and no significant wetland communities were identified during background research or field surveys. • Wetland types found in the Study Area are abundant throughout north-eastern Ontario. • The area of inundation contains wetlands in low-lying areas, including shallow marshes • Effects on wetland hydrology are expected to be localized to the headpond area. • The proposed main access and transmission line route traverses forested swamps • Wetlands can be particularly sensitive to soil compaction, siltation and sedimentation, and indirect effects resulting from the creation of new edges during access road and transmission line construction • Wetland drainage may be altered due to installation of the road surface and vegetation clearing.	• No mitigation measures are required for wetlands that will be inundated by the proposed headpond. • Construction methods outlined in the MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990) will be followed for installation of access roads. • Wherever possible, existing vegetation will be retained. Along access routes, tree roots will be left in place and not grubbed through wetland areas. • Where roads cross wetland areas, culverts should be placed under the road in low-lying areas (e.g. swales) to facilitate drainage between wetland features. • Silt barriers (e.g. fencing or brush barriers) will be erected adjacent to construction areas within wetlands. These barriers should be monitored and maintained during and following construction until soils are re-stabilized with vegetation. • Any surface runoff will be directed away from wetland units to avoid erosion or introduction of sediment. • All fuel and chemical storage and activities with the potential for contamination will occur in properly protected areas at least 30 m from wetlands. • Revegetation will take place immediately following construction.	• Wetland types found in the Study Area are prevalent throughout much of north-eastern Ontario. • Some wetland areas will be removed as a result of access road and transmission line construction, and formation of the headpond. • Minor effects of access road installation may include increased wind throw and localized changes to wetland vegetation communities due to microclimatic and edge effects immediately adjacent to proposed access routes.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).
Aquatic Vegetation	Construction	• Approximately 4.5% of the existing Mattagami River area between Yellow Falls to immediately upstream of Loon Rapids contains sparse aquatic vegetation cover. • Aquatic vegetation community types are typically dominated by bur-reed or pondweed, which are prevalent throughout the Study Area. • The amount of cover provided by aquatic vegetation in the Study Area is not generally high.	• As the amount of aquatic vegetation is expected to return to baseline levels or increase following inundation, no additional mitigation measures are required.	• Inundation is not expected to have a significant effect on the amount of aquatic vegetation as the amount is expected to remain the same or increase as more habitats become available following formation of the headpond.	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
	Operation	• Existing submergent and emergent vegetation within the headpond area will be affected by the increase in water depth. • The Project will result in a new littoral zone 16.2% (approximately 30,000 m^2) larger than currently exists. • Since the littoral zone is expected to increase by approximately 16.2%, and water velocity will be slower, new submergent and emergent vegetation is likely to be established naturally • No nuisance aquatic vegetation was identified. Nuisance vegetation will not be imported for the purpose of the Project. • No aquatic plants of conservation concern were identified			
Wildlife	Construction	**Birds** • The majority of bird species in the Study Area depend on extensive forest habitats. • Some habitat will be lost to the headpond, and construction of the access road and transmission lines will result in the removal of some forest, but will follow existing roads or trails to the extent possible. • Expanded right-of-way width necessary for access roads and transmission lines will result in some forest habitat removal for area-sensitive birds. • Potential disturbance to birds during construction may arise from noise and human activity. • More sensitive birds, such as forest raptors, will temporarily avoid the forest areas adjacent to construction areas **Amphibians and Reptiles** • Limited disruption of amphibian habitat will have an insignificant effect on habitat availability. • Standard access and sediment controls in wet areas will minimize the potential effects to	• Project access roads have been designed to follow existing roads/trails to the extent possible • It is recommended that tree clearing take place outside the core breeding season (May 16th to July 31st) for forest birds • Tree clearing activities for the Project should occur during the winter months if possible. • If tree clearing is required during the core breeding season, an ornithologist will undertake a nest survey prior to clearing to identify nesting birds. • Identified nests will be provided with an appropriate clearing buffer as recommended by the ornithologist until breeding season has ended and young have fledged. • To the extent possible, clearing and blasting activities will be timed for the mid-summer, fall, and/or winter so that disturbance to wildlife breeding and breeding bird nesting is avoided. • Vegetation removal will be minimized where possible to limit habitat disturbance. • Habitat may be created or enhanced for breeding or staging waterfowl and Bald Eagles through increased littoral zone.	• Wildlife in the Study Area may be habituated to periodic disturbance through harvesting activities. • The effects of the Project on wildlife are anticipated to be similar to effects associated with historic and ongoing natural and anthropogenic habitat disturbance in the area. • Habitat disturbance will be minimized since access roads and transmission lines will follow existing linear features. • Habitat for some species, including staging waterfowl and moose may be improved.	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		these areas. **Mammals** • Additional areas suitable for moose feeding may be created as a result of increased littoral area, • Inundation will result in the loss of current shoreline habitat that potentially provides feeding and denning habitat for mink and otter, and denning habitat for marten. • Shoreline habitat will re-establish along the new headpond shoreline during initial operation. • Construction activities may create high levels of noise and human activity during work hours. • Some mammals (such as raccoons and bears) may become attracted to the construction site if litter or food is not securely stored. • Some mammal species that are more sensitive to disturbance, such as marten and lynx, avoid areas with even low levels of human activity.	• Habitat effects on area-sensitive forest birds will be minimal, as only a small area of edge forest trees will be removed. • Construction personnel will avoid interacting with wildlife. Litter and food will be disposed of promptly and stored securely if left on site. • All vehicles and equipment with combustion engines used during operation or maintenance must use effective exhaust and intake mufflers		
	Operation	**Birds** • The bird species present are expected to become quickly habituated to limited disturbance resulting from operations (daily operator visits and low-level noise from the plant). **Amphibians and Reptiles** • The formation of the headpond may affect rocky outcrop habitat, used by amphibians and reptiles. • Reduction in flow velocity in the headpond and increased littoral zone may also create additional amphibian habitat. **Mammals** • Disturbance during operation will result from limited road traffic and low-level noise from the plant. • Improved access may also result in increased local use of the roads and headpond for fishing	• Tree trimming or removal as required for non-emergency maintenance of the transmission line ROW will take place outside of the core breeding season of between May 16th and July 31st or in consultation with a qualified ornithologist or biologist • Operations and maintenance personnel will avoid interacting with wildlife. Litter and food will be disposed of promptly and stored securely if left on site.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		or other activities. • Most species of wildlife become quickly habituated to this type of disturbance. • The species that are more sensitive to disturbance, including marten and lynx, will likely continue to avoid areas with even low levels of human activity. Traffic is not expected to be at levels sufficient to influence mammal movement.			
Species of Concern	Construction	**Species at Risk in Canada** • Monarch butterfly (*Danaus plexippus*) was sighted during wildlife surveys. This species is known to occur north of the Study Area (Layberry et al., 1998), and individuals observed during wildlife surveys were likely migrants moving through the Study Area. This species is unlikely to be affected by Project construction or operation. • No other flora or fauna listed under Schedule 1 (threatened, endangered, or special concern) of the SARA are present in the Study Area (EC, 2007). **Committee on the Status of Endangered Wildlife in Canada Listed Species** • Rusty Blackbird, Short-eared Owl, Canada Warbler, Common Nighthawk, and Olive-sided flycatcher have been noted as present in the Study Area in the Atlas of the Breeding Birds of Ontario as possibly breeding. None of the above birds are listed in Schedule 1 of the SARA. **Species at Risk in Ontario** • The Bald Eagle (*Haliaeetus leucocephalus*) is listed in northern Ontario as a species of Special Concern by the COSSARO and the SARO regulation.	• Monarch butterfly populations are unlikely to be affected by construction or operation of the Project • If Yellow-rattle will be affected by construction, plants will be transplanted to a more suitable location, in consultation with terrestrial biologists. • Construction activity may prevent Bald Eagles from utilizing the area in the immediate vicinity of Yellow Falls and the proposed headpond area during construction. • Once operation begins, the increase in littoral zone and reduction in water velocity throughout the headpond area may result in more suitable conditions for Bald Eagle foraging and breeding • Large trees must be left along the shoreline of the proposed headpond to provide suitable nesting habitat where possible. • With the exception of *Sphagnum jensenii*, species are able to disperse from areas where Project activities will occur and are unlikely to be affected by construction or operation	• The Project may result in a slight improvement to Bald Eagle habitat in the Study Area. • The Project is unlikely to have an effect on any other species of conservation concern	Neutral (no effect is anticipated to occur following implementation of mitigation measures).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
	Operation	• Bald Eagles do not currently nest along the proposed headpond, although a nest was sighted in the vicinity the North Muskego River approximately 14 km downstream of the Project site. • The proposed headpond will provide for an increase in potential habitat • No other flora or fauna listed under the SARO regulation not listed on Schedule 1 of the SARA or through COSEWIC have been noted in the study through field work, anecdotal information, or the NHIC database. **Provincially and Locally Rare and Vulnerable Species** • One rare plant species, Yellow-rattle (*Rhianthus minor ssp. groenlandicus*), was noted during vegetation surveys. This plant is locally common and was observed on the roadside and trails off Highway 655 and is unlikely to be affected by Project construction or operation. • The NHIC database (2007) indicated that three other ranked species may occur in the Study Area. *Sphagnum jensenii*, a moss, was recorded in 1976 and is ranked by the MNR as imperiled. Red-disked Alpine (*Erebia discoidalis*), a butterfly, was recorded in 1992 and is ranked by the MNR as vulnerable. Lake Emerald (*Somatochlora cingulata*), a dragonfly (no record date available), is ranked by the MNR as imperiled to vulnerable. • These species were not observed during vegetation and wildlife surveys, and it is not anticipated that the Project will affect these species.			

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Fire Hazards	Construction Operation	• The Project site is located in a forested area where fire is a naturally occurring disturbance. • Construction equipment and personnel have the potential to unintentionally start forest fires through use of equipment, welding, metal cutting, blasting, burning of woody debris, cooking fires and barbeques, or careless disposal of cigarettes. • Uncontrolled forest fires have the potential to damage infrastructure and equipment, cause loss of life or severe health problems, and destroy wildlife habitat. • Timber stockpiling and tree limbing activities may increase potential fuel loads during the construction period of the Project.	• The proponent must adhere to the requirements of the *Forest Fires Prevention Act* (RSO 1990, C. F.24) and the *Modifying Industrial Operations Protocol* developed by the Aviation and Forest Fire Management ("AFFM") unit of the MNR (2007). • A fire prevention and preparedness plan must be developed and approved by the MNR Cochrane District Fire Management Supervisor prior to construction • Fire extinguishers must be located within 5 m of each piece of construction equipment. • Backpack pumps will be located on each piece of heavy equipment as required by the fire prevention and preparedness plan. • A fire equipment cache containing pumping units, backpack pumps, shovels, axes, and any other equipment needed to suppress forest fires must be located near worksites. • Appropriate fire training must be given to all personnel. 25% of employees must have training that meets the MNR SP-102 standard (MNR, 2007). • Organic debris such as brush and non-merchantable timber will be piled and burned, or immediately chipped and removed from the work site to an appropriate location. • Organic material will be removed at least 1 m around the debris pile. Debris must be burned in an excavated pit to reduce the potential for wind to spread the fire. • No burning is to occur under windy conditions. • A fire permit from the MNR District Office will be required to burn any material. • Care must be taken to avoid burning on peat-based soil	• No effects resulting from accidental fire are expected to result from the Project	Neutral (no effect is anticipated to occur following implementation of mitigation measures).
Protected Natural Areas	Construction	• No ANSIs, ESAs, provincial parks, federal parks or candidate parks have been identified in the Study Area	• No mitigation or protection measures are required.	• No effects on protected natural areas are expected to result from the Project	Neutral (no effect is anticipated to occur following implementation of mitigation measures).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
	Operation	• There are three conservation reserves and one forest reserve within the Study Area. It is not anticipated that the Project will have an effect on these areas.			
Aquatic Environment					
Fish	Construction	**Fish Habitat** • The construction of the dam and powerhouse structure will likely be considered a Harmful Alteration, Disruption, or Destruction of fish habitat ("HADD") as defined by the DFO • Construction activities will affect fish habitat and movement, and may affect survival • Construction of the dam and powerhouse structures will result in the loss of approximately 3,650 m^2 of fish habitat during the life of the Project. • Formation of the headpond will result in approximately 71 ha of additional aquatic habitat • Field studies identified limited potential spawning activity 50 to 100 m downstream of Yellow Falls by white sucker. • The Project will not affect potential white sucker spawning habitat downstream of Yellow Falls. **Fish Movement** • Downstream fish passage over Yellow Falls will be maintained during Stage One of dam construction. • Following installation of the Stage Two cofferdam, eggs and larvae will be able to pass through the spillway gates and powerhouse. • During cofferdam construction and subsequent pumping from the construction area there is potential for stranding fish remaining in the area. **Survival** • Explosives work will be conducted in the dry, so it is unlikely that this work will have any effect	**Fish Habitat** • Alterations to fish habitat in the Mattagami River, resulting from the construction of the proposed dam, will require YFP to obtain an authorization from the Department of Fisheries and Oceans. • Formation of the headpond results in an overall net gain in aquatic habitat. However, relative abundance of different habitat types will be altered due to the overall lentic nature of the headpond. • YFP has developed the Yellow Falls Hydroelectric Project Fisheries Compensation Plan. The preferred compensation options proposed by YFP that appear feasible for incorporation into the Project design are summarized below. *Construction of Headpond Spawning Habitat* • YFP proposes to create artificial spawning habitat approximately 1 km upstream of Yellow Falls. • The constructed habitat will consist of an excavated channel with a bottom elevation of 243 m. Channel construction will be undertaken prior to headpond filling. *Improvement of Spawning Habitat at North Muskego River* • In the spring of 2007 and summer of 2008 the North Muskego River was assessed to determine its utilization by the target species. A bedrock outcrop and associated rapids located four kilometres upstream of the Mattagami River mouth was identified as being utilized by spawning walleye and white suckers (Golder, 2007). • At this location, the potential exists to introduce constructed spawning habitat in association with the rapids feature that currently exists. • Habitat construction is proposed to occur on an	• The Project will be constructed at an existing natural barrier that is considered impassable to fish. • Approximately 95% of small fish and larvae that become entrained will pass through the turbines unharmed. • Additionally, larger juvenile and adult fish will be able to avoid entrainment as their burst speeds exceed intake velocities. Although some mortality is anticipated, percentages of fish killed are not expected to be high. • During construction, effect of explosives on fish can be mitigated using standard measures. • The Project will adhere to the DFO "no net loss of productive capacity" policy. • Fish spawning surveys conducted during 2006 and 2007 have not identified significant utilization by fish of existing riffle/rapid habitats in the stretch of river between Yellow Falls and Loon Rapids. • Long-term monitoring of the fishery in the Study Area will be a requirement negotiated with the relevant agencies. • The Fish Sanctuary located downstream of Lower Sturgeon GS will not be affected by the Project.	Low (slight decline in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		on local fisheries. **Fish Sanctuary** • A fish sanctuary is located immediately downstream of Lower Sturgeon GS and extends to the northern boundary of Mahaffy Township. The fish sanctuary will be not be affected by the formation of the headpond or the Project in general.	existing bedrock shelf which currently contributes limited habitat value. **Movement** • Fish stranded during dewatering behind the cofferdam will be removed, documented, placed in a pail containing clean water, and quickly transported to the Mattagami River downstream of the cofferdam area. • Fish removal and relocation will be considered complete when no more fish are readily caught. • A scientific fish collection permit, obtained from the MNR, will be required for this process. • Water pumping will occur at such a rate as to ensure survival and capture of the maximum number of fish possible. • Design features of the Project such as the gated spillway will allow passage of large quantities of water and could be utilized by larval and juvenile fish for downstream passage through the dam structure. Most adult fish tend to migrate upstream • Flow and river conditions downstream of the Project shall remain relatively unchanged during operation **Survival** • DFO *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky, 1998) will be implemented. • Trash rack spacing of 23 mm will be used for the Project, which will prevent adult fish from passing through the turbines • Velocities at the intake screens will be 0.6 m/s, which is slower than the burst speeds of small sturgeon (0.7 m/s), preventing impingement of fish on the intake screens. **Fish Sanctuary** • No mitigation or protection measures are required.		
	Operation	**Fish Habitat** • The run-of-river operational approach and proposed dam design will operate within the existing regulated flow regime. • Flows downstream of Yellow Falls will be concentrated to turbine outlets and the gated spillway, thus changing the orientation of flows at the base of Yellow Falls where small numbers of white sucker are presumed to spawn. • Inundation of the headpond will change upstream habitats due to increased water depth. • The approximately 6 km reach upstream of Yellow Falls will change from a lotic (fast-moving) environment to a lentic (slower moving) environment. • Creation of the headpond will create additional new habitats such as over-wintering habitat. • 71 ha of new aquatic habitat will be created, for a total headpond area of 160 ha. • The loss of riffle habitats between Yellow Falls and Loon Rapids is considered to be non-significant to the spawning success of white sucker, walleye, northern pike, and other species based on fieldwork to date. • Riffle habitats between Yellow Falls and Loon Rapids are not suitable spawning habitats for northern pike. • There are many alternative spawning areas for each of the four target species, such that they			

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		will be unaffected by the proposed headpond • The river in this area is dominated by runs/flats and riffles with occasional shallows and pools. • Following commencement of operations, the affected reach will be dominated by pool habitats, with most of the pool habitats occurring in the lower sections of the headpond. The upper headpond will generally consist of runs/flats. • Through inundation, areas with deeper pools and submerged bedrock features will be created (e.g., submerged islands and rapids), and will result in an increase of in-stream cover • Areas downstream of Yellow Falls and at Davis Rapids with a high percentage of cobble substrate will experience increased sediment deposition. • Based on field studies in 2006 and 2007, use of areas with cobble substrate at Yellow Falls and Davis Rapids is limited. • The headpond will provide approximately 16.2% (30,000 m^2) more shallow littoral habitat than currently exists, an area anticipated to be highly productive in terms of generating benthic and fish biomass • Potential spawning habitats for walleye in Rat Creek will be inundated, but will also be replaced (naturally via access to suitable new areas further upstream in the tributary through inundation) by new spawning habitats of similar size for these two species. **Fish Movement** • Yellow Falls is considered a naturally impassable obstacle to upstream fish movement. Construction of the dam/powerhouse structure at Yellow Falls will not affect the current inability for fish to move upstream past this structure. **Survival**			

