ENVIRONMENTAL REPORT FOR THE REDEVELOPMENT OF THE UPPER MATTAGAMI GENERATING STATIONS: WAWAITIN, SANDY FALLS AND LOWER STURGEON

Submitted To:

ONTARIO POWER GENERATION

Submitted By:

SENES

SENES Consultants Limited

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EXECUTIVE SUMMARY

Ontario Power Generation (OPG) plans to redevelop the existing Wawaitin, Sandy Falls and Lower Sturgeon Generating Stations (GS). This Environmental Report (ER) has been prepared pursuant to the terms and conditions of OPG's *Class Environmental Assessment for Modifications to Hydroelectric Facilities* under the Ontario Environmental Assessment (EA). These three generating stations are located on the Upper Mattagami River in Northeastern Ontario. Wawaitin GS and Sandy Falls GS are located within the City of Timmins and Lower Sturgeon GS is located in unorganized territory north of Timmins.

The purpose of redeveloping these generating stations is that they have been in operation as run-of-the river plants for over 90 years and are all at the end of their designed service life. These three generating stations operate at 25 cycles and therefore the power cannot be used locally in Timmins and instead must be transmitted to Sudbury in order to convert the power to 60 cycles and then be injected into the power grid. Significant energy losses occur during the process of transmitting and converting the 25 cycle to 60 cycle power. All three plants are in need of structural and electrical/mechanical repair. As well, OPG has a mandate from the Government of Ontario to expand, develop and/or improve its hydroelectric generation capacity.

Redevelopment of these generating stations will increase their total capacity from approximately 19 to 35 megawatts (MW) largely through technological advances and making better use of the water that is available. The increased production can be done without making any changes to the levels and flows as approved in the Mattagami River System Water Management Plan.

This ER describes the proposed projects including the existing and proposed facilities; assesses project alternatives; describes the existing natural and socio-economic environment; describes the public, First Nations and agency consultation undertaken; addresses the environmental effects of redevelopment; and proposes mitigation measures to obviate or minimize the effects.

Description of the Existing and Proposed Facilities

The Wawaitin, Sandy Falls and Lower Sturgeon Generating Stations were built in 1912, 1911 and 1923 respectively to supply power to the then booming gold mining industry in Timmins. All three of these facilities were acquired by the Hydro Electric Power Commission, a predecessor of OPG in 1944.

All three generating stations are run-of-the-river facilities operating in compliance to the Mattagami River System Water Management Plan. There are no plans to change any of the operating requirements identified in the Water Management Plan. Along with increasing the capacity of the stations from 19 to 35 MW, annual energy production will be increased from 108 to 180 Gigawatt hours (GWh).

The Proposed Undertaking involves: the decommissioning and removal of the existing powerhouses and associated equipment such as the penstocks and surge tanks; the construction of new powerhouses and penstocks and in the case of Sandy Falls, a new water canal; installation of necessary equipment; refurbishments to dams, weirs and other civil structures; and installation and removal of temporary facilities for construction such as cofferdams and laydown areas.

The proposed facilities will be connected to the Hydro One Local Distribution System around Timmins at a voltage level of 27.6 kilovolts.

Existing Environment

The Wawaitin GS is located on the Canadian Shield whereas the Sandy Falls GS and Lower Sturgeon GS are located on the Great Clay Belt. The three generating stations are located in Ontario's boreal forest with the major forest cover typified by jack pine, black and white spruce, poplar and birch. Typical mammalian species include moose, black bear, snowshoe hare and lynx, amongst others.

The Mattagami River is situated within the Moose River drainage basin of the Hudson Bay Drainage System. The Mattagami River provides coolwater fish habitat, with walleye the most important fish species common throughout the river. Northern pike and white sucker are also common throughout the river. The presence of lake sturgeon, lake whitefish, smallmouth bass and longnose sucker have also been documented. Other common fish species include yellow perch, burbot, mottled sculpin and various minnows. Existing water quality in the river is considered to be good.

While all three generating stations exist in a relatively small area of Northeastern Ontario, they do vary in terms of the existing local environment. Sandy Falls GS is located in the rural area within the City of Timmins boundaries only 10 kilometers (km) from the City centre. While there is some crown land, the area is predominantly private and characterized by rural land uses. There is also some recreational fishing use near the generating station. Wawaitin GS is also located in the City of Timmins but exists largely in a wilderness area south of the City. Other uses in the area include forestry, cottaging and outdoor recreation. Lower Sturgeon GS is located in a remote wilderness area about 40 km north of the City with no homes or cottages near the generating station. Human use in the area is restricted to the occasional angler, canoeist or hunter.

The City of Timmins would be the key staging point for construction of these projects. Timmins is well-known as a major mining area but it also contains several forest products mills and is the key economic centre in Northeastern Ontario.

Public, First Nations and Government Involvement

Significant public, First Nations and government agency consultation has been undertaken as part of the environmental assessment.

Opportunities for the general public to comment on the Proposed Undertaking have been provided throughout the course of the EA. The public has been notified about the undertaking via notifications in newspapers and through the two project newsletters to a project mailing list comprised of over 800 individuals and organizations. Two open house/public meetings in Timmins have been held on the project along with briefings to local elected officials. In addition a web site, providing information about the project was developed to compliment project newsletters and provide an effective and easy means for the public to provide meaningful input on the projects. In general, the public has been very supportive of the projects, recognizing the contribution these plants make to the Province's energy supply, the economic benefits to Northeastern Ontario and the commitment not to alter the operating regime as documented in the approved Water Management Plan for the Mattagami River System.

An offer of consultation was made to four First Nations – Flying Post, Matachewan, Taykwa Tagamou and Mattagami. While discussions were held with Chiefs from all the First Nations, only Mattagami First Nation chose to be consulted on a significant basis. Three meetings were held with Mattagami First Nation: one with the Chief and Council; a general community session; and, finally a tour of the Sandy Falls GS and Wawaitin GS. No significant concerns were raised during these consultation sessions.

Consultation with municipal, provincial and federal agencies has been ongoing throughout the course of the EA. Many formal meetings have been held with various agencies to address interests identified.

Environmental Effects of Redevelopment

As the Undertaking is with respect to the redevelopment of the existing generating stations, the incremental environmental effects of the Undertaking will largely occur during the construction period.

During the proposed generating station construction phase, potential impacts on the aquatic environment may occur due to in-water construction activities, blasting, soil erosion and turbidity generation, and accidental spills. Based on an assessment of the available baseline information and potential effects, as well as the implementation of the recommended mitigative measures, the effects during construction are concluded to be minimal, localized and short-term.

During the proposed operations phase of the generating stations, potential impacts on the aquatic environment may occur due to accident spills. Based on an assessment of the baseline information and potential effects, as well as implementation of liquid free power equipment, the operation of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS is concluded to have negligible effects on the aquatic environment.

Environmental protection during construction will be ensured by adherence to the site-specific Environmental Management Plans, as well as compliance with regulatory standards and guidelines. The Environmental Management Plan ensures that environmental protection will be achieved by requirements with respect to the environmental aspect specific to each site and the management of such aspects, including mitigation of environmental effects. The Environmental Management Plan will include the Erosion and Sediment Control Plan, Spills Emergency Preparedness and Response Plan, Hazardous Materials Management Plan and Waste Management Plan.

As these are existing generating stations and there are no plans to alter the flows and levels in the river, it is anticipated that the operating effects post redevelopment will be similar to the existing situation. The proposed redevelopments will be in full compliance with the Mattagami River System Water Management Plan.

As the Proposed Undertaking maintains these sites in their existing use with only minor changes to the actual layouts no changes to land use or human use in the areas around the generating stations are expected. The air and noise effects associated with the project are limited to the construction period and would be typical for construction sites. There are only a few receptors close to any of the generating stations and the site effects are to be managed by compliance with the local noise by-law and adherence to good construction practices.

It is estimated that there will be significant economic benefits to Timmins and Northeastern Ontario from the project. In Northeastern Ontario alone it is estimated the project expenditure will be $29-38M (million), resulting in a total sales of $51-$68M and total person years of employment to be in the range of 370-490. The Undertaking will also ensure the continuance of the existing employment associated with the facilities

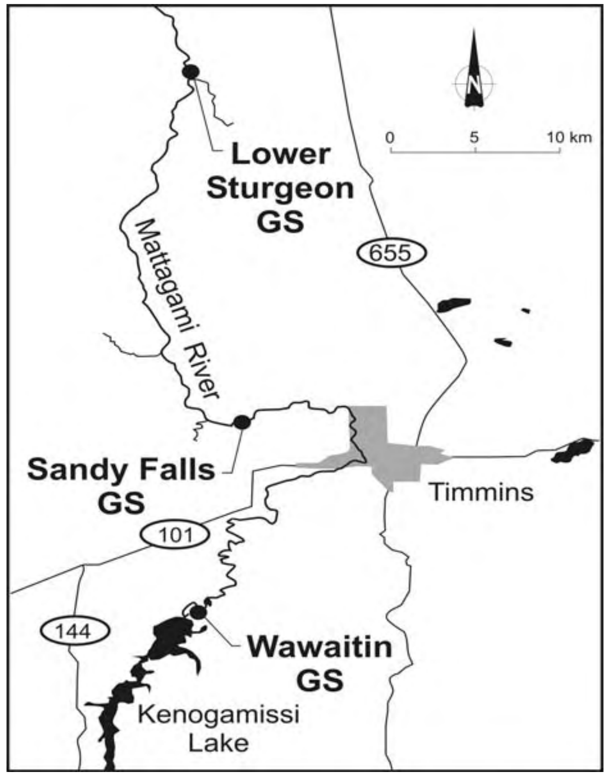
Due to the extensive prior disturbances, no significant archaeological features or sites of interest were recorded that will be impacted by the proposed redevelopments at the Wawaitin GS, Sandy Falls GS or Lower Sturgeon GS. While the powerhouses, penstocks and surge tanks are to be demolished at all three sites, the overall cultural landscape of the sites will remain, as these sites will remain in use as hydroelectric generating stations. The existing dams, weirs and intake canals are to remain with only minor refurbishments.

Overall Benefits of the Project

There are a number of overall benefits to the project: adding more clean renewable power to the Province's supply; ensuring the continuance of this existing source of power; reducing energy losses by providing power directly into the grid at the City of Timmins; freeing up a transmission corridor for other uses; benefiting the local and regional economy during construction of the facilities; and, ensuring the continuance of the economic benefits that currently flow from the facilities.

The benefits identified above can all be achieved while adhering to the existing approved Water Management Plan for the Mattagami River System. The overall environmental impacts associated with the project are expected to be temporary and minor. These impacts are associated with the construction phase and are mitigable.

1.0 INTRODUCTION



This Environmental Report (ER) is submitted to the Ontario Ministry of the Environment (MOE) by Ontario Power Generation Inc. (OPG) for review by MOE in order to redevelop the Wawaitin, Sandy Falls and Lower Sturgeon Generating Stations (GS) located near Timmins (Figure 1-1).

This ER has been prepared pursuant to the *Class EA for Modifications to Hydroelectric Facilities* and approvals requested in accordance with terms and conditions of the Class EA approval.

The Proposed Undertaking will involve the decommissioning and demolition of the existing powerhouses on each site and the construction of new powerhouses and associated equipment. There will also be some refurbishments and modifications made to the existing civil works such as the dams and weirs at each generating station.