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• Impingement and entrainment are potential hazards to fish once the dam is in operation. • Fish that are small enough to pass through the trash rack (i.e., those with a girth less than 23 mm) could become entrained into the turbines. • Fish small enough to become entrained (<200 mm in length) are likely to have survival rates greater than 95% (Skanski et al, 2001; Heisey et al, 1996) • Entrainment is anticipated to be minimal since none of the target species makes significant downstream migrations. Passive drift may occur in the fry stage for some species; • Larger fish will be rheotactic (generally swim upstream) when encountering the initial downstream flows associated with the intake (turbines), and will utilize burst speeds to overcome intake velocities and move away from the turbine intakes. **Fish Sanctuary** • The fish sanctuary is located approximately 15 km upstream of the terminus of the proposed headpond and will not be affected by the construction or operation of the Project.			
Lake Sturgeon	Construction	• COSEWIC has recommended that the James Bay populations, of which the Moose River is a part, be designated a species of “special concern” under the SARA. • Lake sturgeon are a species of special concern under the SARO regulation • Aquatic assessment investigations conducted for the Project have confirmed that lake sturgeon are located within Area A (below Island Falls).	• The successful downstream migration of larval sturgeon should be ensured by use of the Kaplan turbines, which have a > 95% success rate of passing small fish. • The upstream migration of sturgeon is presently considered negligible because of the difficulty that both Island Falls and particularly Yellow Falls pose for this species.	• Lake sturgeon do not appear to be present in the area occupied or affected by the Project • Larval and juvenile sturgeon will be able to pass downstream through the dam structure	Neutral (no effect is anticipated to occur following implementation of mitigation measures).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
	Operation	• No sturgeon have been identified in Area B or Area C (between Yellow Falls and Loon Rapids). • Modeling undertaken for the Project has determined that lake sturgeon are unable to ascend Yellow Falls with the exception of a very small probability of limited passage during infrequent flood events. • During fisheries field investigations undertaken for the Project, lake sturgeon were not found between Island Falls and Loon Rapids. • The proposed Project is not anticipated to increase the fragmentation of the local lake sturgeon population.			
Benthic Organisms	Construction	• The conversion of a lotic (fast-moving) to a lentic (slower moving) habitat will alter the composition of the benthic community. • Organisms requiring flowing water (i.e., typically the larger “sensitive” insects) will be replaced by organisms tolerant of still waters (i.e., simpler insects and worms). • Benthic organisms will colonize newly inundated soils, initially in high numbers. • Downstream of the proposed dam, alterations to thermal and flow regimes, sedimentation, water chemistry and biotic interactions have the potential to alter the benthic community. • Impoundments typically entrap suspended sediments, removing natural sediment load from the river. Although headponds trap some suspended solids, they can export large	• An increase in littoral area and subsequent increase in benthic productivity in the headpond is expected. • Creation of a lake-like water body will increase the numbers of zooplankton and phytoplankton, other sources of food for small fish. • Drift of benthic organisms from the new spawning habitats will help to offset losses of drift as a result of headpond formation. • The creation of constructed riffle habitat within the headpond and the North Muskego River will also contribute additional benthic production to the Mattagami River.	• The Project will significantly alter the species composition of benthic communities within the headpond • Overall, increased productivity of benthic organisms, zooplankton and phytoplankton, ultimately resulting in an increase in fish productivity (fish biomass).	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
	Operation	quantities of limnoplankton that become food for filtering benthic organisms • The littoral zone of the new headpond will contain a benthic community that is relatively productive and diverse. The mayfly *Hexagenia*, a major food item in the diet of lake sturgeon, can be expected to increase in numbers in the depositional areas of this reach of the Mattagami River. • The littoral zone can also be expected to support large numbers of chironomids, worms, snails, and bivalves, all of which will provide food for sturgeon and other benthic feeding fishes such as white and longnose sucker, as well as forage fish such as darters and sculpins. • The conversion of the headpond from a fast-flowing system to one that is more lake like will reduce benthic drift, and thus part of a food resource for fish that are downstream.			
Mercury Methylation	Construction Operation	• Inundation will facilitate methylation of mercury in the short term, and will likely lead to increases in mercury concentrations in tissues of game fish within the proposed headpond. • Increases of mercury concentrations in fish tissue can be anticipated to be limited spatially to the proposed headpond. • Concentrations of mercury in walleye (the principal sport fish) caught in the vicinity of the headpond have generally varied with fish total length. • Concentrations of mercury in the muscle of an average 40-cm fish have typically been ~ 400 ng/g • This section of the Mattagami River has about average or lower mercury concentrations in fish when compared to other sections • Many other locations in the Moose River Basin have concentrations high enough (in some cases upwards of 0.9 mg/kg) to warrant	• Pre-impoundment clearing will take place to limit the nutrient supply and mercury methylation. • Mercury levels in fish in the headpond will be monitored for several years after impoundment • Mercury concentrations as monitored in common sport fish will be made available to the appropriate agencies. • Consultation with local river users and community members has indicated that Island Falls, located 2km downstream from the Project, is the primary recreational fishing area. • Mercury levels within sportfish populations at Island Falls are not anticipated to increase.	• Concentrations of mercury in the flesh of piscivorous fish generally increase by two to three times background after inundation of a headpond. Such increases in mercury concentration in the may result in total restriction for women of child-bearing age as well as the general restriction for the general population. • Concentrations will likely increase early in the life of the headpond (e.g., years one to ten), but will decline over time (e.g., years 10 to 20) • The net effect of methyl mercury bioaccumulation in fish flesh is likely to be limited to the headpond and may result in a reduction in the use of the natural resource in the Study Area.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		restrictions on consumption. • Concentrations below 2,660 ng/g would be considered levels that pose a limited risk of impairment for wildlife. • Mercury accumulation in the flesh of fish is not expected to affect birds and wildlife that feed on fish. • Mattagami River water used in homes and businesses has been treated by the municipal facility. Municipal treatment effectively removes contaminants including mercury. • Mercury methylation is not expected to affect use of the Mattagami River for drinking water since methyl mercury concentrations are anticipated to be limited to the headpond. Further, mercury in the water column is mostly adsorbed (stuck to) particles which are removed during the course of water treatment. • Persons that use raw river water may be exposed to slightly higher amounts. However, boiling water before use will reduce the potential for exposure to mercury since the boiling point for methyl mercury is 92^{o}C, while the boiling point for water is approximately 100^{o}C.			
Resources					
Use of Non-renewable Resources	Construction	• The Project will use aggregate resources. • Construction equipment will require oil-based fuel (petroleum or diesel fuel. • In addition, aggregate material will be required to upgrade and create the access road and provide material for concrete production.	• Fuel conservation measures, including a no idling policy will be implemented. • Efficient use of hydrocarbon based fuels for travel/transportation will be encouraged through local procurement of goods and services.	• The Project will not have a significant effect on non-renewable resources and may assist in offsetting non-renewable resource use for electricity generation, such as hydrocarbon fuels and coal.	Positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).
	Operation	• Run-of-river hydropower is typically the most efficient form of electricity generation, producing, on average, 267 units of energy during operation for every unit used during construction and maintenance. • The high efficiency of hydroelectric generating stations is a result of the renewable fuel source	• Hydropower is very efficient and non-renewable resources are not consumed during the electricity generation process, • No mitigation and protection measures are required for the operation of the facility.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• The operation of the Project will result in the efficient use of a small amount of non-renewable resources.			
Forest Resources	Construction	• Tembec) harvests forest resources under a SFL in accordance with the *Crown Forest Sustainability Act*. • Timber will be removed from portions of the Study Area for site access, transmission line installation, construction staging, headpond clearing, and as required in the areas adjacent to the powerhouse and dam location. • A total of approximately 70 ha of forest will be cleared as a result of the Project, some of which is currently occupied by clear-cut areas, • The MNR Mattagami River policy area (G1744) requires a 120 m buffer from the Mattagami River in which timber harvesting is not permitted • Following headpond formation, the buffer will be displaced and restored adjacent to the headpond boundaries. • The revised policy area will occupy approximately 140 ha of additional forest resources which will be removed from production	• Timber to be removed from the Study Area will be harvested and processed in accordance with an overlapping agreement between YFP and Tembec. • All merchantable timber will be provided to local mills for processing as per the overlapping agreement. • The number of trees removed from the Study Area will be minimized to the extent possible. • An amendment to the SFL will be required to withdraw Crown land from forest production • A FRL will be required to clear timber for access roads, transmission lines, construction areas, headpond areas, structures, and ancillary facilities. • Stumpage fees will be required for any timber harvested, and renewal fees paid by the SFL holder and will be reimbursed according to MNR requirements and the overlapping agreement between YFP and Tembec	• Significant forest resources exist in the Study Area, and the Project will remove only a small portion from production. • Appropriate agreements will be executed with the local SFL holder in accordance the *Crown Forest Sustainability Act.*	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).
	Operation	• There is no need to harvest any timber from the Project site during operation • Trees that may interfere with transmission lines or other Project infrastructure may require periodic trimming or removal.	• Large-scale timber harvesting will not be required during the operation phase of the Project • No further mitigation measures are required.		
Game, Fish, and Wild Foods	Construction	• The Project is located in the vicinity of three registered trap line areas (MNR Trap Line reference numbers C64, C66, and C67). • No commercial fishing or aquaculture operations currently exist in the Study Area. • Improvements to river access through elimination of barriers to boat travel and access to the boat ramp upstream of Yellow Falls are likely to increase opportunities for sport fishing	• The proponent has consulted with the registered trap line permit holder and provided appropriate mitigation for disturbance to trapping operations during construction. • Mitigation and protection measures for noise, are expected to limit the effect of construction activities on wildlife • Hunters may require additional travel away from the Project site to access game during the construction	• Following construction, the Project is not anticipated to have a significant effect on commercial trapping or recreational hunting, fishing access, and wild food gathering.	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		in the headpond area. • Recreational fishing is likely to continue at Island Falls • Access for recreational trapping or hunting in the immediate vicinity of Project will be limited during construction • Increased noise and activity in the vicinity of Red Pine Road during construction may disturb game during fall hunting season. • A wild rice stand is located 1.3 km west of Red Pine Road, and will not be affected by the construction or operation of the Project.	period • Following construction, game availability and movement patterns are expected to be similar to pre-existing conditions.		
	Operation	• Improved access along Red Pine Road following construction may increase hunting, fishing, and trapping opportunities, and create additional hunting and fishing pressure in the area. • Big game such as moose and bear may be susceptible to increased hunting pressure • Improvement of Red Pine Road may provide enhanced access to fishing opportunities in the proposed headpond area. • Potential aquatic feeding areas for moose and feeding and denning areas for mink, otter, and marten may be present along the shores of the Mattagami River • Moose feeding area may increase post-construction, as the area of the littoral zone (< 2 m in depth) is expected to increase by 16.2% (approximately 30,000 m^2) and water velocity will be reduced. • Habitat assessments for mink, otter and marten should be approached at a landscape level. These species are likely to continue to be present in the Study Area due to the large blocks of habitat available.	• Since the Project site does not represent ideal habitat for large game, and will have limited effect on game presence during operation, no further mitigation measures are proposed. • The Project is not expected to negatively affect the availability of fish, or wild food for consumption. • The licensing process for bear, moose, and other game ensures sustainability of wildlife populations in Ontario and continued opportunities for wildlife harvesting. • Fisheries regulations are in place to ensure continued sustainability of game fish populations and continued recreational opportunities.		
Land-Use					
Residential, Commercial, and	Construction	• No lands occupied by the Project are designated as residential, commercial, or	• YFP representatives will be identified for community members or representatives to discuss any issues	• Some seasonal residents may experience effects due to noise and reduced access	Minimal (potential effect may result in a slight decline in resource in

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Industrial Land Use		industrial, • Cottages scattered downstream of the Project are consistent with residential land uses. • The Town of Smooth Rock Falls is the closest settled area, and is located approximately 18 km north of Yellow Falls. • Project infrastructure, including transmission lines and access roads, will not be located within Town boundaries. • No effects are anticipated on residential, commercial, or industrial land uses within the Town during the construction phase of the Project. • Seasonal residents located within 1 km of Red Pine Road and Project infrastructure may experience disturbance due to noise during construction. • Access along Red Pine Road may be affected during construction due to truck traffic and safety concerns. • Cottage owners along the North Muskego River have expressed concern to YFP about an existing "pull-off" parking area located adjacent to Red Pine Road	or concerns. • YFP will ensure the Town of Smooth Rock Falls and the MNR maintain current project contact information to provide stakeholders with avenues to address their input throughout the construction of the Project. • YFP will construct a new permanent parking area of compacted gravel approximately 400 m^2 adjacent to Red Pine Road in the immediate vicinity of the existing pull-off area • YFP will ensure access to cottages via Red Pine Road • The Project is not expected to affect residential, commercial, or industrial land uses	along Red Pine Road during the construction phase of the Project. • This effect will be limited to the construction phase.	Study Area during construction phase, but the resource should return to baseline levels).
	Operation	• The Project is not likely to affect MNR Crown Land Use Policy in the Mattagami River Area which indicates cottaging opportunities may be encouraged south of the Town of Smooth Rock Falls.	• The Project is not expected to affect residential, commercial, or industrial land uses		
Provincial and Municipal Land Use Policies	Construction Operation	• No ANSIs, ESAs, provincial parks, federal parks or candidate parks have been identified in the Study Area. • Three conservation reserves and one forest reserve within the Study Area are located well outside of the Project footprint • According to the MNR Crown Land Use Policy Atlas, hydroelectric power generation is a priority in the Mattagami River Area,	• YFP will maintain means of community communication by ensuring the Town of Smooth Rock Falls and the MNR have Project representative's contact information. • YFP will also adhere to MNR plans and policies throughout the Project lifecycle, as well as the themes presented in the PPS. • As the Project is unlikely to have an effect on protected natural areas, no mitigation measures are required	• The Project is consistent with existing land use policies in the Study Area, as well as the PPS.	Neutral (no effect is anticipated to occur following implementation of mitigation measures).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• Primary uses are public recreation, cottaging, and commercial tourism. • Roads will be managed in compliance with MNR access roads policy. • The proposed Red Pine access road and transmission line corridor is outside the municipal boundary of the Town of Smooth Rock Falls. • A MOU between the YFP, the MNR, and the SFL holder will be required prior to construction of roads and bridges to determine road use, ownership, and liability. • The Project is consistent with the 2005 Provincial Policy Statement ("PPS"), and resource management plans • No effects on the land use policies are anticipated during the operation phase of the Project.	• No further mitigation measures are required for the operation phase of the Project.		
Hazard Lands	Construction and Operation	• There are currently no lands within the Study Area designated as hazard or contaminated lands. • The PPS states that development is permitted in hazardous lands (i.e. floodplains) where "the development is limited to uses which by their nature must locate within the floodway." • The Project will remain in compliance with applicable dam safety regulations throughout its lifecycle.	• No hazard or contaminated lands have been identified within the Study Area. • YFP will develop a sediment and erosion control plan prior to construction • No further mitigation or protection measures are necessary for the construction phase of the Project. • No mitigation measures are required for the operation phase of the Project	• There is no potential for effects on hazard or contaminated lands as a result of the Project as these land designations have not been identified within the Study Area	Neutral (no effect is anticipated to occur following implementation of mitigation measures).
Recreational Use	Construction and Operation	**Fishing** • Recreational fishing may be affected during construction by limited access to the Project site.	**Fishing** • No mitigation or protection measures are possible for reduction of fishing opportunities at Yellow Falls. However, existing high velocity flows in this area	• Traffic, equipment, and noise will limit recreational opportunities in the vicinity of Yellow Falls and Red Pine Road during construction.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• In addition, fishing pressure may increase due to the presence of workers at the Project site • Following commencement of operations, fishing at Yellow Falls will be limited to areas outside of safety and log booms. • Recreational fishing more than 500 m downstream of the proposed dam/powerhouse structure is unlikely to be affected through construction or operation **Hunting** • During construction, activity and noise may cause game animals to temporarily avoid the construction areas. • Little to no breeding or staging habitat for waterfowl is present along the River. As such, the area proposed for inundation does not represent a prime hunting area for waterfowl or geese. • Following headpond formation, waterfowl habitat may increase. Consequently, opportunities to hunt waterfowl may increase over baseline conditions. • Availability of game birds may decrease in the immediate area of disturbance during construction and return to near-baseline conditions following commencement of operations. **Canoeing, Kayaking, and Boating** • The Mattagami River is a canoe route designated by the MNR. • Incidental observations during 2006 field work and the overgrown state of most portages indicate that the reach of the Mattagami River upstream of Island Falls is not heavily used by canoeists or other boaters. • Although access points are present upstream of Island Falls, a four-wheel drive or ATV may be required to reach the river. • The stretch of river between Island Falls and	generally render fishing by boat or wader unsafe. • Following commencement of operation, opportunities for recreational fishing are likely to be available upstream and downstream of safety booms at Yellow Falls • The headpond may provide additional habitat for Walleye and Northern Pike, along with deeper water, which may result in improved recreational fishing opportunities for these species. ***Hunting*** • Construction activity and safety concerns will limit access along Red Pine Road and may cause game animals to avoid the immediate area of construction over approximately two hunting seasons • Following construction, access along Red Pine Road will be improved, potentially allowing easier access for local hunters. **Canoeing, Kayaking and Boating** • Canoe access in and around Yellow Falls will be provided and the construction contractor will be required to facilitate canoe movement if no portage is available. • Canoeing opportunities will be maintained in the area through the construction of a new portage trail • Safety measures such as signs and booms will warn river users of unsafe conditions in close proximity to the dam. The dam and transformer area will be fenced. • Safety boom and signage will be installed in accordance with MNR and Transport Canada requirements. **Camping** • The Project will not affect the campsite at Island Falls or commercial camp grounds in the Study Area. **Hiking** • Following construction, Red Pine Road may allow easier transportation to hiking opportunities along	• Increased accessibility of the area through the improvement of the Red Pine Road, along with improvement to the local snowmobile trail network may allow further recreation opportunities. • Fishing activities at Island Falls (a popular local fishing location) will not be affected. • Fishing opportunities in the immediate vicinity of Yellow Falls will be lost, • Fishing opportunities may be altered in terms of species present in the headpond. • Opportunities for nature viewing may be altered by the presence of the dam and powerhouse structures, as well as transmission lines. • Through the future and ongoing support from the financial contributions to the Town by YFP, significant recreational benefits to the Town and the Mattagami River are anticipated.	