This document is the product of over a year of extensive study and consultation with First Nations, the general public and government agencies. The environmental assessment (EA) was prepared by SENES Consultants Limited (SENES) with the assistance of OPG and a number of sub-consultants. The EA process was conducted in accordance with the terms of the *Class EA for Modifications to Hydroelectric Facilities*.[1]

Other permits, approvals and clearances will be sought as the project moves into the Design-Build stage. Section 8 of this report identifies a full range of possible approvals required; however, specific permits and approvals will likely be required under the Lakes and Rivers Improvement Act, Environmental Protection Act and clearances under the Federal Navigable Waters Protection Act. The Department of Fisheries and Oceans (DFO) has already provided letters of advice for works at all the generating stations.

[1] Ontario Hydro. Class Environmental Assessment for Modifications to Hydroelectric Facilities Prepared under the Ontario Environmental Assessment Act. Second Submission Approved in August 1993. Approval granted through 2008.

OPG will be using a Design-Build Contractor (DBC) approach to these projects. A short list of contractors has already been identified and OPG plans to obtain approval to move to the execution phase from Board of Directors in early summer 2007, with construction commencing shortly thereafter.

2.0 UNDERTAKING

2.1 PURPOSE OF THE UNDERTAKING

The purpose of this Undertaking is to redevelop the existing Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS located on the Upper Mattagami River. These generating stations have been in operation as run-of-the river facilities for over 90 years and are all at the end of their designed service life. These three generating stations operate at 25 cycles and therefore the power produced cannot be used locally in Timmins and instead must be transmitted to Sudbury in order to convert the power to 60 cycles and then be injected into the power grid. Significant energy losses occur during the process of transmitting and converting the 25 cycle to 60 cycle power. All three facilities are in need of structural and electrical/mechanical repair.

Further, Ontario Power Generation Inc. (OPG) has a mandate from the Government of Ontario to expand, develop and/or improve its hydroelectric generation stations there by increasing their capacity. These projects will increase power production from approximately 19 to 35 megawatts (MW) without making any changes to the approved Mattagami River System Water Management Plan.

2.2 DESCRIPTION OF THE UNDERTAKING

OPG is proposing to redevelop its three existing hydroelectric generating stations on the Upper Mattagami River. The three stations are: Wawaitin GS located within the City of Timmins, Sandy Falls GS located within the City of Timmins and Lower Sturgeon GS located in an unincorporated area north of Timmins.

The Proposed Undertaking involves: the decommissioning and removal of the existing powerhouses and associated equipment such as the penstocks and surge tanks; the construction of new powerhouses and penstocks and at Sandy Falls, a new water canal; installation of necessary equipment; refurbishments to dams, weirs and other civil structures; and, installation and removal of temporary facilities for construction such as cofferdams and laydown areas.

The proposed facilities will be connected to the Local Distribution System in Timmins at 27.6 kV. In the case of Wawaitin and Sandy Falls, after the newly-built facilities are placed in commercial operation, the existing powerhouses and associated water conveying and electricity connection facilities would be decommissioned and demolished. In the case of Lower Sturgeon, the existing powerhouse will be decommissioned and demolished, and the proposed powerhouse built in the existing footprint.

A full description of the Proposed Undertaking occurs in Section 4.

3.0 ALTERNATIVES

A number of alternatives to the Proposed Undertaking were considered during the environmental assessment. Alternatives are categorized according to the terms of the Ministry of Environment's *Class Environmental Assessment for Modifications to Hydroelectric Facilities Prepared under the Ontario Environmental Assessment Act* (Ontario Hydro, 1993). A description and assessment of the five alternatives to the Proposed Undertaking is presented in Section 3.1. Section 3.2 discusses the alternative methods of carrying out the Proposed Undertaking.

3.1 ALTERNATIVES TO THE PROPOSED UNDERTAKING

All alternatives were evaluated using economic, technical and environmental considerations. It should be noted that with each generating station the dams and weirs remain the same as present with refurbishments in order to address dam safety and longevity of the structures.

For the alternatives being evaluated, costs included initial capital costs and lifetime operating and maintenance costs. For the retirement alternative, costs included capital associated with dismantling and sealing the station in order to leave the site in a safe condition. For all alternatives, benefits included the power and energy which result from the undertaking. All estimates of cost used in this evaluation are subject to change as OPG's forecasts of cost escalators, interest rates and the value of system power and energy are updated regularly.

Technical considerations included the existing operating constraints in the area (e.g., water levels, flows), the transmission incorporation requirements, construction requirements, the condition and efficiency of the existing civil structures and electrical and mechanical equipment, and the layout of the site.

Environmental factors examined for each alternative included elements of the biophysical environment, as well as the socio-economic environment. Examples included the aquatic environment, wildlife, botanical resources, resource and recreational uses, and heritage resources. A key area of concern was the potential effect of the various alternatives on existing fish habitat in the area.

All alternatives will maintain the existing water levels upstream and downstream of the generating stations within their current range of fluctuation and as stipulated by the Mattagami River System Water Management Plan. OPG operates within allowable operating elevations, and will continue to do so under the redevelopment scenario.

Alternatives to the undertaking were examined for each of the three project proposals including:

- The "Do Nothing" or Null Alternative

- Retirement of Power Generating Facilities
- Facility Life Extension at 25 Hz(30 Years)
- Frequency Conversion to 60 Hz (30 Years)
- Facility Redevelopment (90 Years)

3.1.1 The "Do Nothing" or Null Alternative

This alternative is to "do nothing", i.e., to continue operating the station and water control structures with no action other than regular maintenance and repairs to the generating equipment upon failure.

The existing powerhouses are at the end of their design life. In addition to being inefficient by current standards, the equipment is at the end of its useful life and the civil structures (dams and weirs) are in poor shape.

This alternative would do nothing to reverse the escalation in maintenance costs and forced outages which are expected to increase as the equipment and civil structures continue to age. It is expected that in a short period of time a major generating component would fail in a catastrophic mode and render the generating facility inoperable. Energy production would cease and the facility would be limited to simply a water control structure. It provides no opportunity to improve station efficiency, to optimize the available water resource at the site for power generation, or to ease the Province's need for more electricity by a clean renewable source.

The null alternative is essentially a deferment of a decision to exercise another alternative. In the case of existing stations, this is considered unacceptable from reliability and cost points of view and does not meet the purpose of optimizing the available water resource at the site. No environmental benefits to "doing nothing" at the sites were identified. In fact, given the age of the powerhouses there is an increased likelihood that something may go wrong and therefore the potential, albeit small, for a risk to the environment from an unforeseen accident.

3.1.2 Retirement of Power Generating Facilities

The retirement of facilities includes all activities necessary to discontinue production in the existing powerhouses. It would involve removal of the equipment and removal or blockage of the intakes. In the case of Lower Sturgeon the powerhouse would be replaced by a dam.

Although small in scale, the replacement of lost power from the existing stations by other facilities will incrementally increase environmental effects elsewhere, depending on the source and nature of power generation. Assuming that the energy from these stations would be replaced by fossil generation, the corresponding emissions emitted into the atmosphere annually would be:

- 105,000 tonnes of CO_2,
- 397 tonnes of SO_2
- 91 tonnes NO,
- 488 tonnes Total Acid Gas and
- 35 tonnes Particulates.

Retiring these facilities would not support the Provincial Policy of encouraging more power generation from clean and renewable sources.

The retirement of the three facilities would result in fewer employment and purchasing opportunities associated with the existing generating stations. This would have a negative economic effect on the City of Timmins and the Northeastern Ontario economy as well as a negative social effect on the displaced workers.

It was determined that there would be no substantial technical, economic or environmental benefits to retiring the stations. Furthermore, there would be negative economic and environmental consequences as the existing power would be lost and would most likely be replaced by non-renewable resources. As this decommissioning alternative foregoes the economic contribution made to the OPG electrical system by the stations and offers no substantial environmental or technical benefits, retirement of the stations was considered unacceptable.

3.1.3 30 Year Facility Life Extension at 25 Hz

This alternative involves carrying out a major work program to restore the generating facilities to a condition suitable for a further 30 years of operation. The station capacity and energy production would be approximately equal to historical values. Water to Wire equipment and auxiliaries would be rehabilitated and the powerhouse civil structures would be rehabilitated (excluding dam repairs).

The costs for upgrades to extend the life of the facility at 25 cycles (25 Hz) are somewhat comparable to those for upgrades to extend the life of the facility with a frequency conversion to 60 Hz and these capital costs will be very high. Life Extension in this alternative would also not result in any increase in capacity or annual energy.

For the three facilities on the Upper Mattagami River, the annual operating, maintenance and administration costs under this alternative are estimated to be the same as in the case of the Null Alternative. Improvements to the Hydro One facilities could include the installation of a new frequency converter into the existing facilities, resulting in a reduced risk of equipment failure and a reduction in Hydro One's annual OM&A costs from the Null Alternative cost. Line losses with this alternative are estimated to drop 39% from 17.6% to 10.7%, representing a significant corresponding monetary saving to the ratepayers of Ontario.

From a technical point of view, this alternative returns inefficient generating units to service using old technology for an extended period. Some uncertainty would exist regarding the expected life of some of the components in the turbines and generators. Sudden failure could result in unplanned unit retirement or long outages for repairs. This alternative would also require OPG to re-assess other modification alternatives (e.g., retrofit or redevelopment) in 20 to 30 years from now.

Environmental effects of this alternative are predicted to be minimal, with short-term effects associated with construction activities. Operating patterns are predicted to be identical to the existing condition. Upon consideration of the economic, technical and environmental aspects of this alternative, the rehabilitation alternative is not preferred.

3.1.4 Frequency Conversion to 60 Hz

Converting hydroelectric facilities from 25 cycles (25 Hz) to 60 cycles (60 Hz) requires a limited modernization for them to be compatible with Ontario's electrical generation and transmission system.

Although the generators and transformers will be replaced in this alternative, the risk of problems with the older turbines and other systems still remain. Additional concerns include the higher costs of running a number of new generators, rather than a single generator (or fewer generators), which may be used in other alternative options. There is also a lost opportunity cost associated with significantly increased efficiency, capacity and energy production.

Overall, this alternative represents considerable capital investment with a small increase in capacity from the three facilities of only 2 MW, and energy production increase of only 10.3 GWh annually. The conversion to 60 cycles is a more favourable option than the other life-extension alternatives without conversion as it decreases annual OM&A costs, increases the capacity and energy output of the stations, and more significantly decreases line losses. Minor upgrades to the Timmins Transformer Station will be required, but will reduce the risk of future equipment failure while lowering Hydro One's annual OM&A costs.

Environmental effects of this alternative are predicted to be minimal, with short-term effects associated with construction activities. This alterative does not assist the Province in obtaining more clean and renewable power from an existing source. Although this alternative is superior to the three alternatives discussed above it is not the preferred alternative.

3.1.5 90 Year Facility Redevelopment

Redevelopment involves the construction of new powerhouses and making refurbishments to the civil structures such as the dams to address dam safety concern, and longevity of the structures. This was identified as the preferred alternative for the Upper Mattagami River sites, based on economic, technical and environmental considerations.