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		Smooth Rock Falls is the primary location for boating due to its accessibility from Smooth Rock Falls and suitability for motorized boat traffic. • Based on the subjective evaluation, the Project is not likely to have a significant effect on current or future whitewater recreation. • During construction, a portage at Yellow Falls will not be possible because of cofferdam installation and ongoing heavy equipment movement. • During operation, the existing portage will be unusable. ***Camping*** • No designated camping areas will be affected by the Project • There are numerous areas along the Mattagami River where suitable backcountry campsites could be located. ***Hiking*** • Hiking opportunities along Red Pine Road may be limited during certain portions of the construction schedule for safety reasons (e.g. road improvements on Red Pine Road, and periods of high heavy-truck traffic). • Following construction, hiking opportunities are likely to be similar to pre-existing conditions. ***Snowmobiling/ATV Riding*** • Smooth Rock Falls is a popular destination for snowmobilers • The Arctic Riders Snowmobile Club maintains approximately 185 km of trails near Smooth Rock Falls. Early in the EA process, it was recognized that the Arctic Riders Snowmobile Club's main trail would be in the same corridor as that planned for access and transmission facilities. It was also noted by the Club that two major watercrossings were required to maintain this trail and there were plans to move it 5 km	forest access roads **ATV/Snowmobile Use** • YFP consulted with the Arctic Riders during the early stages of the Project • YFP and the Arctic Riders executed a Memorandum of Understanding ("MOU") which will facilitate the completion of the new snowmobile trail on the east side of the Mattagami (i.e. opposite side of the Mattagami River from the Project's access road and transmission line). • YFP will discuss the status of the ATV bridge with the MNR and will notify the Smooth Rock Falls Anglers and Hunters club regarding use of Red Pine Road and potential effects to the ATV bridge which crosses the Muskego River. **Wildlife/nature viewing** • Following construction, the natural attributes of the area will change as the result of inundation of falls and rapids, as well as the potential removal of aged and unusual trees **Support for Recreational Activities** • During the development of the Project, stakeholders within the Town of Smooth Rock Falls indicated their ongoing interest in the development of recreational activities within the Town, as well as along the Mattagami River. • YFP has committed to providing to the Town an annual contribution of $3,000 per year to support local environmental stewardship activities in the area. • YFP has also committed to the installation of a parking lot along the Red Pine Road. • YFP has committed to a one-time contribution of $70,000 to support recreational developments in the Town of Smooth Rock Falls.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		east of the Town of Smooth Rock Falls. • ATV riding is also popular in the area. Local access and logging roads are well suited to this purpose. • The Smooth Rock Falls Hunters and Anglers Club constructed an ATV bridge across the Muskego River near the Red Pine Road. • ATV access along Red Pine Road may be limited during certain portions of the construction schedule for safety reasons (e.g. road improvements on Red Pine Road, and periods of high heavy-truck traffic). • Following construction, ATV riding opportunities may slightly improve **Wildlife and Nature Viewing** • It is assumed that wildlife and nature viewing is primarily associated with non-consumptive recreational uses such as canoeing, hiking, and camping (Hunt and Haider, 2000). • Local users are particularly interested in Bald Eagle viewing. • During construction, wildlife may avoid the immediate area of activity. • During operation, traffic volumes (approximately 1-2 trips to and from the site each day) are not expected to significantly influence wildlife behavior over baseline conditions. • Wildlife viewing may improve for some species since the littoral zone will increase and water velocity will be reduced in the headpond • As much of the Study Area has undergone disturbance in the form of timber harvesting, and is a relatively homogenous landscape, high quality nature viewing opportunities are limited in the Study Area • During construction, the Project will influence nature viewing by introducing disturbance through tree-clearing and construction of			

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		Project components. • During operation, water features at Loon Rapids, Davis Rapids, and Yellow Falls will no longer be visible. The dam/powerhouse structure and transmission line will form additional anthropogenic components of the landscape.			
Utilities and Infrastructure	Construction	**Utilities and Railroads** • New and upgraded access roads, including three watercrossings by bridge and a transmission line are part of the Project infrastructure. • The Project will connect to the existing Hydro One Networks Inc. (“Hydro One”) 115 kV H9K transmission line. • YFP will require a Memorandum of Understanding (“MOU”) and Crown land tenure, administered by the MNR, to construct the transmission line. • The transmission line will cross natural gas pipelines south of Highway 11 that are owned and operated by TransCanada Pipelines Ltd (“TCPL”). • The transmission line will also cross the Ontario Northland Transportation Commission (“ONTC”) tracks east of the existing crossing by Red Pine Road. **Roads and Highways** • Most passenger vehicles, concrete trucks, miscellaneous vehicles, will utilize Highway 11, which is currently utilized for local, regional, and inter-provincial truck traffic. • There may also be instances during construction where overweight or oversize loads will require special traffic planning or permits. • Large truck traffic will not pass through residential areas of Smooth Rock Falls. • YFP will require a Memorandum of	• Highway 11 is designed for truck traffic and currently extensively used for inter-provincial goods transportation. • When construction is occurring in the vicinity of Highway 11, equipment will be stored as far from the edge of the traveled portion of the roadway as possible. • Warning signs and construction barricades will be erected at all areas of construction activity near the intersection of Red Pine Road and Highway 11. • Appropriate traffic control measures must be used if construction activity occurs before dawn or after dusk. • YFP will obtain the required crossing agreement from TCPL prior to construction of the access road and transmission line crossing within 30 m of the existing pipelines. • YFP has executed a private crossing agreement with the ONTC. • YFP will require a Memorandum of Understanding (“MOU”) and crown land tenure administered by the MNR to construct transmission lines, upgrade Red Pine Road, and construct additional access roads.	• Short-term disruptions in traffic may result from construction • No long-term significant adverse effects on roadways, pipelines, railways or municipal services are anticipated • Continued low-level use of municipal infrastructure (waste disposal and roads) will be required for the duration of the Project. • No adverse effects on utilities and railroads are anticipated as YFP will obtain necessary approvals.	Minimal (Potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels.

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		Understanding ("MOU") and Crown land tenure, administered by the MNR, to upgrade Red Pine Road and construct additional access roads. • Traffic associated with the construction phase has the potential to result in short-term localized disturbance to traffic patterns, wear and tear on the roads, and the potential for traffic safety hazards. **Municipal/Emergency Services** • Emergency services may be required by the Project although YFP and the Construction Contractor will have strict safety policies in place, • The Project will not place additional demand on existing water supply or sewage treatment infrastructure in the area.			
	Operation	**Utilities and Railways** • Crossing agreements with TCPL and Ontario Northland may require monitoring and maintenance of crossings during operations. **Roads and Highways** • Operations related traffic will be limited to operator vehicles and intermittent traffic associated with maintenance. **Municipal/Emergency Services** • No additional road maintenance is anticipated as a result of the Project. • The Project is not anticipated to generate any additional demand for local emergency services. • The Project will not be physically connected to community services or infrastructure; hence no increases for these services are anticipated.	• YFP will commit to monitoring and maintenance of crossings as required by agreements with TCPL or ONTC		
Waste Materials	Construction	• YFP will retain an MOE-licensed waste disposal contractor to remove waste and recycling during construction. • The waste disposal contractor will dispose of material at an MOE-licensed facility in	• Construction waste will be limited to packaging and construction material such as small amounts of leftover wood, cardboard, or other common materials. • Materials will be reused or recycled to the greatest	• The Project will require minimal use of waste disposal facilities, and will contribute to municipal waste disposal operations through recycling or tipping fees. • The use of the local waste disposal facility	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		accordance with the disposal facility's CofA. • The Smooth Rock Falls Landfill may be used to dispose of non-hazardous waste provided that the facility is licensed to accept construction waste and at the discretion of the waste disposal contractor. • A slight decrease in capacity at the Town of Smooth Rock Falls Landfill may occur if used to dispose of construction waste. • Hazardous waste materials will not be generated in large quantities and will be disposed of through conventional waste-oil and hazardous waste disposal streams in accordance with MOR regulations. • There is no anticipated permanent storage of hazardous materials on-site. • No known active or closed waste disposal sites exist within 500 m of proposed Project components.	extent possible. • The Construction Manager will implement a site-specific Waste Collection and Disposal Management Plan • If waste is classified as other than solid non-hazardous, a Generator Registration Number is required from the MOE and the generator will have obligations regarding manifesting of waste in accordance with the MOE's Hazardous Waste Information Network ("HWIN").	will generally be restricted to the construction phase of the Project.	
	Operation	• Waste materials are limited to ongoing maintenance for the powerhouse facilities (e.g., lubricants and hydraulic oils). • Minimal amounts of normal household waste will be generated, and will be disposed of through the normal waste stream	• YFP will implement an on-going waste management program consisting of reduction, reuse, and recycling of materials • Subject waste will be registered on MOE's Hazardous Waste Information Network		
Socio-Economic Features					
Nature and Organization of Local Governments	Construction Operation	• No effects on the nature and organization of the Town of Smooth Rock Falls are anticipated during the construction or operation phases of the Project.	• No further mitigation or protection measures are necessary.	• No net effects on the nature and organization of local governments are expected as a result of the Project	Neutral (no effect is anticipated to occur following implementation of mitigation measures).
Population	Construction	• Use of local workers during the construction phase will be maximized. • An influx of temporary workers from elsewhere is not anticipated to significantly affect local population level. • The increase in temporary workers could create a short-term increase in demand for rental housing during the construction phase.	• The Project is expected to have a short-term effect on the size of the local population, therefore no mitigation or protection measures are necessary during the construction phase of the Project.	• Effects on the size and structure of the local population are expected to be restricted to the construction phase of the Project, and will be limited	Minimal (Potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels) since use of local workers will be maximized.

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• There is also potential for some additional demand on local public services such as waste disposal, health care, housing, and education			
	Operation	• No effects on population levels are expected.	• No mitigation measures are necessary for the operation phase of the Project		
Local Economy	Construction	• Construction will result in direct, indirect, and induced economic benefits. • The total Project budget is approximately $72 million • Local sourcing of materials and services will be encouraged, provided that they are available in sufficient quality and quantity at competitive prices. • The combined taxes generated from direct and indirect/induced employment is estimated at $5,092,000. • Road improvements will also result in economic benefits.	• A positive effect will be encouraged by promoting the use of local labour, goods and services provided they are available in sufficient quantity and quality and at competitive cost throughout the construction phase of the Project.	• The Project will result in potentially significant construction related employment gains. • The Project is unlikely to result in any labour shortages in the local community • The Project is unlikely to generate any negative effects on local private property interests • The Project will generate some capital improvements in public roads • The Project will have a positive effect on the local economy during the two-year construction period and, to a lesser degree, during the operation phase	Positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).
	Operation	• Two full-time positions will be required to manage and operate the facility year-round. • The total economic impact is an additional $99,900 of gross employment income to the economy. • The federal and provincial income tax generated by full-time positions as well as indirect and induced employment is approximately $35,800. • Ongoing labour requirements for routine maintenance such as access road repair and transmission line vegetation clearing will create additional direct, indirect, and induced employment • YFP will place a strong preference on local material and labour supplies. • YFP will pay water rental and property taxes totaling $336,480 per year (subject to any legislated increases) beginning in the 10th year of operation (there is a 10-year holiday on	• Use of local goods and services will be encouraged provided they are available in sufficient quantity and quality and at competitive cost throughout the duration of the operation phase of the Project.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		taxes for new generation).			
Local Business, Institutions, or Public Facilities	Construction and Operation	• Polar Bear Outfitters will not be affected by construction or operation of the Project. • The Project will not affect the dam safety rating or operation of existing hydroelectric facilities. • There will likely be a sufficient amount of rental properties to accommodate the influx of temporary workers • Local institutions such as schools and health care facilities may also experience a limited additional demand for services. • Businesses such as food providers, fuel retailers, mechanical shops, lodging facilities in Smooth Rock Falls and the surrounding region are anticipated to experience positive economic benefits • No further effects are anticipated	• Local goods and services will be used whenever possible if they are available in sufficient quality, quantity, and at competitive prices. • Throughout the construction period, community members and local business owners should be kept advised of the Project schedule in order to ensure that inventory and staffing levels are appropriate for the demand. • No further mitigation measures will be required	• The Project will have a positive effect on local businesses during the two-year construction period and to a lesser degree during the operation phase	Positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).
Tourism	Construction	• Tourism in the region is resource-based • The Project is not expected to have an effect on tourism operators holding a Land Use Permit • The Study Area exhibits low potential for ecotourism. • Any tourism taking place during the construction phase may be affected due to increased levels of noise, and in-water works requiring booms and dams. • The Project is not expected to affect areas currently used by tourists.	• A new portage route will be constructed to maintain the crossing at Yellow Falls for local canoeists.	• Due to the increased amount of noise and in-water works during the construction phase, some temporary effects to potential tourism may occur • The operation of the Project will not affect areas currently used by tourist outfitters • The Project will not affect current ecotourism potential.	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).
	Operation	• The Project is not expected to affect areas currently used by tourists.	• No further mitigation measures will be required during the operation phase of the Project.		
Navigability of Waterways	Construction	• In-water work such as cofferdam installation may affect navigability of the Mattagami River • Construction activity will prevent use of the existing portage around Yellow Falls	• Warning signs will be placed at least 100 m upstream and downstream of work locations to warn river users of construction activities. • Any structures or materials that are placed on the bed or the surface of the Mattagami River or the North Muskego River during construction will be	• Following commencement of operations, the proposed boat ramp upstream of Yellow Falls will be accessible. • A well-marked and maintained portage will be provided at Yellow Falls • Portages at Loon Rapids and Davis	Positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			removed immediately following construction • The bridge over the North Muskego River will permit passage of small craft such as canoes, kayaks, and rafts without requiring a portage • YFP will obtain the necessary *Navigable Water Act* permits prior to construction of the dam or the bridge structures. • Small vessels seeking passage past Yellow Falls will be permitted safe passage • A temporary portage route will be demarcated.	Rapids will no longer be required	
	Operation	• Following construction, the dam/powerhouse structure will prevent small craft such as canoes and kayaks from portaging directly over Yellow Falls. • The navigability of the Mattagami River between Yellow Falls and Loon Rapids will be improved as a result of increased water depths and reduced obstruction due to boulders and rapids.	• An appropriately signed portage will be installed on the upstream and downstream sides of the powerhouse/dam structure. • Portage signs must be placed 100 m upstream and downstream of the portage entry/exit locations • Safety booms, coloured international orange, must be placed a minimum of 50 m upstream and downstream from the powerhouse/dam structure. • All signage will be installed in accordance with Transport Canada requirements.		
Local Employment and Labour	Construction	• YFP will encourage the employment of local persons as part of contractor/supplier proposals. • Suitable skill sets are anticipated available in the Smooth Rock Falls community and local First Nations community.	• YFP will place a strong preference on local labour and supplies as detailed above	• Employment of local persons is expected to have a positive effect on the economic base of the community during the construction phase. • Following the two-year construction period, two full-time positions will be created.	Positive and low (potential effect may result in a slight improvement in resource in Study Area during the life of the Project).
	Operation	• Two operators will be directly employed, with ongoing additional labour, requirements for routine maintenance	• YFP will place a strong preference on local labour and supplies		
Community Services and Infrastructure	Construction	• The Project will not require the use of community services or infrastructure such as electricity, potable water, or wastewater treatment. • It is anticipated that sufficient lodging and services for construction workers will be provided by existing infrastructure (e.g. rental housing, hotel/motels)	• No mitigation or protection measures are required	• The Project is expected to have a short-term, minimal effect on the demand for community services and infrastructure during construction. • Following commencement of operations, minimal demand will be made on community services.	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• No additional municipal infrastructure • An increased presence of workers may slightly increase demand for community services including fire, police and medical treatment			
	Operation	• Limited use will be made of the community services and infrastructure during operation.	• No mitigation measures are required		
Housing	Construction	• The demand for temporary or rental housing will increase within the Town of Smooth Rock Falls	• Recent closure of the Tembec Mill in Smooth Rock Falls has resulted in increased availability of rental residential spaces. No mitigation or protection measures are required	• No long-term or significant effects on housing are expected	Neutral (No effect is anticipated to occur following implementation of mitigation measures).
	Operation	• No significant additional demand for housing is expected.	• No mitigation measures are required		
Traffic	Construction	• The construction phase will require numerous truck trips to transport personnel, equipment and materials • The increase in traffic, including excess load traffic, results in the potential for short-term, localized disturbance to traffic patterns, and wear and tear on roads.	• A road safety program will be implemented to deal with specific traffic planning issues in consultation with the MTO and MNR. • The intersection between Highway 11 and Red Pine Road must be signed and controlled using a stop sign to prevent traffic from proceeding directly onto the highway. • Upgrades to the intersection or an intersection control plan will be developed as required in consultation with the MTO. • Construction and operation traffic will be required to stop and ensure that a train is not passing at the railway crossing on Red Pine Road. • Presence of construction vehicles on Red Pine Road must be clearly indicated via appropriate signage. • Construction traffic will avoid residential streets to the greatest extent possible • Appropriate permits will be obtained from the MTO to implement traffic related activities or for transportation of unusual loads.	• Effects associated with increased traffic volume will primarily occur during the construction phase of the Project.	Minimal (Potential effect may result in a slight decline/improvement in resource in Study Area during construction phase, but the resource should return to baseline levels).
	Operation	• Additional effects on traffic are not anticipated as Project related traffic would be restricted to operation and maintenance transportation.	• The above mentioned mitigation measures will also be applied to the operation and maintenance phase of the Project when required.		
Public Health and Safety	Construction	• The Project is not located in a highly populated or heavily used area, therefore potential health	• Implementation of transportation planning and safety measures during construction	• Safety risks for recreational users are considered minimal as posting warning	Neutral (no effect is anticipated to occur following implementation of

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		and safety concerns are greatly reduced. • Potential public health and safety risks are generally related to construction traffic and unauthorized public access the facility. • Safety precautions (e.g. warning signs, fencing, etc.) will be employed to limit such risks. The Project poses no foreseeable risks associated with sanitation. • Contingency plans will be developed to ensure immediate response to any unexpected event, accident, or malfunction	• All roadwork will follow MNR *Environmental Guidelines for Access Roads and Water Crossings* (1990). • The primary protective measure for accidents and equipment malfunctions is the safe design, construction, operation, maintenance, and decommissioning of the Project and ancillary facilities. Accidents and malfunctions can also be minimized through proper training and education of employees.	signs and limiting access to Project components will greatly reduce risk • Risks for operation and maintenance crews can be reduced through facility design, and proper employee training and attire	mitigation measures).
	Operation	• Reduced visibility and slippery surfaces may pose safety risks for operation and maintenance workers.	• Safety measures will be employed around the Project site to inform the public of health and safety risks and to prevent access to hazardous areas such as the powerhouse and dam. • Non-slip surfaces and railings will be incorporated into the construction plans. • YFP will ensure that emergency responders within the Study Area are aware of the Project location and the procedures to be followed in the event of an emergency.		
Heritage, Culture, Landscape, and Archaeological Resources					
Heritage and Archaeological Features	Construction	• Construction has the potential to affect archaeological and heritage resource sites. • Stages I through III Archaeological/Cultural Heritage Assessments were conducted • A site near Yellow Falls will require mitigation and protection measures. • Archaeological features may also exist along the proposed access roads and transmission line route • A local First Nation community member with experience related to the identification and management of First Nation burial sites has undertaken a field visit with the Project Archaeologist and YFP.	• Should archaeological features be identified during construction activities, all activity in the vicinity of the discovery must immediately cease, and the Ministry of Culture archaeologist contacted. Potentially interested First Nations must also be contacted • A licensed archaeologist may be required to develop site-specific mitigation measures and oversee site salvage operations in consultation with the Ministry of Culture. • Should potential human remains be encountered during construction: o All work in the vicinity of the discovery must be suspended immediately. o Notification must be made to the Ontario Provincial Police who will conduct a site investigation and contact the district	• No net effects on heritage or archaeological resources are expected with implementation of mitigation and protection measures in accordance with Ministry of Culture requirements.	Neutral (no effect is anticipated to occur following implementation of mitigation measures).