Technical advantages of this alternative include the much greater capacity to make more efficient use of the available water resource at the site, optimization of the operation of the hydroelectric facilities with the other hydroelectric facilities on the river system, and the opportunity to install more modern, automated and efficient generating unit(s). Overall, the redevelopment alternative will increase the sum capacity from these three generating stations from 19 MW to 35 MW, enabling them to produce additional clean, renewable power for the Province. Furthermore this power can be produced from water rather than through fossil generation and thus not contributing acid gas, particulates and carbon dioxide to the environment.

This redevelopment alternative results in a direct connection to the local distribution system in the Timmins area. At present these stations must transmit power from Timmins to Sudbury where the power can be stepped up to 60 Hz. This alternative will significantly reduce the energy losses due to the transmission of energy from Timmins to Sudbury while at the same time freeing up this transmission corridor for other uses. As well, the 27kV connection into the local grid will produce an additional socio-economic benefit by providing a better level of security to the Timmins area in the event of a large power outage.

Environmental effects of redevelopment may be greater than that of a life extension alternative but short-term in nature, minor, temporary and mitigable. Noise, air and socio-economic effects on the human and natural environments are considered to be very minor, temporary and mitigable. Effects on the fish and aquatic biota will also be minor and temporary are also considered to be within the realm of mitigable and acceptable effects. Long-term environmental effects are predicted to be minimal because the existing total discharge pattern and associated range of water level fluctuations are not predicted to change. Once completed, the Sandy Falls GS would maintain the EcoLogo certification As well; having new powerhouses in place with modern equipment lessens the risk of any potential environmental impact through operations.

This alternative also has broader socio-economic benefits for Timmins and Northeastern Ontario. The redevelopment of these facilities will guarantee that the existing employment and other economic benefits associated with the operations of these facilities will be perpetuated in the future. As well, the redevelopment of the facilities (i.e., construction activities) is expected to have a temporary but significant benefit to the economy of Timmins and Northeastern Ontario.

Redevelopment will result in the installation of new, safe and efficient generating units, which will provide power and energy benefits to Ontario consumers for the next 90 years.

Redevelopment was determined to be technically and environmentally sound, and to have substantial economic benefits over the other alternatives. For these reasons it was determined to be the preferred alternative.

3.2 ALTERNATIVE METHODS OF CARRYING OUT THE UNDERTAKING

The Environmental Assessment Act (EAA) requires the identification and evaluation of alternative methods of carrying out the undertaking. This was done during OPG's concept and definition phases for the Upper Mattagami site redevelopments. This section describes the alternative methods of carrying out the redevelopment of the Upper Mattagami sites, and the reasons for choosing the preferred methods.

Alternative ways of carrying out the undertaking which were examined included: station location options; water conveyance options; and power options [the number of units, the type of unit and the capacity for the unit(s)]. Economic, technical and environmental factors were considered in selecting the preferred alternative for each site. These are discussed below.

It should be noted that for all three generating stations, the dams and civil structures will remain in their existing locations but refurbishments will be undertaken in order that they address dam safety requirements and longevity of these structures.

3.2.1 Wawaitin GS

Location Options

The physical characteristics of the site and the economic benefits associated with operation of the existing generating station while the new facility is being constructed resulted in selecting the option of building the new powerhouse next to the exiting one and discharging the water to the existing tailrace.

Power Generation and Water Conveyance Options

Once a decision was made on the location of the new powerhouse an assessment was conducted on the options for the penstock and an optimization exercise was carried out to select the final size (capacity) of the station.

The optimization exercise looked at potential station capacities of 11, 13.5, 15, 16 and 18 MW. The following table summarizes these power capacities and the resultant annual power generation increase for each of the five options for Wawaitin GS. Option 3 was selected as the preferred alternative.

Table 3-1: Total Power Capacity and Annual Power Generation for Wawaitin

Power Option	Installed Capacity		Annual Generation	
	MW	% Increase	GWh	% Increase
1	11.0	3.7	72.7	33.6
2	13.5	27.1	78.0	43.3
3	15.0	41.5	80.4	47.8
4	16.0	50.9	81.0	48.9
5	18.0	69.8	82.9	52.4

The new turbines will be able to use rated flows of 45 m^3/s, an increase of 12.5% over the present flows of 40 m^3/s. Two 7.5 MW vertical Francis turbine/generator sets were selected as the preferred option.

Two penstock alternatives were evaluated. The first looked at utilizing the existing penstock to supply the water to the new powerhouse and the second looked at constructing a new penstock to supply the new units. Based on the economics of the project and the condition of the existing penstocks a decision was made to construct a brand new penstock with similar life expectancy to the new powerhouse.

As the new powerhouse is located adjacent to the old one, decommissioning and demolition of all existing, non-required facilities would be required.

The existing dams, intake canal, access roads, parking lots and other facilities remain in their existing layouts with refurbishments made to the dams and canal for safety and economic reasons.

Environmental Effects

The environmental effects of all of the capacity options will involve the decommissioning of the present powerhouse and associated penstocks and surge tanks, and minor disturbance to the property (minor loss of vegetation, etc.) for the new site facilities. Other environmental effects of these alternatives would be temporary and mainly related to the effects of cofferdams (in the intake canal and at the tailrace) on the aquatic environment. The full description of effects and proposed mitigation measures is outlined in Section 6.

This alternative largely mimics the existing generating station in its historic layout and the additional impact on the environment is in areas already disturbed by activities associated with the operation and maintenance of the generating station.

Project Costs

Capital costs vary with the capacity of the station, the number of units within the powerhouse and the complexity of the civil works associated with the plant.

Recommended Alternative

The preferred alternative was power option 3 with a single new penstock and powerhouse adjacent to the existing one. This alternative replaces the four existing turbine-generator units with two 7.5 MW vertical Francis turbine/generator sets with a single new penstock from intake channel to the powerhouse. This also involves replacing the existing powerhouse and tailrace with a new powerhouse located immediately adjacent to the west side of the existing one.