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Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			coroner. o Notification must also be made to the Ministry of Culture and the Registrar of Cemeteries. • Further mitigation measures are outlined in the Archaeological/Cultural Heritage Assessment and the Ministry of Culture letter dated September 24, 2007		
	Operation	• There is limited potential for disturbance, following construction. • No additional effects on archaeological, heritage or cultural resources are expected.	• No protection or mitigation measures are required for the operation phase of the Project • During the operation phase, YFP will continue to implement any site protection plans that may be developed.		
Community Character	Construction	• There is potential to temporarily affect the local viewscape due to increased traffic volumes and the presence of construction machinery. • Short-term effects associated with an increased population of non-resident construction workers, and noise due to the increased traffic volume and frequency is also possible.	• Environmental noise will be reduced through the standard operating practices (e.g. vehicles equipped with mufflers, maintained in good working order, etc.) • Construction-related traffic in the vicinity of Smooth Rock Falls is of a same nature as existing through-traffic on Highway 11 (e.g. service vehicles, tractor trailers, logging equipment).	• Construction-related traffic on Highway 11 associated with Project construction is not anticipated to significantly affect the community character in Smooth Rock Falls due to the existing highway commercial traffic using Highway 11. • No long term effects on the community character of Smooth Rock Falls are expected during operations.	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).
	Operation	• Community character will not be affected during the operation phase.	• No effects to the community character of Smooth Rock Falls are anticipated		
Lifestyle	Construction	• Project construction will have an effect on outdoor recreation • Outdoor recreational activities have been identified as major components of the lifestyle of local residents, • Most construction-related disruptions will be temporary, and recreational activities can continue in the local area unimpeded.	• Mitigation measures include protection and enhancement of recreational use, noise, and traffic management during construction.	• Recreational activities adjacent to Yellow falls and the Red Pine Road may be disturbed during construction. • During operation, recreational activities in the immediate vicinity of Yellow Falls may be altered. • Fishing activities can continue downstream and upstream of Yellow Falls outside the safety booms • Improved access along Red Pine Road and construction of a boat ramp at Yellow Falls may facilitate recreational activities important to the Smooth Rock Falls lifestyle. • The remaining local area will continue to	Minimal (potential effect may result in a slight decline in resource in Study Area during construction phase, but the resource should return to baseline levels).
	Operation	• Access to Project infrastructure will be restricted to ensure public safety and prevent vandalism. A • Access to the Mattagami River for canoeing and kayaking will be improved. • Red Pine Road improvements and construction of a boat ramp upstream of Yellow Falls will	• Mitigation measures implemented during the construction phase of the Project will also address potential effects during the operation phase. Therefore, no further mitigation measures are required.		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		allow improved boat access. • Snowmobile activities will be positively affected through the construction of new snowmobile trails in partnerships between YFP and local snowmobile groups. • The Project will inundate areas used for angling approximately 6 km upstream of Yellow Falls, including Davis Rapids and Loon Rapids.		be appropriate for recreational use.	
Scenic or Aesthetically Pleasing Views	Construction	• There is potential to temporarily affect the local viewscape in the Town of Smooth Rock Falls due to increased traffic volumes and the presence of construction machinery. • Activities during construction that will result in changes to the viewscape at the Project site include dam construction, removal of vegetation along the shoreline, construction of access roads, transmission lines, aggregate extraction, and construction staging areas. • The majority of construction activities will take place at Yellow Falls, approximately 18 km from Smooth Rock Falls, out of view from Smooth Rock Falls or Highway 11. • Viewscape alterations during construction will primarily affect local recreational users and seasonal residents.	• Good site practices and a traffic management plan will contain construction equipment in appropriately designated work areas. • Construction sites will be rehabilitated or re-vegetated	• Temporary short-term removal of vegetation along the shoreline will be required during the construction phase of the Project • The creation of the access road and transmission line will result in the loss of some terrestrial vegetation • Long-term net effects to the landscape of the Mattagami River at Yellow Falls and within the headpond will be experienced. • Changes to the natural character of the area will be limited following revegetation.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).
	Operation	• The Project will permanently alter the landscape of the Mattagami River between Yellow Falls and Loon Rapids due to inundation. • The powerhouse/dam structure will change the local landscape in the immediate vicinity of Yellow Falls.	• Due to safety and line maintenance requirements, vegetation will be maintained below the height of the transmission line. • The permanent inundation of rapids will change the viewscape. • The headpond, along with revegetation and replanting initiatives on the shoreline, will create a new viewscape for recreational users, tourists, and seasonal residents. • These initiatives will be completed with the objective to retain the natural character of the area as much as possible.		
First Nations					
Effects on First	Construction/Operation	• The TTN and YFP have executed a business-	• YFP has actively engaged Taykwa Tagamou Nation	• There is significant potential benefit to the	Low and positive (potential effect

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Nation Communities		to-business agreement. This agreement conveys all potential First Nations economic benefits that the Project can support to the TTN. • The TTN fully supports the development of the Project. • Wabun communities (Matachewan, Flying Post, Wahgoshig, and Mattagami First Nations) have indicated an interest in the Project. • There are no First Nation reserve lands within the Study Area • YFP and TTN will continue to engage Wabun communities as the Project moves forward. • Engagement of Wabun communities to-date indicates the following: o The Mattagami, Wahgoshig, and Flying Post First Nations consider the Project to be located within their traditional territory; o All three Wabun Communities and the TTN are interested in the management of the archaeological resources identified in the vicinity of Yellow Falls o The Flying Post and Mattagami Communities have stated that the Project is located in an area historically used for hunting, fishing and trapping by their communities. o The Mattagami, Flying Post and Wahgoshig First Nations are requesting economic benefits equal to that of the TTN o The Wahgoshig FN indicated concern related to the effect of the Project on the Sturgeon Populations •	to determine potential Project effects, benefits and mitigation measures. The Taykwa Tagamou Nation fully supports the Project. • The Taykwa Tagamou Nation is continuing to engage the Wabun communities in Nation-to-Nation discussions in an effort to reach an understanding regarding territories. • YFP is committed, as the Project proponent, to continuing good-faith discussions with all the First Nations expressing an interest in the Project. • Consultation with First Nations is ongoing and will continue throughout the Project's lifecycle to identify and mitigate any concerns or effects that arise. • Following construction, game availability and movement patterns are expected to be similar to pre-existing conditions. • The Project is not expected to negatively affect the availability of fish, or wild food for consumption following construction • Following construction, access along Red Pine Road will be improved, potentially allowing easier access for local hunters. • YFP is committed to working with interested First Nations and the MOC to ensure potential and known archeological resources are appropriately protected or preserved. • The Project does not have the ability to support additional First Nations economic benefits. Discussion and agreement is required between the interested Wabun Communities and the TTN regarding the issue of traditional territory along the Mattagami River, and as part of this discussion, agreement on the sharing of benefits associated with the Project.	TTN as a result of the economic benefits that will flow to that community through the construction and operation of the Project. • Based on the mitigation measures in place to address potential effects on hunting, fishing, trapping, and archaeology, there are no anticipated adverse net effects to First Nations communities as a result of the Project. • The construction and operation of the Project will not result in any costs to the Wabun communities.	may result in a slight improvement in resource in Study Area during the life of the Project).
Traditional Land Use	Construction	• The Project has the potential to affect traditional land use practices such as hunting, fishing and trapping during construction.	• Mitigation measures such as the construction of the boat launch and portage route will be implemented during the construction phase to ensure that	• YFP has engaged the registered trapper and First Nations regarding effects on traditional land uses.	Minimal (potential effect may result in a slight decline in resource in Study Area during construction

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		• Project construction will have an effect on angling since access to the Project site for recreational activities will be restricted during the construction phase for safety purposes. Disruptions to angling will also occur during headpond inundation in the areas that will be inundated. • Hunting activities may be affected during construction in the immediate Project area due to an increase in human presence and traffic, resulting in game species avoiding the area • Three trapline areas have been identified adjacent to the immediate Project Area. YFP has contacted trapline permit holders through the MNR. YFP has met with the registered trapper in the vicinity of the Project. • Discussions with the TTN, Mattagami First Nation, Matachewan First Nation, Wahgoshig First Nation, and Flying Post First Nation did not identify any specific concerns associated with traditional activities such as hunting, fishing, trapping or gathering of wild foods by First Nation communities. • Concerns raised by the Wabun Communities were focused on the concept of traditional territory, and economic benefit to their community on that basis.	activities such as angling and hunting may continue unimpeded • YFP engaged the registered trapper in the vicinity of the Project to identify potential impacts on trapping in the area, as well as to • An agreement has been reached with the registered trapper to address potential effect on his operations during the construction period. • To-date no specific concerns related to hunting, fishing, trapping, or food gathering have been raised by First Nations regarding the construction of the Project on their community or community members. • Following construction, game availability and movement patterns are expected to be similar to pre-existing conditions. • The Project is not expected to negatively affect the availability of fish, or wild food for consumption following construction • Following construction, access along Red Pine Road will be improved, potentially allowing easier access for local hunters. • YFP is committed to working with interested First Nations and the MOC to ensure potential and known archeological resources are appropriately protected or preserved.	• First Nations have not brought forward any concerns regarding traditional land use to date. • Potential effects on traditional lands and traditional uses are expected to primarily occur during construction.	phase, but the resource should return to baseline levels).
	Operation	• Fishing activities will be affected as the rapids are a popular location for local anglers. • New fish habitat will be created within the headpond, and some species of sport fish are expected to increase. • Presence of game is expected to be similar to baseline conditions. • The Project may have a positive effect on moose, since littoral zone will increase, potentially providing additional aquatic vegetation for feeding. • Trapping can continue through the operational	• No further mitigation measures are required. • To-date no specific concerns related to hunting, fishing, trapping, or food gathering have been raised by First Nations regarding the operation of the Project on their community or community members. • Following construction, game availability and movement patterns are expected to be similar to pre-existing conditions. • The Project is not expected to negatively affect the availability of fish, or wild food for consumption following construction • Following construction, access along Red Pine		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
		phase of the Project.	Road will be improved, potentially allowing easier access for local hunters. • YFP is committed to working with interested First Nations and the MOC to ensure potential and known archeological resources are appropriately protected or preserved.		
Land Claims	Construction and Operation	• No ongoing land claims exist in the Study Area • The TTN, Mattagami, Flying Post, and Wahgoshig First Nations consider the Project to be located within their traditional territory.	• YFP has actively engaged Taykwa Tagamou Nation and Wabun communities to determine potential Project effects, benefits and mitigation measures • YFP is committed to ongoing good-faith discussions with the First Nations expressing an interest in the Project. • Engagement with First Nations will continue throughout the Project's lifecycle to identify and mitigate any concerns or effects that arise. • Engagement of these First Nation communities has not identified any specific land claim involving the Project lands. • The TTN and four Wabun communities have stated that the Project is located within their traditional territory	• No on-going land claims have been identified in the Study Area. • No negative net effects are anticipated to land claims • During First Nation engagement activities, it has become clear that there is disagreement pertaining to location/overlap of traditional territories along the Mattagami River in the vicinity of the Project. Discussion and agreement is required between the involved First Nations, including the distribution of the economic benefits associated with the Project as provided in the existing agreement with the TTN.	Neutral (No effect is anticipated to occur following implementation of mitigation measures).
Conformity with Agency Plans					

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Construction and Operation		• The Ontario Ministry of the Environment ("MOE"), Ontario Ministry of Natural Resources ("MNR"), the Ontario Power Authority ("OPA"), the Independent Electricity System Operator ("IESO"), the Ontario Ministry of Energy, and Natural Resources Canada are the entities that play the most prominent roles in for the development of renewable electricity projects such as the Yellow Falls Hydroelectric Project. • Each of these agencies have individual, sometimes integrated, policies and plans set out in order to direct development to ensure economic and social vitality, as well as environmental sustainability.	• Through consultations with the administering agencies, YFP has ensured that the proposed project is being developed in accordance with agency plans. • The potential for conflicts of interest to arise as a result of this Project is expected to be minimal since this project complies with the MNR Crown Land Use Atlas, along with the directives of the OPA, the IESO, the MOE, the Ontario Ministry of Energy, and NRCan.	• No negative effects on agency plans are expected as a result of the Project • The Project assists the Government of Ontario in meeting its goals regarding supply of renewable energy and closure of coal-fired generating stations. • The Project also assists the Government of Canada in its goals of reducing greenhouse gas emissions.	Low and positive (potential effect may result in a slight improvement in resource in Study Area during the life of the project).
Accidents and Malfunctions					

Construction and Operation		• Unexpected events requiring contingency planning that may occur during construction or operation of the Project include:
		  • Extreme climatic events
		  • Cofferdam failure
		  • Dam failure
		  • Watercourse siltation
		  • Construction delays
		  • Accidental spills
		  • Unexpected finds of heritage resources or contaminated material
		  • Third party damage
			• To minimize the effect of a construction delay, and if field conditions permit, equipment should be moved and construction should be undertaken on other project aspects.
			• Dam safety analyses will be carried in accordance with the Ontario Dam Safety Guidelines, the Canadian Dam Association Dam Safety Guidelines, and the Lakes and River Improvement Act.
			• There is more than sufficient capacity to pass larger than the design flood.
			• Dam safety requirements include safety booms,
			• Signage will also be posted advising of potential hazards in the area
			• Security fencing will be provided to restrict pedestrian and vehicular access to the facilities.
			• A bypass system will operate to maintain constant flows in the river downstream of the plant.
			• If siltation to a watercourse (or to a wetland or woodlot) occurs, construction will cease immediately until the situation is rectified.
			• Immediate action should be taken to install temporary measures to contain the extent of erosion and siltation as quickly as possible.
			• When site conditions permit, permanent protection
				• Through adherence to agency regulations, modern design principles, and prescribed mitigation measures, no net effects are expected\	Neutral (no effect is anticipated to occur following implementation of mitigation measures).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			measures will be installed on erodible surfaces • If siltation has occurred due to a construction related activity (e.g. dewatering), the activity must be halted immediately until the situation is rectified. • In case of an accidental spill YFP or the Construction Contractor must immediately determine the magnitude and extent of the spill and rapidly take measures to contain it. • Release of sediment will also be treated as a potential spill depending on the magnitude and extent. • If necessary, the MOE Spills Action Center (**1-800-268-6060**) will be notified immediately. In addition, the following precautions will be taken: • During operation, transmission and generating equipment will be housed in structures capable of retaining 110% of fluid capacity to prevent a spill from entering the environment. • No discharge will be intentionally released from transformers. • No fertilizers, pesticides or herbicides will be used during construction or operation. • No hazardous materials listed in Environment Canada's Toxic Substances Management Policy ("TSMP") will be used during construction or operation. • Every reasonable effort will be made to identify archaeological or heritage resources in the construction area prior to construction. • Should buried archaeological material be encountered, construction in the vicinity should cease immediately. • The Ministry of Culture and an archaeologist licensed in the Province of Ontario will be notified. • If the archaeological material includes possible human remains, the local OPP branch, and the Office of the Chief Coroner must be contacted • An appropriate site-specific response plan will then be developed in consultation with a licensed		

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
			archaeologist, First Nations, and the Ministry of Culture before construction resumes in the immediate vicinity. • If evidence of potential contamination is found, such as buried tanks, drums, oil residue or gaseous odour, construction will immediately cease until the source of the material is further investigated. • The MOE will be notified as soon as possible if the source is not immediately obvious or containable.		
Effects of the Environment on the Project					
Construction and Operation		• Climate change • Extreme events including: o Rain/Flood o Hail o Ice storms and freezing rain o Fire o Tornadoes o Earthquakes o Lightning	• The Project is capable of handling the PMF without freeboard. • The Project will be constructed of material easily capable of withstanding damage from the impact of hail • Transmission lines will be monitored on a continuous basis and shut down should a fault be detected • Operating equipment for spill facilities will be designed so that it remains useable during ice storms. • Spill facilities have the capability to be operated remotely and will not be affected should site access become difficult or dangerous • In the event that a forest fire occurs in the immediate vicinity of the Project, YFP will follow direction from the MNR to ensure safety of operators and the Project. • The Project is designed to withstand the forces of a Level 2 tornado • Structures will be designed to meet or exceed potential seismic loads in the Study Area as per the National Building Code and Ontario Dam Safety Guidelines. • The transformer substation, interconnect with the Hydro-One Transmission Network, and powerhouse will be equipped with lightning protection systems in compliance with applicable building codes.	• Declining water discharge trends in the Mattagami River indicate that using average historical values for flood analysis would result in slightly conservative results. • The Project is designed to applicable dam safety guidelines and building codes and will withstand most extreme events	Neutral (no effect is anticipated to occur following implementation of mitigation measures).

Table 6.17 Summary of Project Activities, Effects, Mitigation Measures, and Significance of Net Effects

Feature	Project Phase	Potential Effects	Mitigation and Protection Measures	Net Effects	Significance of Net Effects
Repowering/Decommissioning					
		• Repowering may result in primarily socio-economic effects (i.e. positive employment effects) similar to those for construction of the Project • Significant In-stream work is not envisaged as part of the repowering process. • Alterations to water discharge rates, headpond size, or headpond are unlikely. • Abandonment would not result in significant changes to the aquatic environment in the affected reach of the Mattagami River, but indefinite inspection and limited maintenance would be required. • Associated effects with Project removal are potentially greater than repowering or abandonment. • Since the Project is designed to minimize the risk of contamination during its operational lifespan, remedial clean-up during decommissioning is anticipated to be minimal to non-existent.	• Regulations, policies, or guidelines in place at the time of repowering/decommissioning will be adhered to. • The proponent will undertake appropriate consultation activities and procure all necessary permits and approvals prior to repowering or decommissioning the Project. • Repowering would potentially result in net benefits including short-term employment opportunities, local expenditures, and the continued generation of clean, renewable energy. • Should decommissioning occur, YFP will develop a plan to remove or otherwise stabilize all sediments deposited in the headpond area during inundation. • A site restoration plan, including soil stabilization, planting, and seeding will be developed in consultation with the MNR or the relevant agency of the time. • The Proponent will consider retaining site access and boat launch facilities to limit potential effects on recreational users. • All decommissioning activities will be performed in compliance with the applicable regulations in force at the time and may include the MOE *Guidelines for the Decommissioning and Cleanup of Sites in Ontario* (1993) or equivalent guidelines or regulations.	• Significant adverse effects are not likely to occur provided that the mitigation and protection measures above, as well as current or future laws, regulations, policies, and guidelines, are followed.	Low (potential effect may result in a slight decline in resource in Study Area during the life of the Project).

7.0 Cumulative Effects Assessment

7.1 INTRODUCTION

This cumulative environmental effects assessment ("CEA") describes the potential effects of the proposed Project in combination with the effects of other *certain* and *reasonably foreseeable activities* at a regional level. This CEA has been prepared with regard for the Canadian Environmental Assessment Agency ("CEA Agency") Operational Policy Statement OPS-EPO/3-1999: *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act* as well as the CEA Agency's *Practitioners Guide: Cumulative Effects Assessment, 1999*.

7.1.1 Regulatory Requirements

The assessment of the cumulative effects of a project is required under Section 16(1)(a) of the *Canadian Environmental Assessment Act*, which states:

> *Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the environmental effects of the project, including...any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out.*

The means by which this requirement is fulfilled is at the discretion of the proponent with Responsible Authority ("RA") input.

7.1.2 Definitions

7.1.2.1 Cumulative Effects

The CEA Guide (Cumulative Effects Working Group et al, 1999) defines cumulative effects as changes to the environment that are caused by an action of the Project in combination with other past, present, and future human actions. For example, several developments may have insignificant effects individually, but together they may have significant effects on a given environmental system.

Cumulative effects can alter environmental systems in either an additive or interactive (*i.e.*, synergistic) manner through the following pathways (Cumulative Effects Working Group et al 1999):

- *Physical-chemical transport:* a physical or chemical constituent is transported away from the activity under review, where it then interacts with another activity (e.g., air emissions, sedimentation, wastewater effluent);
- *Nibbling loss:* the gradual disturbance and loss of land or habitat (e.g., clearing of land for a new sub-division and new roads into a forested area);

- *Spatial and temporal crowding:* occurs when too much development occurs within too small an area and in too brief a period of time; and,
- *Growth-inducing potential:* each new project can induce further actions or projects to occur; sometimes referred to as "spin-off" effects (e.g., improved vehicle access resulting in increased hunting pressure).

7.1.2.2 Activities

Activities include *certain* and *reasonably foreseeable* projects (such as other hydroelectric plants) or *actions* (such as local traffic, boating, or recreational fishing) that may interact with potential Project effects (Cumulative Effects Working Group et al., 1999):

- *Certain* projects have a high probability of proceeding (e.g., the project has a building permit)
- *Reasonably foreseeable* projects are likely to proceed, but there may be some uncertainty about this conclusion (e.g., the project is in the early stages of an approvals process (CEA Agency, 1999);
- *Actions* may not be associated with development, but may expand from baseline conditions as a consequence of growth-inducing potential (e.g., increased hunting pressure as a result of improved access to wilderness areas).

7.1.2.3 Additive Effects

Additive effects occur when the magnitude of combined effects is equal to the sum of individual effects (Cumulative Effects Working Group et al., 1999; **Figure 7.1**). For example, a number of industries that release waste into the same river may have an additive effect on biota.

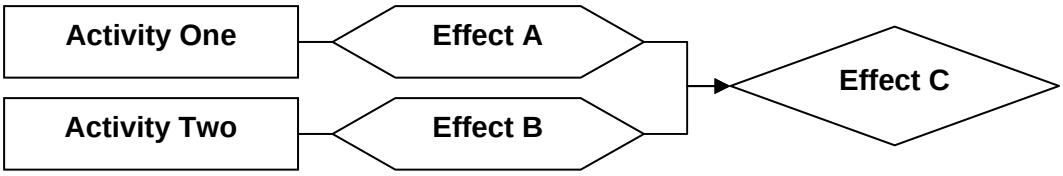

Figure 7.1 Additive Cumulative Effect

7.1.2.4 Synergistic Effects

Synergistic effects are typically more complex and difficult to assess than additive effects and are generally the result of interactions between two or more projects that result in combined effects that are greater than the sum of the individual project effects (Cumulative Effects Working Group et al, 1999; **Figure 7.2**). For example, the release of two different chemicals into a pond may cause an interactive effect between the chemicals that is greater than individual effects would be.

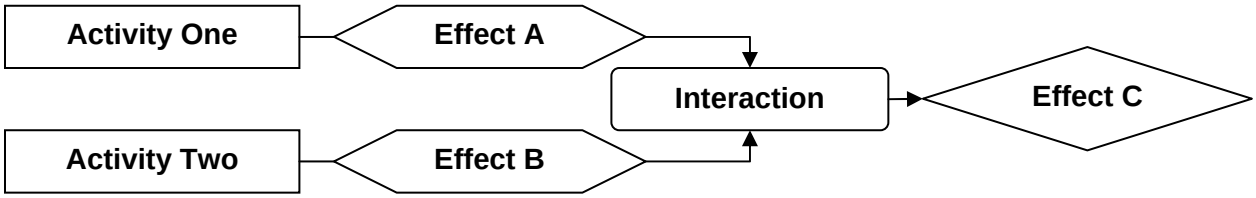

Figure 7.2 Synergistic Cumulative Effect

7.1.3 Study Design

This CEA involved five key stages as outlined in the CEA Agency's Operational Policy Statement and the CEA Guide (**Figure 7.3**):

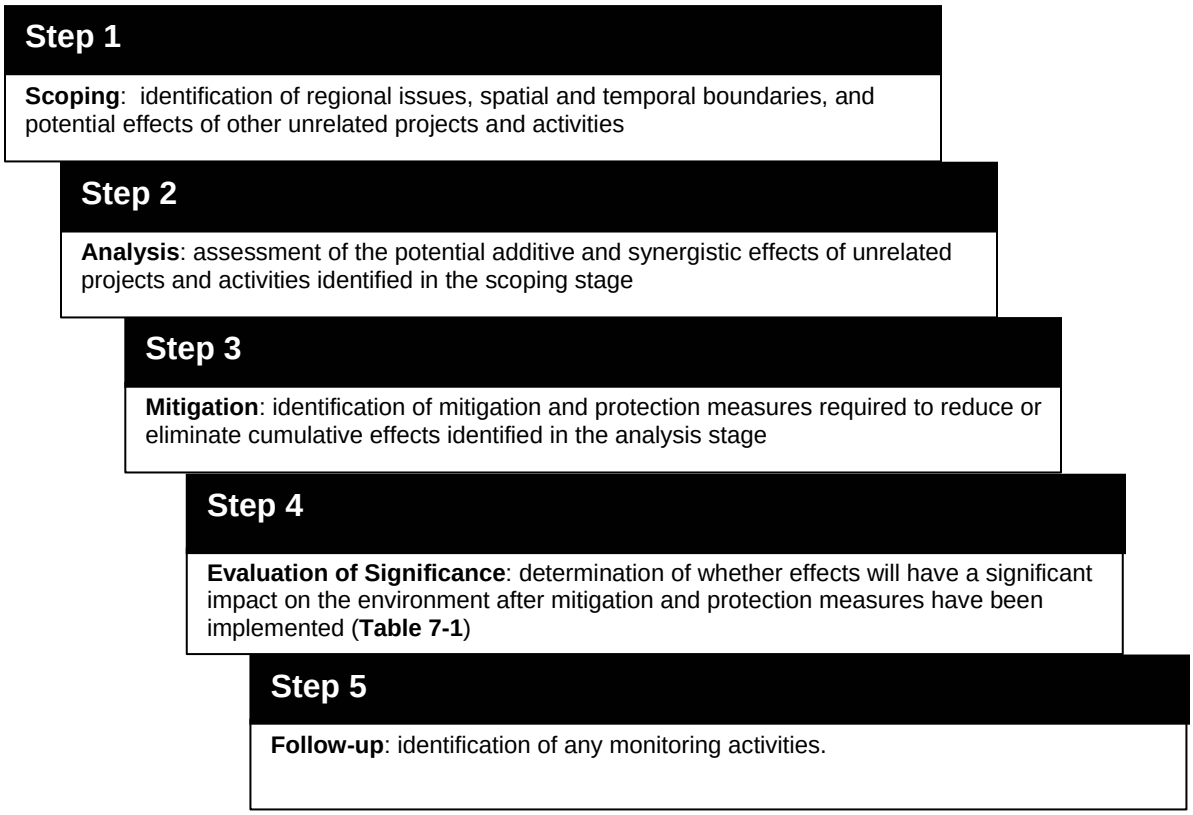

Figure 7.3 CEA Study Design

This CEA is designed to address each of these stages. **Section 7.2** summarizes the methods used to scope the temporal and spatial extent of activities. **Section 7.3** determines interactions between the Project and other activities and provides analysis of potential cumulative effects through a narrative scenario-building process and a project interaction matrix. A detailed discussion regarding cumulative effects identified through the scenario-building process is provided in **Section 7.3.3.**

Section 7.4 provides potential mitigation measures and recommendations to reduce cumulative effects. **Section 7.5** discusses the significance of potential cumulative effects after mitigation measures are applied, and **Section 7.6** discusses follow-up monitoring activities and management measures (see also **Section 9.0**).

7.2 SCOPING

Scoping is used to identify time frames, spatial boundaries, and key issues or effects to be considered in the analysis phase in an effort to focus the CEA. The CEA scoping exercise builds on remaining potential effects following mitigation, as identified in the Project-specific environmental assessment (**Section 6.0**).

7.2.1 Temporal Boundaries

The temporal boundaries for this CEA reflect the nature and timing of key events during the Project lifecycle, including construction and operation, and the availability of information regarding potentially cumulative activities. Interaction between the Project and future activities may result in cumulative effects during the construction and operation phases of the Project.

Prediction of potential effects in association with other projects and activities more than approximately five years into the future substantially increases uncertainty due to the likelihood of unforeseeable or unknown future development activities or projects. Therefore, the decommissioning phase of the Project lifecycle is beyond the temporal boundaries of this CEA. A general discussion on decommissioning is provided in **Sections 2.3.3** and **6.12**.

Narrative scenarios during the CEA temporal boundaries (construction and operation phases of the Project life-cycle) in relation to other identified activities, were developed to describe potential cumulative effects and to address the complexity and uncertainty associated with CEA predictions. The operations phase is defined as five years following the completion of construction activities.

7.2.2 Spatial Boundaries

Selection of a spatial boundary for the CEA was based on identification of additive or synergistic effects of other activities combined with the Project. Construction and operation effects relating to noise, dust, and soil disturbance should dissipate to background levels within one to two kilometres and should remain within the local area of the dam and powerhouse, access road, and transmission line construction.

Effects resulting from water flow alterations during operation could extend as far upstream as Lower Sturgeon GS and as far downstream as Smooth Rock Falls GS. Therefore, the CEA spatial boundary includes potential effects of the Project in combination with other reasonably foreseeable or certain activities within the existing Study Area for the Environmental Assessment (**Figure 1.1**).

7.2.3 Study Boundary Summary

In summary, the CEA study boundaries include the following potential cumulative effects:

- Increased construction traffic and disruption to local traffic patterns
- Economic benefits and labour requirements
- Changes to tourism, recreation, and cottaging resource use
- Changes to neighbourhood and community character
- Changes to wetlands and forests
- Changes to views and landscape features

It is assumed that workers are willing to travel up to 45 minutes or more to reach the Project construction site and may come from Kapuskasing, Timmins, or Cochrane. Therefore, effects on the regional labour pool and economic resources may occur outside of the CEA study boundary.

The CEA Study Area boundaries, along with Projects and Activities identified in **Sections 7.2.4** are shown in **Figure 7.4**.

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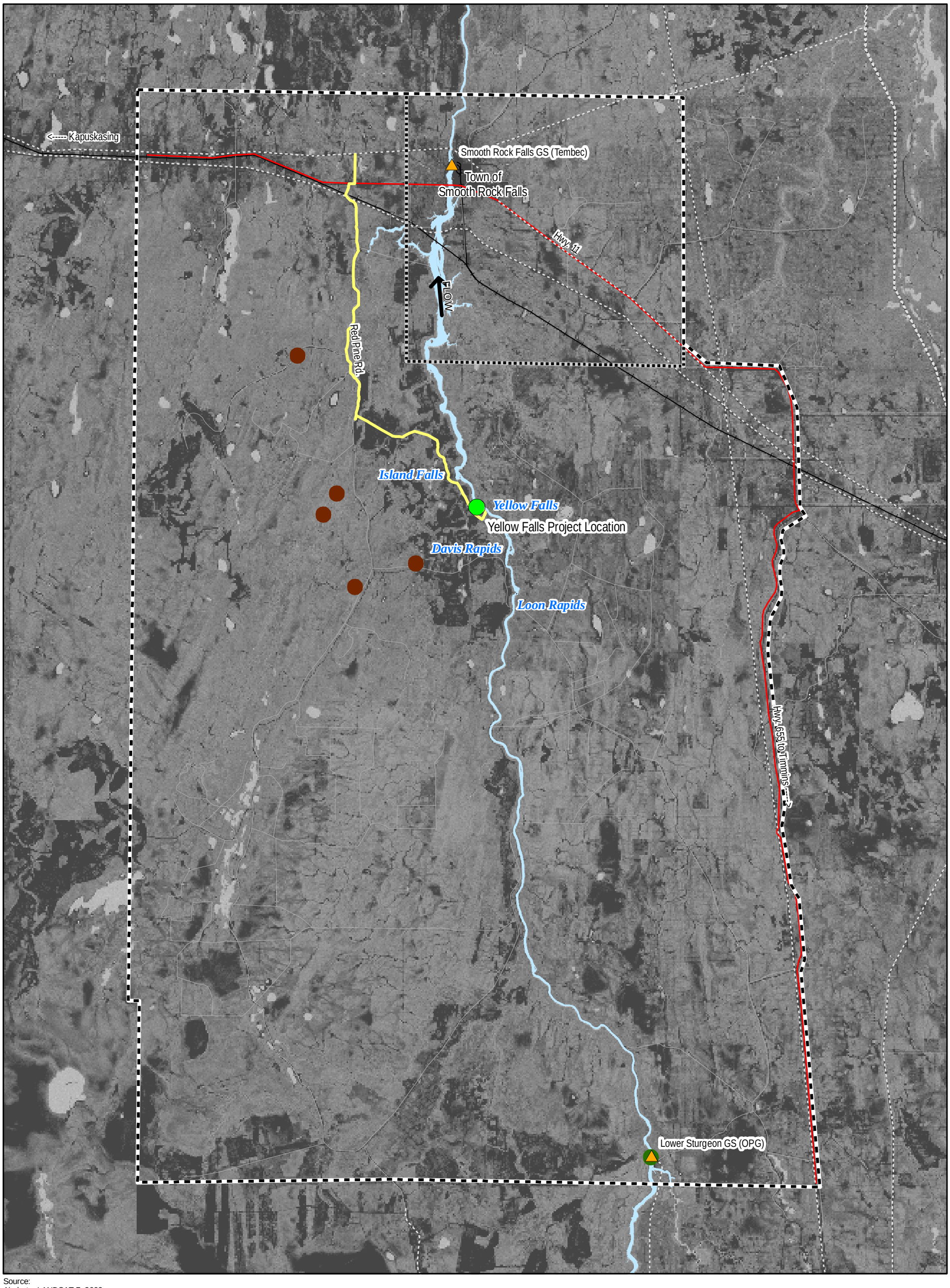

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Source:
Airphoto: LANDSAT 7, 2002.
Base Map: LIDS, 2006.
Timber Harvest Sites: Tembco, undated

Study Area

Smooth Rock Falls Town Limits

Yellow Falls Project Location

Timber Harvesting Sites
with potential Project interactions
(approximate locations)

Lower Sturgeon GS Redevelopment

Improved Acess Road

Existing 115 kV Power Line

N
W
E
S

Stantec

0 1 2 3 4
Kilometers

1:200,000

Key Map

PREPARED FOR:

YELLOW FALLS LP
ENVIRONMENTAL ASSESSMENT REPORT

FIGURE NO. 7.4

CUMULATIVE EFFECTS STUDY AREA, UNRELATED PROJECTS AND ACTIVITIES

Initiated: January 28, 2007
Revised: October, 2008

7.2.4 Identification of Projects and Activities

To assist in identifying regional projects and activities, information was obtained during data collection for this EA, consultation activities including Public Open Houses, comment cards, emails, letters, and review of secondary data sources. In addition, comments were directly solicited from the following government agencies and other organizations (**Table 7.1**).

Table 7.1 Comments from Agencies and Other Organizations

Agency	Activities Identified/Comments	Rationale for Inclusion/Exclusion
Provincial Government		
MOE	No response	Not applicable
MMAH	Project located in unorganized district. Not aware of any developments in the area	Not applicable
MNR	Referred to other agencies.	Not applicable
MNDM	Not aware of any developments, suggested contacting Smooth Rock Falls Community Development Corporation	Not applicable
Ministry of Tourism	Referred to MNDM development officer	Not applicable
MTO	Not aware of any developments in the area	Not applicable
Local Government and Organizations		
Town of Smooth Rock Falls	Not aware of any developments in the area.	Not applicable
Ontario Power Generation ("OPG")	Upper Mattagami Redevelopment has received approval through the EA process. Construction will proceed after Board approval.	Certain activity
Tembec	Tembec will be continuing with forestry harvesting operations in accordance with MNR regulations and Tembec's sustainable forest license	Certain activity
TransCanada Pipelines	No response	Not applicable

7.2.4.1 Certain Activities

Information gathering activities (**Table 7.1**) identified one key regional activity that is considered certain to proceed in the near future; the redevelopment of the OPG Lower Sturgeon Generating Station, approximately 37 km upstream of Yellow Falls (the Upper Mattagami Redevelopment). Lower Sturgeon GS was originally constructed in 1923, and is nearing the end of its operational life. Redevelopment will include demolition and removal of the existing powerhouse and replacement with a new building containing new equipment. Replacement of the powerhouse will require in-water works and the installation of cofferdams.

Redevelopment will result in local expenditures of between $9 and $12 million and additional expenditures of $8 to $10 million. The redevelopment project is expected to benefit the Timmins economy, since it is the closest major community.

Lower Sturgeon operates as a run-of-river plant, and will continue to abide by its current operating plan during and after construction (SENES, 2007). The headpond will be drawn down to the minimum level specified in the Mattagami River System Water Management Plan during construction.

Redevelopment is planned to begin in 2007. The Upper Mattagami Redevelopment, of which Lower Sturgeon GS is a part, also includes Wawaitin GS and Sandy Falls GS, both of which are located upstream of Lower Sturgeon GS. Construction is expected to begin in 2007, but the order in which redevelopment of these three generating stations is expected to occur is unknown at this time (OPG, 2007). Construction is anticipated to be complete in 2009 (SENES, 2007).