The existing spillways and dams are retained in their present location with some refurbishment.

3.2.2 Sandy Falls GS

Several redevelopment alternatives were considered at Sandy Falls GS.

Location Options

Four location options for the new powerhouse were considered including:

1. on the east side of the existing powerhouse between penstocks #1 and #2;
2. downstream of the existing powerhouse;
3. on the south side of the existing powerhouse using the existing tailrace; or
4. on the spillway dam.

Options 1 and 2 carry similar costs for civil structures, but different costs for penstock construction. Option 1 penstock construction will cost roughly 50% less than that of Option 2 as they will be half as long, although Option 2 presents easier construction access. Option 3 avoids the costs of digging a new tailrace, but involves the additional costs of constructing two new retaining walls on each side of the foundations of the old powerhouse. Option 4 represents the most complex construction logistics with difficult site access, and the added complication of working in water. Completely new intakes will also need to be built.

The existing powerhouse will be kept online during a short period of the redevelopment construction activities to maximize generation potential. Available generation capacity will depend on proximity of the new powerhouse to the existing one and the potential for disruption. Option 2 has the least potential for disruption, while Option 3 has the most. Option 1 has the lowest cost and projected energy generation. Options 2 and 4 carry higher construction costs and lower generation potential while Option 3 carries reduced generation revenues. Option 4 is struck as an option due to high costs and decreased generation potential.

Option 2 would result in the tailrace being located in a fish sanctuary and walleye spawning area. For this reason, option 2 was eliminated.

Option 1 is the preferred choice for siting the new powerhouse on the east side of the existing powerhouse. Given this location, further consideration to the design of the redeveloped facility is discussed below.

Power Generation and Water Conveyance Options

Once the location of the powerhouse was finalized a capacity optimization exercise looked at potential station capacities of 3.75, 5.43, 5.91, 6.5 and 7.0 MW. The following table summarizes the power capacity and the resultant annual power generation increase for the four options for Sandy Falls GS.

Table 3-2: Total Power Capacity and Annual Power Generation for Sandy Falls

Power Option	Installed Capacity		Annual Generation	
	MW	% Increase	GWh	% Increase
1	3.75	25	27.1	48.0
2	5.43	81	32.3	91.0
3	5.91	97	33.1	95.8
4	6.5	116	34.0	101.0
5	7.0	133	34.6	104.7

The new turbine will be able to use rated flows of 70 m^3/s, an increase of 63% over the present flows of 43 m^3/s.

Due to the selection of a single unit at Sandy Falls and the flow variability throughout the year a vertical Kaplan turbine is recommended for Sandy Falls GS.

Three design alternatives were also considered for channelling water to the Sandy Falls powerhouse including:

- two new penstocks (3.87m diameter and 106 m long buried steel);
- one single penstock; and
- a concrete power canal - 124m long by 8.6m high by 7.9m wide.

Although the penstocks options are less expensive, the power canal results in substantially reduced head losses and as a result increased power and energy production. Based on the overall economics the power canal is the preferred alternative. There is no discernable difference among the options with respect to the environment.

Environmental Effects

The environmental effects of the all site alternatives will involve the decommissioning of the present powerhouse and associated penstocks and surge tanks, and additional disturbance to the property (loss of vegetation, etc.) for the new site facilities. Options 1 and 3 use largely the same existing tailrace thereby eliminating potential long-term fish habitat affects. The new tailrace proposed with Option 2, however, is located in a known walleye spawning area and therefore will have the greatest impact on fish. The relocation of the tailrace for Option 4 would result in the loss of historical flows provided by the former powerhouse in that section of the river. Other environmental effects of these alternatives would be temporary and mainly related to the effects of cofferdams (at intake and at tailrace) on the aquatic environment.

This alternative largely mimics the existing generating station in its historic layout and the additional impact on the environment is in areas already disturbed by activities associated with the operation and maintenance of the generating station.

Recommended Alternative

The preferred alternative involves power option 2, placement of the new powerhouse on the east side of the existing powerhouse between penstocks #1 and #2 (and penstocks) and a water canal. This alternative will involve the replacement of the three current turbines with a new single vertical Kaplan turbine/generator set rated at 5.5 MW. The existing dam, intake structures and headworks will also be refurbished as part of the redevelopment.

3.2.3 Lower Sturgeon GS

Location Options

Two options were considered at Lower Sturgeon.

1. Relocate the powerhouse and install two new 7.0 MW Kaplan turbines generating units to replace the existing vertical propeller units; or
2. Replace the powerhouse in the same location and install two new 7.0 MW vertical Kaplan turbines generating units to replace existing turbines.

After a detailed technical review of both alternatives it was determined that building a new powerhouse next to the existing structure was not technically feasible. A small section of the earth filled dyke would remain in place between the two structures and this would cause a weak link from a dam safety perspective. In addition, the existing powerhouse would have to be converted into a gravity dam at a significant expense.

Capital Costs

Capital cost issues for Lower Sturgeon are the same as with the other two facilities, and as a result, vertical Kaplan units were recommended since they are more efficient over a greater range of water flows.

Power Generation Options

Of the redevelopment options for Lower Sturgeon, loss of power generation during construction is only a factor in Option 2. During this period of refurbishment, the facility will be out of service. In Option 1 the existing facility would remain in service during construction of the new facilities.

Once the location of the powerhouse was finalized a capacity optimization exercise looked at potential station capacities of 7.3, 8.9, 10.5, 12 and 14 MW. The following table summarizes these power capacities and the resultant annual power generation increase for the three options for Lower Sturgeon GS.