Forestry operations undertaken as part of Tembec's Sustainable Forest License for the Smooth Rock Falls Forest are likely to continue occurring in the Study Area. A number of stands are planned for harvest in the Study Area. Harvest areas that may interact with the Project are primarily located south of Highway 11 in the vicinity of Red Pine Road. The closest stand to Project components is an approximately 25 ha stand located along Red Pine Road, roughly 1.5 km south of Highway 11. Stands totalling approximately 317 ha located in the area west of Red Pine Road at the approximate latitude of Loon Rapids (Tembec, undated) may also interact with the Project.

On the scale of the Study Area, past and present forest harvesting activity may cumulatively interact with the Project. Generally, the effects of forest clearing result in:

- Forest fragmentation and associated edge effects such as introduction of more aggressive early successional species, habitat alteration, and fragmentation (Ferreras, 2001)
- Reduction in available forest habitat
- Lower-aged and even-aged stands of trees

According to the Mineral Deposit Inventory and the Abandoned Mines database, no producing or past-producing mines exist in the Study Area. The nearest producing mine is approximately 12 km south of the Study Area and 12 km east of the Mattagami River. Water quality as measured in 2006 on the Mattagami River generally meets Ontario Drinking Water Standards. As such, the potential cumulative effects of mining operations on water quality in conjunction with the Project have not been included in this CEA.

7.2.4.2 Reasonably Foreseeable Activities

No additional reasonably foreseeable activities have been identified in the Study Area.

7.2.4.3 Actions

As a result of the Project, the existing Red Pine Road will require significant improvements relative to its current condition. Water crossings that currently do not have bridges will have

bridges installed that are suited to heavy trucks. Additionally, Red Pine Road itself will be widened and improved to facilitate two-way traffic by construction equipment. The bridge crossings and road improvements will be in place for the life of the Project. As a result of these improvements, the suitability of these roads for recreational and industry users will be significantly enhanced. However, it is anticipated that recreational activities and industrial operations that utilize the improved Red Pine Road will be conducted in accordance with applicable environmental mitigation techniques and MNR regulations.

7.2.5 Identification of Potential Cumulative Effects

Table 7.2 provides a matrix to determine the potential for interactions between Project-related net effects and effects associated with the certain activities and actions **(Section 7.2.4)** identified within the Study Area.

Where a cumulative interaction is identified with potential effects of an activity or action, this is demarcated by a checkmark under the appropriate action or activity. Potential interactions between projects noted in **Table 7.2** are then used to assist in developing scenarios and in analysis of cumulative effects (**Section 7.3**).

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Table 7.2 Potential Cumulative Effects Interactions

Potential Cumulative Effect	Yellow Falls Hydroelectric Project		Lower Sturgeon Redevelopment	Forest Harvest	Improved Access	Rationale for Potential Cumulative Interactions
	Project Effect	Project Phase				
Bedrock	✓	Construction				Not anticipated – any effects to bedrock are likely to be limited to Project site
Physiography	✓	Construction/Operation				Not anticipated – any effects to physiography are likely to be limited to Project sites
Soils	✓	Construction				Not anticipated – any effects to soil are likely to be limited to Project site
Climate	✓	Operation				Not anticipated – the size of the Project headpond is not likely sufficient to exhibit micro-climatic effects
Seismicity		Operation				Not anticipated – the Project is not expected to affect local seismicity; nor is local seismicity expected to affect the Project
Upstream Flow Alteration	✓	Construction/Operation				Not anticipated - the Project will not affect the tailwater or dam safety rating of Lower Sturgeon GS
Downstream Flow Alteration	✓	Construction/Operation				Not anticipated - the effect of the Project on downstream flows is expected to dissipate within approximately 500 m
River Morphology	✓	Construction/Operation				Not anticipated - any effects to river morphology are likely to be limited to within approximately 500 m downstream of Yellow Falls and within the headpond area. Other activities are unlikely to have an effect on river morphology within the Study Area.
Surface Water Quality	✓	Construction/Operation				If standard construction and forest operations sediment control measures are not adhered to, there is potential for an additive cumulative interaction between Project construction and forest harvesting activities resulting in increased sediment within the Mattagami River system. However, provided that mitigation and protection measures outlined in Section 6.0 are followed during the construction and operations of the Project, and forest harvesting follows industry-standard regulations and guidelines, resultant increases in sediment are expected to be negligible.
Mercury Methylation	✓	Operation				Not anticipated - any effects associated with mercury methylation are anticipated to be limited to the Project headpond.
Ice	✓	Operation				Not anticipated – effects of the Project on frazil ice formation are likely to be limited to immediately upstream and downstream of the proposed facility. Effects of the Project on ice formation in general are likely to be limited to the proposed headpond.
Groundwater	✓	Operation				Not anticipated – effects of the Project on groundwater are likely to occur adjacent to the headpond and areas of excavation.
Accidental Spills or Releases to the Environment	✓	Construction/Operation				Not anticipated - the likelihood of accidental spills or releases to the environment as a result of the Project is low, provided that mitigation and protection measures as outlined in Section 6.0 are undertaken. Similarly, it is assumed that other activities in the Study Area will be proactive in preventing and limiting the effects of accidental spills or releases.
Air Quality	✓	Construction/Operation				Assuming that increased hydroelectric generation capacity is used to offset fossil-fueled electricity production, a cumulative, but negligible net improvement to air quality may occur
Greenhouse Gases	✓	Construction/Operation				Assuming that increased hydroelectric generation capacity is used to offset fossil-fueled electricity production, a cumulative, but negligible net improvement to production of Greenhouse Gases in Ontario may occur
Noise and Vibration	✓	Construction/Operation		✓	✓	Use of Red Pine Rd. by Project construction, and recreational users or industrial operators during construction period could result in additive effect on noise and vibration
Terrestrial Vegetation	✓	Construction/Operation		✓		Clearing requirements of the Project could interact additively with ongoing forest harvesting operations to reduce the amount of forest habitat and increase potential edge effects. .
Wetlands	✓	Construction/Operation		✓		Clearing requirements of the Project could interact additively with ongoing forest harvesting operations to reduce the amount of wetland habitat.
Aquatic Vegetation	✓	Operation				Not anticipated – Little aquatic vegetation currently exists along the Mattagami River. Other activities are not likely to interact with the Project to reduce or increase the amount of aquatic vegetation
Wildlife	✓	Construction/Operation			✓	Improved access to area could result in increased hunting pressure. Interaction between the Project and forest harvesting activities may result in forest habitat fragmentation and edge effects.

Table 7.2 Potential Cumulative Effects Interactions

Potential Cumulative Effect	Yellow Falls Hydroelectric Project		Lower Sturgeon Redevelopment	Forest Harvest	Improved Access	Rationale for Potential Cumulative Interactions
	Project Effect	Project Phase				
Fire Hazards	✓	Construction				Not anticipated – all activities may result in additional fire hazards. However, it is assumed that the likelihood of occurrence is low provided that applicable legislation, regulations, and guidelines are followed.
Protected Natural Areas						Not anticipated - protected natural areas are not located within the Study Area
Species of Concern	✓	Construction/Operation				Potential interactions are not anticipated
Fish	✓					The Project and Lower Sturgeon Redevelopment each have the potential to affect fish and fish habitat. However, the projects are geographically dispersed and will not cumulatively interact.
Lake Sturgeon						Effects on Lake Sturgeon populations by the Project are not anticipated.
Benthic Organisms	✓					The Project and Lower Sturgeon Redevelopment each have the potential to affect benthic invertebrate communities. However, the projects are geographically dispersed and will not cumulatively interact.
Use of Non-Renewable Resources	✓	Construction/Operation				The Project and Lower Sturgeon will both use non-renewable resources such as aggregate, fossil fuels, and petroleum by-products for construction and maintenance. However potential interactions resulting in changes to the overall aggregate supply within the Study Area are not anticipated due to geographical separation between the Project and the Lower Sturgeon Redevelopment. Petroleum products are sold on the world market and it is unlikely that either project will significantly affect this resource.
Agriculture or Agricultural Land Use						Not anticipated - agricultural land uses are generally not located within the Study Area
Minerals, Aggregates, and Petroleum	✓	Construction				Potential interactions are not anticipated to result in changes to the overall aggregate supply within the Study Area due to geographical separation between the Project and the Lower Sturgeon Redevelopment
Forest	✓	Construction		✓		Clearing requirements of the Project could interact additively with ongoing forest harvesting operations to reduce the amount of forested area in the Study Area. .
Game, Fish, and Wild Foods	✓	Construction/Operation				Not anticipated – – the Project is unlikely to interact with other activities to affect availability of game, fish, and wild foods.
Residential, Commercial, and Industrial Land Use	✓	Construction				Not anticipated – due to the undeveloped nature of the lands in the vicinity of the Project, the Project is unlikely to interact with other activities to affect residential, commercial, or industrial land use.
Provincial and Municipal Land Use Policies	✓	Construction/Operation				Not anticipated – the Project is not likely to interact with other activities to change provincial or municipal land use policies.
Hazard Lands	✓	Construction/Operation				Not anticipated – Project-specific effects on hazard lands as defined in the Ontario Provincial Policy Statement are not likely to interact with other activities.
Recreational Use	✓	Construction/Operation			✓	Improved access to the area could result in improved recreational opportunities
Utilities and Services	✓	Construction/Operation		✓		Increase in traffic volumes on Highway 655 resulting in deterioration of highway
Waste Materials	✓	Construction/Operation				Not anticipated – Project production and disposal of waste material at appropriate licensed facilities is not expected to interact with other activities.
Nature and Organization of Local Governments						Not anticipated – none of the activities are anticipated to affect the nature and organization of local governments

Table 7.2 Potential Cumulative Effects Interactions

Potential Cumulative Effect	Yellow Falls Hydroelectric Project		Lower Sturgeon Redevelopment	Forest Harvest	Improved Access	Rationale for Potential Cumulative Interactions
	Project Effect	Project Phase				
Population	✓	Construction	✓			Interaction between the Project and Lower Sturgeon GS may temporarily increase population in the Study Area.
Local Economy	✓	Construction	✓			Use of local goods and services may cumulatively produce noticeable change to better than baseline local economic conditions over short-term
Local Business, Institutions or Public Facilities	✓	Construction	✓			Use of local goods and services may cumulatively produce change to better than baseline use of local businesses
Tourism	✓	Construction				Not anticipated- the Project is not expected to interact with other activities to increase or reduce tourism in the Study Area
Local Employment and Labour	✓	Construction	✓			Local employment requirements, may cumulatively produce a change to better than baseline conditions over the short-term
Community Services and Infrastructure	✓	Construction	✓			Interaction between the Project and Lower Sturgeon GS may temporarily increase demand on community services and infrastructure in the Study Area
Housing	✓	Construction				The Project may result in a temporary requirement for additional housing in the Smooth Rock Falls area. However, interactions with other activities are not expected within the Study Area.
Traffic	✓	Construction/Operation		✓	✓	Increase in traffic loads on Highway 11, Highway 655 and Red Pine Road resulting in wear and tear of highway
Public Health and Safety		Construction/Operation				Activities are not expected to interact with the Project to affect public health and safety.
Heritage and Archaeological Features	✓	Construction				Not anticipated – any effects to heritage and archaeological features are likely to be limited to Project site and will be the subject of mitigation or protection measures during the course of construction and operation.
Community Character	✓	Construction/Operation				Not anticipated – the Project is unlikely to interact with other activities to alter community characteristics.
Lifestyle	✓	Construction/Operation				Not anticipated – the Project is unlikely to interact with other activities to alter lifestyles.
Scenic or Aesthetically Pleasing Views	✓	Operation		✓		The Project may interact with ongoing forest harvesting to alter scenic or aesthetically pleasing views.
Effects on First Nations Communities	✓	Construction				The Project will not directly affect First Nation communities and potential interactions are not anticipated.
Traditional Land Use	✓	Construction/Operation	✓			Potential interactions are not anticipated since appropriate First Nations engagement will be required for each Project.
Land Claims						The Project will not affect existing land claims. Therefore, potential interactions are not anticipated.

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7.3 POTENTIAL CUMULATIVE EFFECTS

The CEA Guide (Cumulative Effects Working Group et al, 1999) advocates selection of future actions to consider in the CEA based on the most likely or reasonable future scenario. For this CEA, two straightforward scenarios were developed (discussed below) during the construction and operation phases of the Project life-cycle. The scenarios were used to clarify assumptions involved in predictions about the future in an attempt to address the complexity of assessing additive and synergistic effects.

7.3.1 Construction Scenario

In the Project construction scenario, the Upper Mattagami Redevelopment is anticipated to occur concurrently with Project construction. Correspondingly, traffic may increase along Highway 655 from Timmins to the Lower Sturgeon GS site. Labour and equipment requirements may overlap to some degree; however, the Project is expected to draw on local labour and suppliers wherever possible.

Employment opportunities in the construction industry will be slightly higher than baseline conditions as a result of the combined labour requirements of the two Projects. A high degree of overlap is not expected since the Project will draw on local labour wherever possible, while most of the labour force for the Lower Sturgeon GS Redevelopment is expected to originate from Timmins.

Businesses in the Study Area may see some additional sales as a result of the combined needs of both Projects, along with indirect economic benefits from workers.

Upgrades to Red Pine Road will occur early in the construction phase. Following completion of these road improvements, travel on Red Pine Road will be improved and there is potential for increased use by recreational and industry users. It is assumed that Tembec will require access along Red Pine Road to harvest stands south of Highway 11 and west of Red Pine Road.

7.3.2 Operation Scenario

In the operation scenario, both the Project and the Lower Sturgeon GS Redevelopment will operate concurrently.

Employment opportunities in the construction industry are expected to have returned to baseline conditions since major projects in the area will be substantively complete. Local businesses that have benefited from an influx of construction workers may experience a return to pre-construction sales.

Traffic in the general Study Area is likely to return to baseline conditions; however there is potential for increased traffic (relative to current conditions) along Red Pine Road due to road and access improvements resulting from the Project. Potential traffic sources include recreational users (e.g. ATV use, recreation fishing, hunting), and industry users.

7.3.3 Assessment of Cumulative Effects

Using the scenario-building exercises above, the following cumulative effects were identified and assessed:

7.3.3.1 Noise and Vibration

- **Construction and Operation Phases**
- **Potentially Negative Effect**

Use of the improved Red Pine Road by Project construction traffic as well as any potential use by other recreational users or industrial operators during the construction period would result in an additive effect of noise and vibration in the immediate vicinity of the Red Pine Road.

During the operation phase of the Project, traffic is limited to operations staff visits to the plant (i.e. pickup truck). Therefore continued additive effects associated with the Project and other users of Red Pine Road are not expected during the operations phase of the Project.

7.3.3.2 Recreational Use

- **Operation Phases**
- **Potentially Positive/Negative Effect**

During the operation phase of the Project, access along Red Pine Road will be improved for recreational users. The improved access will result in potentially positive effects on recreational activities such as ATV travel, camping, hunting, and fishing in the vicinity of the Project. Increased hunting and fishing pressure could result in a negative effect. However, no net negative effect should occur provided that any additional fishing activity is undertaken within MNR license limits.

7.3.3.3 Infrastructure

- **Construction Phase**
- **Potentially Negative Effect**

Major components for both the Yellow Falls Hydroelectric Project and the Lower Sturgeon GS Redevelopment will likely be transported from Timmins. However, most construction materials for both projects are expected to come from nearby concrete plants, aggregate or rock quarry sites. Most Project workers will likely be from Smooth Rock Falls, Cochrane, or Kapuskasing, or will take up residence in Smooth Rock Falls. Workers for the Lower Sturgeon GS Redevelopment will likely originate from Timmins or other nearby communities. However, transportation of major or specialty components on Highway 655 may result in minor road wear over baseline conditions. Since the Highway is designed for, and currently used for shipment of goods and large loads, the temporary additive effect is not likely to be significant.

7.3.3.4 Local Economy

- **Construction and Operation Phase**
- **Potentially Positive Effect**

Both the Project and the Lower Sturgeon GS Redevelopment are major undertakings and will likely result in positive economic effects within the Study Area. Most components, material, and workers for the Lower Sturgeon GS Redevelopment are expected to travel from Timmins or other nearby communities, while the Yellow Falls Hydroelectric Project will draw on local suppliers to the extent possible. As a result, potential interactions are limited to possible sales at local businesses which may result in indirect or induced economic benefits, and to an increase in taxes and water royalties over the life of the projects, which may be reinvested in northeastern Ontario. However, distribution of tax and royalty income is the role of the Ontario Government.

7.3.3.5 Terrestrial Vegetation

- **Operation Phase**
- **Potentially Negative Effect**

According to the Ontario Land Cover database, the entire Study Area comprises approximately 193,560 ha. Air photo observation and Ontario Land Cover classification indicates that approximately 76% (147,600 ha) of the Study Area has been harvested at some point (Classes 8, 9, 10, 11). Tembec plans harvest of an additional 3,084 ha in its current Forest Management Plan. The Project, using the Island Falls location, would affect approximately 374 ((approximately 0.003 % of previously harvested area) ha of forest, swamp, and marsh habitat, 122 ha of which included recently cut areas. Since the proposed dam and powerhouse were relocated from Island Falls to Yellow Falls, a reduction in headpond size will reduce effects to riparian vegetation and habitat. On a percentage basis, the Project will have a negligible contribution to cumulative effects resulting from forest harvesting/clearing in the CEA Study Area.

7.3.3.6 Local Businesses, Institutions, or Public Facilities

- **Construction and Operation Phase**
- **Potentially Positive Effect**

Local businesses may see additional sales as construction material and supplies are needed at the Project and the Lower Sturgeon GS Redevelopment. Both projects may result in indirect or induced economic benefits from sales to workers. However, interaction is not expected to be significant since most components, material, and workers for the Lower Sturgeon GS Redevelopment are expected to travel from Timmins or other nearby communities, while the Yellow Falls Hydroelectric Project will draw on local suppliers to the extent possible.

7.3.3.7 Local Labour and Employment

- **Construction Phase**
- **Potentially Positive Effect**

There may be some interaction between the Project and the Lower Sturgeon GS Redevelopment through labour requirements. Wherever possible, the Project will utilize the skills of local workers, who may originate from Smooth Rock Falls, Cochrane, Kapuskasing, or the surrounding area. Some workers for the Lower Sturgeon GS Redevelopment may come from the same area. However, interaction is not expected to be significant since most workers are expected to travel from Timmins or other nearby communities.