Table 3-3: Total Power Capacity and Annual Power Generation for Lower Sturgeon

Power Option	Installed Capacity		Annual Generation	
	MW	% Increase	GWh	% Increase
1	7.3	37.7	52.0	40.4
2	8.9	67.9	56.2	51.3
3	10.5	87.5	59.5	60.1
4	12	114.2	62.1	67.8
5	14	150	65.0	75.6

The new turbine will be able to use rated flows of 120 m^3/s, an increase of 140 % over the present flows of 50 m^3/s.

Environmental Effects

The environmental effects of the preferred Option 2 are considered to be least of all the alternatives. While it will result in the loss of the present powerhouse, the overall cultural landscape of the Generating Station will remain in-tact. The disturbance to the property will be limited to only minor and temporary effects during construction (e.g., for construction laydown areas). The location of the tailrace in this option remains the same whereas for others it would result in the loss of historical flows provided by the former powerhouse in that section of the river. Other environmental effects of these alternatives would be temporary and mainly related to the effects of cofferdams (at intake and tailrace) on the aquatic environment, possibly affecting fish spawning in tailrace.

Recommended Alternative

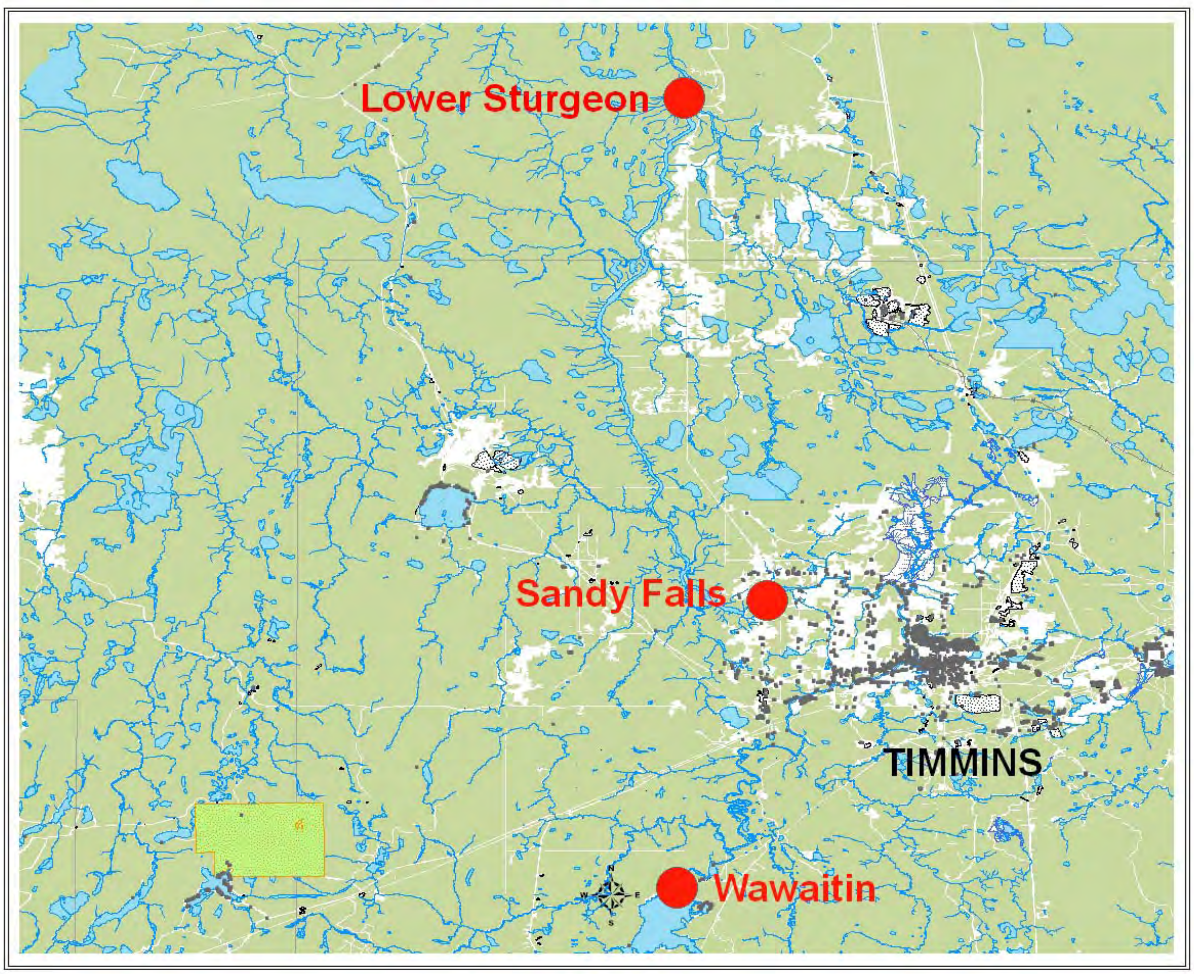
The preferred alternative is to build a unit intake and powerhouse using the existing footprint and power option 5, which involves replacing the existing two vertical propeller turbines and generator with a two vertical Kaplan units rated at 7.0 MW each. The existing civil structures will also be refurbished with this alternative.

4.0 DESCRIPTION OF THE EXISTING AND PROPOSED GENERATION FACILITIES

4.1 INTRODUCTION

Ontario Power Generation Inc. is proposing to redevelop three hydroelectric generating sites on the Upper Mattagami River: Wawaitin GS and Sandy Falls GS are located within the City of Timmins and Lower Sturgeon GS, north of Timmins (see Figure 4-1). These facilities have been in operation as run-of-the-river plants for over 90 years and are all at the end of their designed service life. These three generating stations operate at 25 cycles; however, the power cannot be used locally in Timmins. Instead, it must be transmitted to Sudbury in order to convert the power to 60 cycles and then be injected into the power grid. This has resulted in significant energy losses during the process of transmitting and converting the 25 cycle to 60 cycle power. As well, all three stations are in need of structural and electrical/mechanical repair.