7.3.3.8 Traffic

- **Construction Phase**
- **Potentially Negative effect**

As a result of the redevelopment of Lower Sturgeon GS and the Project, construction traffic from Timmins may temporarily increase usage of a portion of Highway 655. Major components for both the Yellow Falls Hydroelectric Project and the Lower Sturgeon GS Redevelopment will likely be transported from Timmins. However, most construction material is expected to come from nearby concrete plants, aggregate or rock quarry sites. Most Project workers will likely be from Smooth Rock Falls, Cochrane, or Kapuskasing, or will take up residence in Smooth Rock Falls. Workers for the Lower Sturgeon GS Redevelopment will likely originate from Timmins or nearby communities. Thus, cumulative effects on traffic will probably be limited to transportation of major components on Highway 655. Minor traffic delays may occur since construction vehicles, oversize or overweight loads typically travel at slower speeds than most other vehicles on provincial highways.

Significant use of the improved Red Pine Road by other users such as recreational and industry users may result in an additive effect on traffic along Red Pine Road and on Highway 11 in the vicinity of Red Pine Road. Congested heavy equipment traffic along key haul routes is not desired by the Project or other industrial operators. Accordingly, YFP will continue discussions with other industries to coordinate use of Red Pine Road to minimize the potential for additive traffic effects during construction. As access along Red Pine Road by heavy equipment is currently not possible, it is not anticipated that other industrial users (.e.g. forestry) will require intensive use of Red Pine Road during the construction period.

During the operation phase, traffic associated with the Project is limited to site visits by operations staff via pick-up truck or ATV. As a consequence of this low Project-related traffic volume, significant additive traffic effects are not anticipated during the operation phase of the Project.

7.4 MITIGATION MEASURES

Mitigating local effects at the source is the best way to reduce the potential for cumulative environmental change. For the purposes of this CEA, it is assumed that all activities listed above have undergone, are in the process of, or will undergo, some form of environmental effect or planning assessment prior to being approved for development.

In addition, this CEA assumes that each activity will be required to meet applicable municipal, provincial, and federal standards and regulations as well as employing industry and environmental best practices. Consistent with the principal of avoidance, implementation of standard construction and operation protection and mitigation measures, and following good industry practices, it is assumed that unrelated activities will be sited, operated, and maintained with regard for applicable municipal, provincial, and federal policies and standards.

Regulatory compliance by these unrelated, project-specific activities will greatly limit the potential for adverse effects to interact between or among the various projects, and thus the need for mitigation measures. Nevertheless, at the regional level, there is still the potential for cumulative environmental effects that will be primarily temporary (e.g., construction traffic).

During any simultaneous development of the Lower Sturgeon GS and the Project, the majority of biological and physical change is anticipated to occur over a dispersed spatial area and is best mitigated at the project site(s). There is also the potential for positive changes to socio-economic features through growth-inducing changes associated with large construction projects.

The potential for additive effects of noise and traffic along Red Pine Road will be mitigated through coordination with other users whose activities along the Red Pine Road may generate traffic. Coordination of activities will result in minimal additive effects, and improved haul route safety.

7.5 EVALUATION OF SIGNIFICANCE

A cumulative effect may be considered significant even though a project-specific effect is noted as insignificant. Project specific assessments, which focus on the incremental effect of the project being assessed, can assist in making significance determinations, but serve only as a starting point. This CEA takes other factors into account, including:

- Effectiveness of mitigation
- Incremental contribution (additively or synergistically) of net effects from each project under review
- Magnitude of change relative to baseline conditions
- Reversibility
- Ecological context

Considering these factors, and using the criteria set out in **Table 6.1**, an evaluation of the significance of each cumulative effect assessed above is shown in **Table 7.3**. The results of this evaluation suggest that overall, significance of cumulative environmental change is considered

minimal since the Yellow Falls Hydroelectric Project and the Lower Sturgeon GS Redevelopment are geographically separated and may draw on labour and material resources in different areas. Through coordination of activities with local industry, potential additive effects of noise and vibration and traffic along Red Pine Road will be minimal. Improved access via Red Pine Road is anticipated to result in a medium positive effect on recreation.

Table 7.3 Significance of Net Cumulative Effects

Potential Cumulative Effect	Magnitude of Effect	Geographic Extent	Duration	Irreversibility	Level of Significance after Mitigation Measures (+/-)
Utilities and Services	Minimal – cumulative interactions between the Lower Sturgeon GS Redevelopment and the Project are anticipated to result in minimal wear to Highway 655 above baseline conditions	Anticipated to be localized to a portion of Highway 655	Short-term – potential cumulative effects of the Project and the Lower Sturgeon Redevelopment are expected to occur during the construction period only	Reversible	Minimal (-)
Local Economy	Low – cumulative interactions between the Lower Sturgeon GS Redevelopment and the Project are anticipated to result in an increase in the Provincial tax base, which may be reinvested in Northeastern Ontario.	Anticipated to occur within the Study Area and the surrounding communities of Cochrane, Kapuskasing, and Timmins	Short-term – potential cumulative effects of the Project and the Lower Sturgeon Redevelopment are expected to occur during the construction period only	Irreversible	Low (+)
Local Business, Institutions or Public Facilities	Minimal – cumulative interactions between the Lower Sturgeon GS Redevelopment and the Project are anticipated to result in a slight increase in sales at local businesses	Anticipated to occur within the Study Area	Short-term – potential cumulative effects of the Project and the Lower Sturgeon Redevelopment are expected to occur during the construction period only	Irreversible	Minimal (+)
Local Employment and Labour	Minimal – cumulative interactions between the Lower Sturgeon GS Redevelopment and the Project are anticipated to result in a slight increase to local employment and labour	Anticipated to occur within the Study Area and the surrounding communities of Cochrane, Kapuskasing, and Timmins	Short-term – potential cumulative effects of the Project and the Lower Sturgeon Redevelopment are expected to occur during the construction period only	Irreversible	Minimal (+)
Traffic	Minimal – cumulative interactions between the Lower Sturgeon GS Redevelopment and the Project are anticipated to result in minimal traffic increases on Highway 655, primarily from specialty components.	Anticipated to be localized to a portion of Highway 655	Short-term – potential cumulative effects of the Project and the Lower Sturgeon Redevelopment are expected to occur during the construction period only	Reversible	Minimal(-)

7.6 FOLLOW-UP

The purpose of follow-up is to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures. Under CEA, it is typically the RA that defines and implements the monitoring program, while it is the proponent's responsibility to monitor their own project's contribution to cumulative environmental change. This approach is generally undertaken since it is unreasonable to expect one proponent to monitor the effects caused by another proponent.

8.0 Water Management Planning

8.1 ZONE OF INFLUENCE

The Zone of Influence of a facility is the upstream and downstream extent of a facility's operational effects (MNR, undated). The Project's zone of influence extends upstream to approximately Loon Rapids (see **Figure 2.4**) and approximately 500 m downstream of Yellow Falls under the proposed operating conditions.

8.2 DEVELOPMENT AND EVALUATION OF OPTIONS RELATED TO FLOWS AND LEVELS

As described in **Sections 1.7** and **2.2**, a number of options have been explored for development of the Project. In 1990, a number of options were explored including location of the Project at Island Falls (2 km downstream of Yellow Falls) and at Yellow Falls. At the time, the Island Falls site was chosen since it offered significant advantages in terms of available head. A headpond height of 245 m and length of 16 km was selected as able to ensure the most available power at the time. However, market conditions made development of the Project unfavourable.

Building upon the continuing evolution of Ontario's electricity market, and previous work completed for the Yellow Falls Hydroelectric Project, YFP reactivated the Project in 2001, after re-evaluating economic conditions, power demand conditions, and financing options. At the time, it was decided to locate the facility at Island Falls to take advantage of additional head available at that location, allowing construction of a generating plant with a nameplate capacity of 20 MW, and with an optimal headpond level of 244 m asl, which resulted in significantly less inundation of surrounding land than the previous proposed operating level of 245 m.

In August 2005, the EA process was started as required under O. Reg. 116/01. Since August 2005, extensive aquatic and terrestrial studies have taken place, and the proponent has engaged aboriginal communities, agencies, and the public in the Project, including two public open houses, community meetings, several newsletters, and extensive email correspondence. In November, 2007 a Draft EA was released for first nation, agency, and public review. Several public and agency comments were received, particularly from the Ministry of Natural Resources and the Friends of the Mattagami River (a local interest group).

During the public review of the Draft EA, and subsequent consultation with agencies and the public, a potential Project modification was identified that would address many of the concerns raised during the review of the Draft EA. YFP made a decision to modify the Project by relocating the dam and powerhouse structures two kilometres upstream of Island Falls to Yellow Falls.

Stakeholders were informed of the modifications to the Project design through several means:

- Two meetings of the Smooth Rock Falls Recreation Committee on January 15 and February 22, 2008. The creation of the Recreation Committee was proposed by YFP in response to recreation-related comments received during the August 2007 community meeting in Smooth Rock Falls. Committee membership included a representative from YFP, Town staff and council members, as well as members of the Smooth Rock Falls Community. Community representatives were identified and selected by the Town of Smooth Rock Falls via written invitation to participate sent to all community members.

- Two meetings between YFP and the Friends of the Mattagami River on March 5, and March 18, 2008

- Distribution of the Spring 2008 newsletter, distributed to the local community, First Nations, as well as to all persons on the Project mailing list

- Posting of the Spring 2008 newsletter to the project website (www.yellowfallshydro.com)

- Presentation by YFP to Smooth Rock Falls Town Council Committee of the Whole on April 21, 2008

The Yellow Falls site offers less head and the project nameplate capacity changed from 20 MW to 16 MW. However, the change in location also provides numerous benefits, including the continued use of the Island Falls site for recreation, reduced potential for disruption of identified fish habitat immediately downstream of Island Falls, and maintenance of morphological diversity in the Mattagami River between Lower Sturgeon GS and Smooth Rock Falls GS.

The Project will be operated as a “power on availability plant”. This operating method is commonly known as run-of-river, in which power is generated based on the available river flow at that time, since water is not stored for later release. The outflow from a run-of-river facility is equivalent to the natural flow of the river, and thus the headpond is maintained at a relatively constant level. The Yellow Falls Hydroelectric Project is a run-of-river hydroelectric facility, and is not designed to manipulate river flows or store water. Therefore, limited options to alter flows and levels exist.

8.3 FLOWS AND LEVELS UNDER NORMAL OPERATING CONDITIONS FOR THE PROPOSED PROJECT

Since the Project will operate as a run-of-river facility, flows and levels will be dependent on the regulated flow regime so that headpond level is maintained as close to 244.0 m as possible. Consequently, low flow or flood conditions will be highly dependent on the operation of upstream facilities. Normal operating conditions are described in **Table 8.1**.

As a requirement of the Mattagami River Water Management Plan, a 15 m^3/s minimum flow requirement to Smooth Rock Falls GS requirement is described in the Mattagami River Water

Management Plan. This minimum flow requirement has been adopted by the proponent to ensure compliance with the Mattagami River WMP. However, historical data indicates that river discharge is typically greater than 15 m^3/s minimum flow requirement 99.7% of the time. The only time this minimum flow requirement will not be meet is in the very extreme conditions when river flow is below 15m^3/s (i.e. the head pond will not be used to compensate for any shortcoming in natural river flows).

Table 8.1 Flows and Levels Under Normal Operating Conditions

Normal Operating Range	243.85 – 244.15 m 244.0 m target 0.3 m range
Maximum Discharge (m^3/s)	None
Minimum Discharge (m^3/s)	15 m^3/s

8.4 MONITORING REQUIREMENTS FOR FLOWS AND LEVELS

8.4.1 Data Recording and Reporting

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.

8.4.2 Non-Compliance

Should a non-compliance event occur, YFP is required to verbally notify the MNR within 24 hours of the incident with the following information in accordance with the Mattagami River Water Management Plan:

- 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.

9.0 Inspection and Monitoring

This section summarizes follow-up measures and monitoring that YFP and the construction contractor will carry out during construction and operation of the Project. A detailed Environment Inspection and Monitoring Plan ("Monitoring Plan") is provided in **Appendix J**. Inspection and monitoring throughout the construction and operation phases of the Project will ensure continued compliance with applicable legislation as well as mitigation and protection measures set out in this document.

9.1 MONITORING PLAN STRUCTURE

Monitoring is fundamental to ensuring the success of protection and mitigation measures outlined in **Section 6.0**. The monitoring plan for the Project 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.

Environmental monitoring, which began with the collection of primary background data as part of this EA, will continue with appropriate follow-up activities during the construction and operation phases of the Project. Monitoring will provide data on the effectiveness of key environmental, health, and safety site management measures implemented as part of this Project.

9.1.1 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.

9.1.2 Goals and Objectives

The monitoring plan seeks to meet the following goals:

- Minimize conflicts with individuals, organizations, and communities within the Study Area
- 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 protection and mitigation measures outlined in the EA Report
- Minimize potential environmental effects associated with construction works within waterways
- 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
- Minimize community concerns and address issues in terms of effects identified during the development of infrastructure and/or refurbishment activities.
- Improve management, reduce areas of uncertainty, build on successes and make adjustments to limit failures.

9.2 ENVIRONMENTAL MANAGEMENT SYSTEMS

As part of the environmental monitoring objectives outlined above, and in addition to the Monitoring Plan (**Appendix J**), several programs, plans, and procedures will be developed by YFP and the Construction Contractor as outlined below. They will guide all stages of construction, operation, and decommissioning so that the environmental performance of the Project is optimized. However, for the programs, plans, and procedures to be effective, appropriate management structures and contract documents must be established.

9.2.1 Management Structures

YFP, the Construction Contractor, and subcontractors will take steps to ensure that they have appropriately skilled personnel to carry out the environmental responsibilities as defined in this EA Report and incorporated in the Construction and Environmental Management Plan ("CEMP"). The Contractor, subcontractors, or other organizations associated with Project development activities will develop responsive reporting systems that clearly assign

responsibility and accountability for actions. As appropriate, YFP will review these reporting documents.

9.2.2 Contract Documents

YFP is committed to constructing, operating, and repowering/decommissioning the Project in an environmentally responsible manner and in compliance with applicable laws, regulations, and guidelines. All contractors and subcontractors retained by YFP will be accountable for actions that have an adverse effect on the environment. As such, any contract documents executed by YFP will incorporate mitigation and protection requirements as outlined in the EA Report.

Additionally, all contractors, subcontractors, and other associates of the Project will follow the guiding principles of the monitoring program, and comply with relevant municipal, provincial, and federal legislation.

9.2.3 Change Management

During implementation of the Project, change may be required to address unforeseen or unexpected conditions or situations. YFP and the Construction Contractor will be responsible for ensuring environmental and safety issues are addressed. YFP will undertake any significant changes to programs, procedures, and plans as required throughout the life of the Project. An Adaptive Resource Management ("ARM") approach will be adopted as described in **Appendix J**.

9.2.4 EcoLogo® Certification

The Environmental Choice Program ("ECP") is Environment Canada's ecolabelling program. To obtain the EcoLogo® a product or service must be made or offered in a way that: improves energy efficiency, reduces hazardous by-products, uses recycled materials, is re-usable, or provides some other environmental benefit. In addition, certified products or services should meet or exceed any applicable industry specific safety and performance standards.

A company may have its product or service certified in one of the following ways:

- The product or service meets or exceeds the ECP criteria; or
- If no criteria exist for the product or service type, a panel of experts convened by the ECP (Panel Review Process) determines that a specific product or service has significantly less adverse environmental effects than competing products or services.

Canadian Hydro, the lead partner in YFP, currently has all of its facilities EcoLogo® Certified or slated for certification. It is YFP's intention to register the Project for EcoLogo® Certification through the Environmental Choice Program.

9.3 PROGRAMS, PLANS, AND PROCEDURES

As appropriate, YFP and/or the Construction Contractor will implement the programs, plans, and procedures discussed below. The programs, plans, and procedures will be reviewed by the appropriate agencies, including NRCan, MNR, and DFO as required.

9.3.1 Construction Program

The Construction Contractor will prepare a CEMP prior to the initiation of any substantive on-site works with oversight by YFP. The CEMP will be the controlling plan for all construction activities specifying work procedures for each key project component. The CEMP will be comprised of a series of plans and procedures covering all critical construction and environmental management tasks.

The Project CEMP will include procedures and plans based on regulatory requirements, accepted good site practices, and any specific measures identified within this EA, including the following plans as appropriate:

Sediment and Erosion Control Plan: YFP and the Construction Contractor will develop a plan that details operational procedures that prevent soil erosion and sediment from entering watercourses within the Study Area during construction and operation. The plan will include post-construction rehabilitation procedures.

Traffic Management Plan: The Construction Contractor will develop and implement a plan specifying movement of materials and personnel to, from, and within the workspace areas; management of connection points between site access roads and public roads; transport of oversize or overweight loads; control of any upgrades or modification to roads, dust, and vehicle emission controls.

Waste Management Plan: The Construction Contractor will develop a plan that specifies provisions for the reuse, recycling, or disposal of solid waste, hazardous waste, and sanitary waste.

Health and Safety Plan: The Construction Contractor will develop a plan that considers public and occupational health and safety issues. These may include limiting site access, protecting the public from equipment and construction areas, use of personal protective equipment, accident reporting, equipment operation, and confined space entry.

Emergency Response Plan: The Construction Contractor will include a plan for the proper handling of spills and the associated procedures to be undertaken during a spill event, including containment procedures, clean-up materials, proper disposal of spill residue, and storage locations of clean-up materials. The plan will also cover response actions to high winds, floods, fire preparedness, evacuation procedures, and medical emergencies.

Training Plan: The Construction Contractor and YFP will develop a plan that ensures construction personnel are informed and trained as necessary to perform assigned tasks safely and with due regard for environmental conditions. This plan will also ensure that workers are familiar with the above plans prior to construction.

9.3.2 Operation and Maintenance Program

During pre-operational mobilization YFP will develop an operation and maintenance program in consultation with relevant agencies. The program will be based upon existing, proven procedures that have been developed for other hydroelectric facilities owned and operated by Canadian Hydro. The program will be designed to ensure compliance with all applicable municipal, provincial, and federal requirements.

As appropriate the program will cover predictive and preventive maintenance, routine maintenance, annual overhauling, inspection of equipment and components, procurement of spare parts, and maintenance of optimum inventory levels in order to reduce inventory carrying costs and working capital costs. It will also include a schedule for regular inspections of Project facilities.

The regular maintenance that will occur through the operation and maintenance program will optimize the operating condition of equipment. Where necessary, YFP will incorporate the corresponding elements of the monitoring program as documented in the following subsections.

9.3.2.1 Environmental Procedures

YFP will be responsible for implementing all approved environmental procedures during the operation phase of the Project. Individual employee responsibilities will be assigned as necessary to support the full and effective implementation of the environmental procedures. As appropriate the environmental procedures will address the following issues to prevent environmental contamination and injury to personnel.

- **Environmental calendar**: to establish the specific dates and times for environmental inspections of Project facilities, monitoring events, and emergency notifications.
- **Spills and releases**: to identify the specific procedures for the prevention, response, and notification of spills. In addition, it will establish the general procedures for spill clean-up, personnel training, and material handling and storage to prevent spills.
- **Hazardous waste management**: to outline the procedures for the proper identification of hazardous waste and its proper storage, handling, transport, and disposal. In addition, the procedures will outline specific requirements for personnel training, emergency response, product review and approval, and record keeping.
- **Solid waste management**: to establish alternative procedures for the management and disposal of general waste.

These procedures will ensure internal and external risks are fully evaluated and the information communicated to personnel in advance of any accident or malfunction.

9.3.2.2 Occupational Health and Safety Procedures

YFP will undertake the following measures to ensure employee health and safety are maintained throughout Project operation:

- Sanitary facilities will be well equipped (e.g. protective creams and soaps)
- Ventilation systems will be used to control work area temperatures and humidity and where work is required in hot and/or humid places employees will be encouraged to take breaks away from these areas.
- Personal protective equipment, including non-slip safety footwear, eye protection, clothing, and hardhats, will be worn by operations and maintenance personnel when on duty
- Elevated platforms, walkways, and ladders will be equipped with handrails, toeboards, and non-slip surfaces
- Electrical equipment will be insulated and grounded in compliance with the appropriate electrical codes

YFP will adhere to MSDS and WHMIS regulations and, as necessary, will require that the Construction Contractor and subcontractors are properly certified. In addition, all required Ontario Ministry of Labour procedures will be followed and adhered to, including appropriate permits, applications, and registrations.

Incidents in the workplace have the potential to cause personal injury and property damage. As appropriate, YFP will maintain a master Incident Report that documents illnesses and accidents. The Incident Report will document all activities resulting in incapacity to work for at least one full workday beyond the day on which the illness or accident occurred. As required, records will also be maintained noting the total number of days of absence from work as a direct result of the illness or accident. All records will comply with Ministry of Labour requirements.

9.3.2.3 Training Program

As appropriate YFP will develop an operations training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental, health, and safety procedures, and the emergency response plan. Training may include the following issues:

Environmental Protection

- Important/sensitive environmental features and areas
- Incidence reporting (i.e., spills, wildlife incidents)

- Materials disposal

Facility Safety

- Site and task specific safety hazards
- Accident reporting
- Chemical and hazardous materials handling
- Fall and arrest protection
- Eye, ears, head, hands, feet, and body protective equipment
- First aid training and equipment
- WHMIS training
- Equipment operation and hazards
- Fire prevention and response
- Lockout and tag out procedures
- Scaffolds and ladders

Emergency Preparedness

- Fire preparedness and response
- Natural disasters (i.e., extreme weather events)
- Hazardous materials and spill response
- Medical emergencies
- Rescue procedures.

Training could begin as the initial staff complement is hired during the pre-operational mobilization period. There will also be on-going training for employees as well as specific training sessions for new hires. Graduated testing and certification by supervisors and the operation managers will ensure that all trainees perform at an acceptable level prior to being assigned a full position.

9.3.2.4 Emergency Response Plan

YFP will finalize an emergency response plan for operational activities during pre-operational mobilization. This plan will be based upon the existing plans developed by Canadian Hydro for its other hydroelectric facilities, the final design of the Project, and the management actions noted above.

9.3.2.5 Information Disclosure

YFP will continue its contact with interested parties during the initial period of operation and for as long as this remains an effective two-way channel for communication. To this end, as appropriate, YFP will develop and maintain a complaint record and tracking system with contact information posted on-site to address community concerns during construction and operation. A complaint record and tracking is also a requirement of the Water Management Planning process. YFP will also maintain the project website (**www.yellowfallshydro.com**) as appropriate to convey information about the Project, YFP's involvement in the community, and to provide notice of unique maintenance events.

9.3.3 Decommissioning Program

Although a formal decommissioning plan has not been prepared at this stage in the planning process, it is foreseeable that at the end of the Project's useful life, the structures can be dismantled (**Section 6.14**). However, decommissioning is not typical for most hydroelectric plants as upgrading or rehabilitation usually proves more economic. Notwithstanding this, decommissioning activities for the Project would involve the following works:

- Remove mechanical and electrical equipment
- Remove ancillary facilities
- Remove dam and spillway structures
- Demolish remaining site structures
- Fill and grade the river banks with suitable engineered fill
- Replace topsoil and cultivate, seed, and plant as required.

The Project is designed to minimize the risk of contamination during its operational lifespan. Potential contaminants besides minimal amounts of fuel and lubricants necessary for daily maintenance and operation will not generally be stored on-site at any time. Therefore, remedial clean-up during decommissioning is anticipated to be minimal to non-existent. The Project will be operated and maintained according to industry best practices. As such, there should be no significant environmental liabilities associated with clean-up or remediation. All decommissioning activities will be performed in compliance with the applicable regulations in force at the time and may include the MOE's Guidelines for the Decommissioning and Cleanup of Sites in Ontario or equivalent guidelines or regulations.

9.3.4 Measurement of Performance

Specific internal audits (e.g. management team and/or process team), and external audits against the plans, safety and environmental procedures, and other policies and procedures are all part of establishing performance standards necessary to minimize risks on a continuing basis.

As appropriate, a formal audit program for the Project, with regard to loss control programs (i.e., health, safety, environment, and security), will be performed regularly.

9.4 MONITORING REQUIREMENTS

9.4.1 Construction Phase

The Construction Contractor will be the primary party responsible for the implementation of construction monitoring measures. It is recommended that YFP employ periodic environmental inspection to ensure that the Contractor operates in an environmentally sound manner and fulfills requirements outlined in the EA Report and appropriate laws, regulations, and guidelines. Implementation of construction monitoring measures will be undertaken in a manner that is consistent with Canadian Hydro's standard environmental and engineering practices and in compliance with applicable municipal, provincial, and federal standards and guidelines. The following subsections summarize key monitoring activities to be implemented as discussed in **Appendix J**; other standard industry monitoring practices are discussed in **Section 6.0**.

9.4.1.1 Aquatic Habitats

Construction activities that have the potential to affect aquatic habitats and watercourses include dam and ancillary facility construction, equipment operation, vegetation clearing and disturbance, headpond filling, and accidental spills. Stringent monitoring of these activities is necessary to ensure aquatic flora and fauna are protected.

In-stream construction activities will be monitored by Project personnel to ensure that excessive siltation or sedimentation of watercourses does not occur.

In conjunction with the general pre- and post-construction monitoring activities, the Construction Contractor will also maintain a record of water quality monitoring for standard parameters that could be affected by construction activities (e.g. for turbidity and total suspended solids) in the vicinity of the Project.

Monitoring will be required in the event of watercourse contamination from an accidental spill or leak.

9.4.1.2 Fisheries Act Requirements

Appropriate remedial measures will be completed as necessary and additional follow-up monitoring conducted as appropriate. Since the Project is deemed a harmful alteration, disruption, or destruction of fish habitat under Section 35 of the federal *Fisheries Act*, monitoring will be required as outlined in **Appendix J**.

9.4.1.3 Terrestrial Habitats

Construction activities that have the potential to affect terrestrial flora and fauna include equipment operation, vegetation clearing and disturbance, headpond flooding, access road and transmission line construction, accidental spills and/or leaks, and waste disposal. Stringent monitoring of these activities is necessary to ensure terrestrial flora and fauna are protected.

As required by applicable law, records of vehicle maintenance will be retained by the Construction Contractor and will be made available for inspection by the appropriate authorities, as required. All vehicles involved in construction activities must be maintained in good operating condition. All vehicles identified through the monitoring program that fail to meet the minimum emission standards will be repaired immediately or removed from the construction area.

Vegetation clearing activities will be conducted under observation and monitoring by Project personnel. Monitoring of vegetation clearing will ensure that vegetation is cleared only from designated areas. Areas outside the designated construction sites shall not be disturbed.

Monitoring will be required following the unlikely event of contamination from an accidental spill or leak. Contaminated soils will be removed and replaced as appropriate.

As appropriate, records of waste generation and disposal will be maintained. Where waste disposal monitoring is undertaken it will include a periodic review of all waste records, visual inspection of waste storage areas for effectiveness, and inspection of waste receiving facilities. The purpose of inspection is to ensure that wastes are properly reused, recycled, or disposed of in a manner consistent with provincial standards and good industry practices. Where a third party's activities are identified as non-compliant or insufficient, the Construction Contractor will seek out an alternative recycling or disposal solution.

9.4.1.4 Air Quality & Environmental Noise

Air quality and environmental noise effects due to construction typically relate to dust emissions, and the generation of noise and exhaust emissions from construction equipment; specifically construction vehicles, generators, and power tools. The Construction Contractor will ensure that all equipment and vehicles brought onto the work sites are in proper working order with functioning mufflers and emission control systems.

During construction, appropriate measures will be implemented to minimize the potential for nuisance effects and damage to nearby vegetation as a result of construction-related dust. The construction manager or designated person will ensure that dust is kept to a minimum 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.

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 undertaken.

9.4.1.5 Stakeholder Relations

YFP will continue its pre-construction contact with project stakeholders during construction and through the initial period of operation as long as this seems an effective two-way channel for communication. YFP or the Construction Contractor will have a designated representative to maintain good community relations throughout construction. The Project representative will address concerns expressed by stakeholders during construction in an expeditious and courteous manner. Effort will be made to respond to those inquiries as soon as is reasonably possible. As appropriate, and prior to the start of construction, contact points for the Project representative will be provided to the Town of Smooth Rock Falls.

9.4.1.6 Local Expenditures

Where practical, the Construction Contractor will encourage the hiring of local manpower and subcontractors to conduct non-specialized aspects of the Project construction. This may include tree and brush clearing, topsoil removal and site grading, construction of access roads, and construction and servicing of maintenance buildings and other structures. Where practical, the Construction Contractor will also encourage the use and procurement of local goods and services where they are available in sufficient quality and quantity and at competitive prices.

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.

9.4.2 Operation Phase

Building on the environmental management measures recommended above to minimize potentially adverse effects while enhancing the positive effects associated with the operation of the Project (**Section 6.0**), the following operations monitoring program has been developed. As with the construction phase, the monitoring program is designed to allow YFP to monitor and assess the effectiveness of the proposed management measures and to verify compliance of the Project with applicable municipal, provincial, and federal legislation and guidelines.

YFP will be the primary organization responsible for the implementation of the operational monitoring measures. Implementation of the measures will be undertaken consistent with Canadian Hydro's standard environmental and engineering practices.

9.4.2.1 Water Management Planning Process

Immediately after operation begins, the Project will require an amendment to the Mattagami River System Water Management Plan ("WMP"). The WMP amendment will require preparation of an operating plan that is submitted to the MNR. The operating plan specifies

minimum and maximum headpond levels, and minimum flows to ensure that the Project does not unduly affect other river users. Operational plan details discussed with the MNR and as part this EA process will be incorporated into the amendment document and operating plan.

9.4.2.2 Stakeholder Relations

YFP will continue its contact with Project stakeholders during the initial operation of the Project for as long as this seems an effective two-way channel of communication. As a long-term presence in the community, YFP will continue to develop local relationships and channels of communication which could benefit the local area.

Ongoing stakeholder communication will allow YFP to receive and respond to community issues on an ongoing basis. YFP strives to be a good corporate citizen, protect the environment, and enhance the quality of life in the communities in which they operate.

9.4.2.3 Local Expenditures

As was the case during the construction phase, YFP will continue to encourage the use and procurement of local goods and services where they are available in sufficient quantities and qualities, and at competitive pricing.

9.4.2.4 Fish

Fish habitat will be altered as a result of inundation and flow changes at the base of Yellow Falls. As discussed **in Appendix J**, monitoring will be required to ensure that mitigation and protection measures are effective and that no significant adverse effects are experienced by fish or fish populations. Monitoring activities include sampling of fish populations, characterization of post-construction fish habitat conditions, bathymetric measurements, and analysis of fish condition.

9.4.2.5 Water Flow and Quality

Water levels and flows will be recorded and maintained according to minimum and maximum flow requirements outlined in **Section 8.0** and as required by relevant laws, regulations, guidelines and the Mattagami River Water Management Plan as amended following Project commissioning.

Mercury levels may rise within the Study Area as a result of inundation. Thus, mercury levels in fish will be monitored for several years after impoundment (**Appendix J**). Mercury levels will be reported to appropriate authorities to ensure that the health of recreational fishers is not affected by the Project. Water quality testing for parameters including mercury will take place as determined in consultation with the appropriate agencies.

10.0 Summary and Conclusions

10.1 SUMMARY OF KEY FINDINGS

1. This Yellow Falls EA is consistent with and meets the MOE requirements for Environmental Assessment for Electricity Projects as mandated under Regulation 116/01, the Electricity Projects Regulation, the MNR *Waterpower Program Guidelines* (1990), and the Canadian Environmental Assessment Act.
2. A comprehensive Stakeholder Consultation and Information Disclosure Program identified the key interests of stakeholders. The EA Report defines the means by which the Project addresses interests expressed by stakeholders. Additionally, a Consultation and Information Disclosure Program was developed to guide discussions with local First Nations.
3. Based upon detailed and thorough analyses of the interests identified through the Stakeholder Consultation and Information Disclosure Program and engagement of local First Nation communities, and those identified by the Project team through the Integrated Screening Checklist and the CEAA requirements, the scope of issues addressed in this EA included:

- First Nation interests
- Surface water quality and flows
- Groundwater quality and quantity
- Sedimentation and soil erosion
- Accidental spills
- Residential, commercial, or institutional land-use
- Hazard lands
- Remediation of contaminated land
- Air quality
- Emissions of greenhouse gases
- Emission of dust
- Environmental noise
- Species of conservation concern
- Wetlands
- Wildlife habitat and movement
- Fish and fish habitat
- Migratory birds
- Significant ecosystems
- Vegetation
- Agricultural lands and production
- Game and fishery resources
- Community character
- Recreation, cottaging, and tourism
- Traffic
- Public health and safety
- Archaeological resources
- Scenic or aesthetically pleasing landscapes
- Creation of waste materials
- Potential accidents and malfunctions
- Economic benefits

4. For the transmission lines and access roads, significant adverse net environmental effects have been avoided through careful routing along existing linear features. The Project is generally located in a rural, natural area and thus has a minimal effect on socioeconomic features.

5. Potential negative effects that could not be avoided can be effectively mitigated using well-known and proven methods and technologies. In particular:

   - The Project is not expected to affect limiting habitat for lake sturgeon, walleye, northern pike, or white sucker. Aquatic habitat is expected to almost double in the proposed headpond through inundation, while the littoral zone will increase in size by approximately 16.2% (30,000 m^2). Effects due to impingement and entrainment are expected to be minimal. The fish habitat compensation plan (**Appendix G4** of the **EA Report**) has been developed to compensate for changes to fish habitat as a result of the Project. The compensation plan includes the construction of a spawning channel within the Project headpond, as well as enlargement of an existing riffle area located on a tributary downstream of the Project.
   - Mercury methylation is not anticipated to result in additional consumption restrictions to the point where fish are generally unsuitable for consumption based on current guidelines. Mercury is not typically transported out of the headpond area.
   - Effects to the natural environment including vegetation and wildlife are anticipated to be minimal. Appropriate post-construction monitoring programs will be put in place to characterize and quantify any residual effects.
   - Environmental noise levels at surrounding receptors are predicted to be well within the applicable MOE environmental noise criteria.
   - Access for recreation and cottaging will generally be improved during operation since Red Pine Road will be upgraded and maintained and a boat launch will be provided at Yellow Falls
   - No significant net effects to canoeing are expected during operation, since portages at Davis Rapids and Loon Rapids and will no longer be needed, and a regularly maintained portage route will be provided around Yellow Falls.
   - No significant net negative effects are anticipated to heritage or archaeological resources. Construction and operation activities are being planned to account for known archaeological resources, and ensure that Ministry of Culture requirements are addressed.
   - Short-term traffic delays are anticipated during the construction phase of the Project.
   - Means to address effects of the environment on the Project, such as ice and seismic activity, are built into the component designs

6. Net positive effects are expected to result from development of the Project, in particular:
    - The Project will have the capacity to produce 16 MW of clean, renewable electricity. Annual generation is anticipated to be about 69,500 megawatt hours ("MWh") - enough electricity to power approximately 6,800 average Ontario households.
    - Greenhouse gases are not directly emitted through operation.
    - Pre-construction and construction activities will require approximately $70 million in capital costs including labour, equipment, and materials.
    - Construction of the Project is expected to generate over 100,000 person-hours of employment, with over half of this employment expected for the local workforce.
    - Operation activities will create 2 year-round permanent employment opportunities.
    - Increased investment into renewable energy, contributing to the growth of Ontario's hydroelectric industry.
    - Provincial and federal taxes paid by YFP are approximately $336,480 annually.

10.2 CONCLUSION

The phase out of coal-fired generation, aging generation facilities, population growth, and the continued increase in demand for electricity contribute to the need for new generating and transmission facilities over the next 10 years within Ontario. The provincial government has recognized these challenges to the electricity system and has actively procured new, renewable energy generation facilities such as the Yellow Falls Hydroelectric Project. The Project is consistent with federal government policy (e.g., ecoEnergy) and provincial policies (e.g., Provincial Policy Statement).

The Project will result in changes to fish habitat between Yellow Falls and Loon Rapids. YFP is required to obtain authorization under the Fisheries Act from DFO, including the provision of fisheries compensation measures. The proponent, DFO, and the Ontario Ministry of Natural Resources ("MNR") have been involved in numerous discussions regarding mitigation and compensation for loss and disruption of fish habitat, resulting in development of a fish habitat compensation plan which involves creation of spawning shoals within the headpond as well as additional riffle habitat creation in the North Muskego River, a tributary to the Mattagami River downstream of Yellow Falls. The compensation plan is acceptable to the DFO and MNR.

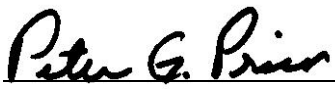
The proponent has also developed a comprehensive monitoring Plan (**Appendix J**) that has been reviewed by the applicable provincial and Federal agencies. This monitoring plan will monitor the effectiveness of protection and mitigation measures, and verify compliance with applicable guidelines and standards, optimizing the environmental benefits of the Project.

Further, the Project will positively contribute economic resources to the Town of Smooth Rock Falls, and will not significantly contribute to greenhouse gases formation.

In conclusion, based upon the field studies and analyses documented herein, the Project is not likely to cause significant net environmental effects, provided that mitigation and protection measures are implemented.

STANTEC CONSULTING LTD.

Jeff Hankin, Project Manager



Peter Prier, Senior Principal
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