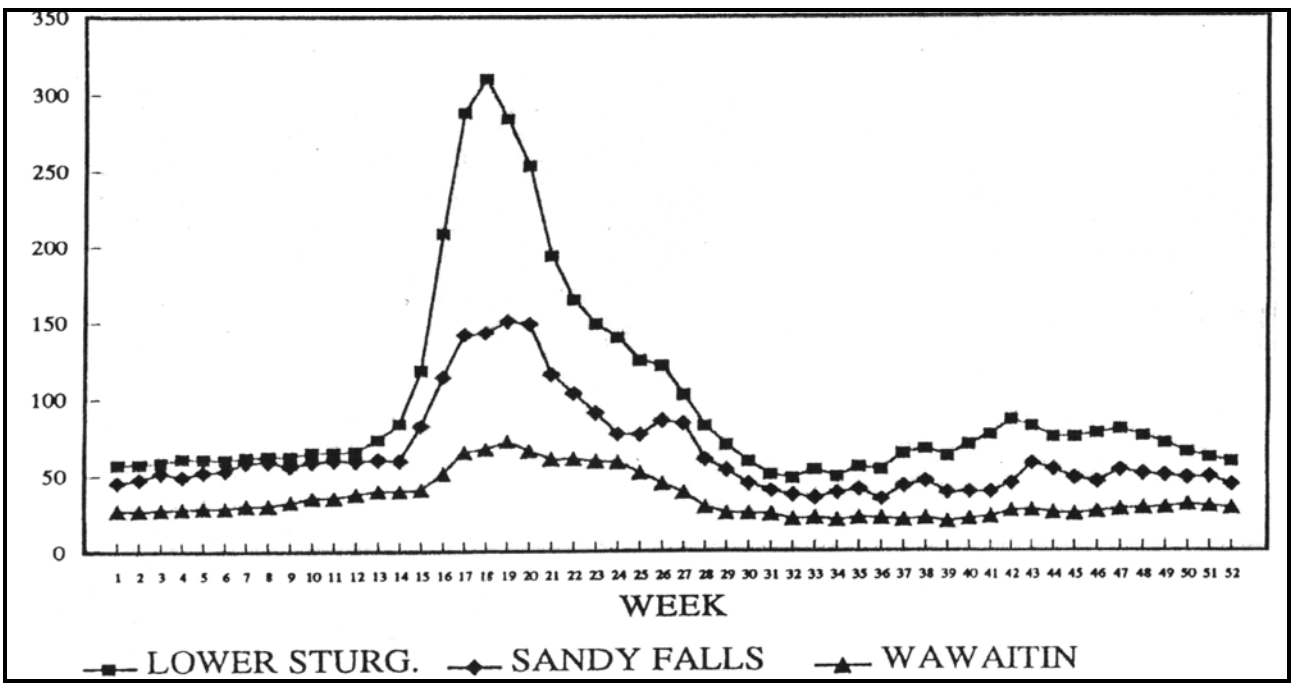
Figure 4-1: Location of Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS



The combined existing nameplate capacity of the three generating stations is 18.7 MW. The proposed undertaking involving the construction of new powerhouses and various associated infrastructure will provide a combined nameplate capacity of approximately 35 MW, an increase of approximately 85 %. Annual energy production will be improved from 108 GWh to 180 GWh, a 67% increase. A connection at 27.6 kV will be made with the local distribution system in the Timmins area.

As indicated above, the three generating stations on the Upper Mattagami River have operated as run-of-the-river plants. Figure 4-2 presents average weekly flow data for the three generating stations. Tributaries entering the Mattagami River between the furthest upstream Wawaitin GS and the furthest downstream Lower Sturgeon GS account for the much larger average flow at the downstream plants. The flatter curve for the Wawaitin GS reflects the greater ability and need to control spring runoff upstream of Timmins by using the control dams at Mattagami Lake and Kenogamissi Lake. The Sandy Falls GS and Lower Sturgeon GS are less able to regulate seasonal water flows.

Figure 4-2: Average Flow Data (m^3/s) for the Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS



As the plants are operated as run-of-the-river facilities, the potential for capacity increases is based on improved equipment efficiencies as well as improved utilization of the available water (less spill). The new facilities will continue to operate under the existing operating regimes that have been long established and more recently formalized in the approved Water Management Plan for the Mattagami River System (OPG *et al*., 2006).

In 2000, the Ontario Lakes and Rivers Improvement Act (LRIA) was amended to establish the statutory authority of the Ministry of Natural Resources (MNR) to order the preparation of Water Management Plans for operation of waterpower facilities and associated control structures and ensure compliance with the Plans. The intent of a Water Management Plan is to provide certainty and clarity as to how waterpower facilities and control structures are operated with respect to levels and flows so as to balance environmental, social and economic objectives.

The Water Management Plan for the Mattagami River system includes 18 waterpower structures and facilities located along the river system that have influence on levels and flows (OPG *et al.*, 2006). The Plan was the result of a partnership between OPG, the MNR and other private power producers which operate facilities along the river as well as First Nations and the general public, which participated in the form of various advisory committees.

The Water Management Plan was prepared in accordance with the Water Management Planning Guidelines for Waterpower (MNR, 2002). The Water Management Planning Guidelines were approved by the Minister of Natural Resources on 14 May 2002. The LRIA requires compliance by facility operators with the operating regimes established in the Water Management Plan for the Mattagami River System and a compliance monitoring program has been established for the Mattagami River.

4.2 WAWAITIN GENERATING STATION

4.2.1 Description of Existing Facilities

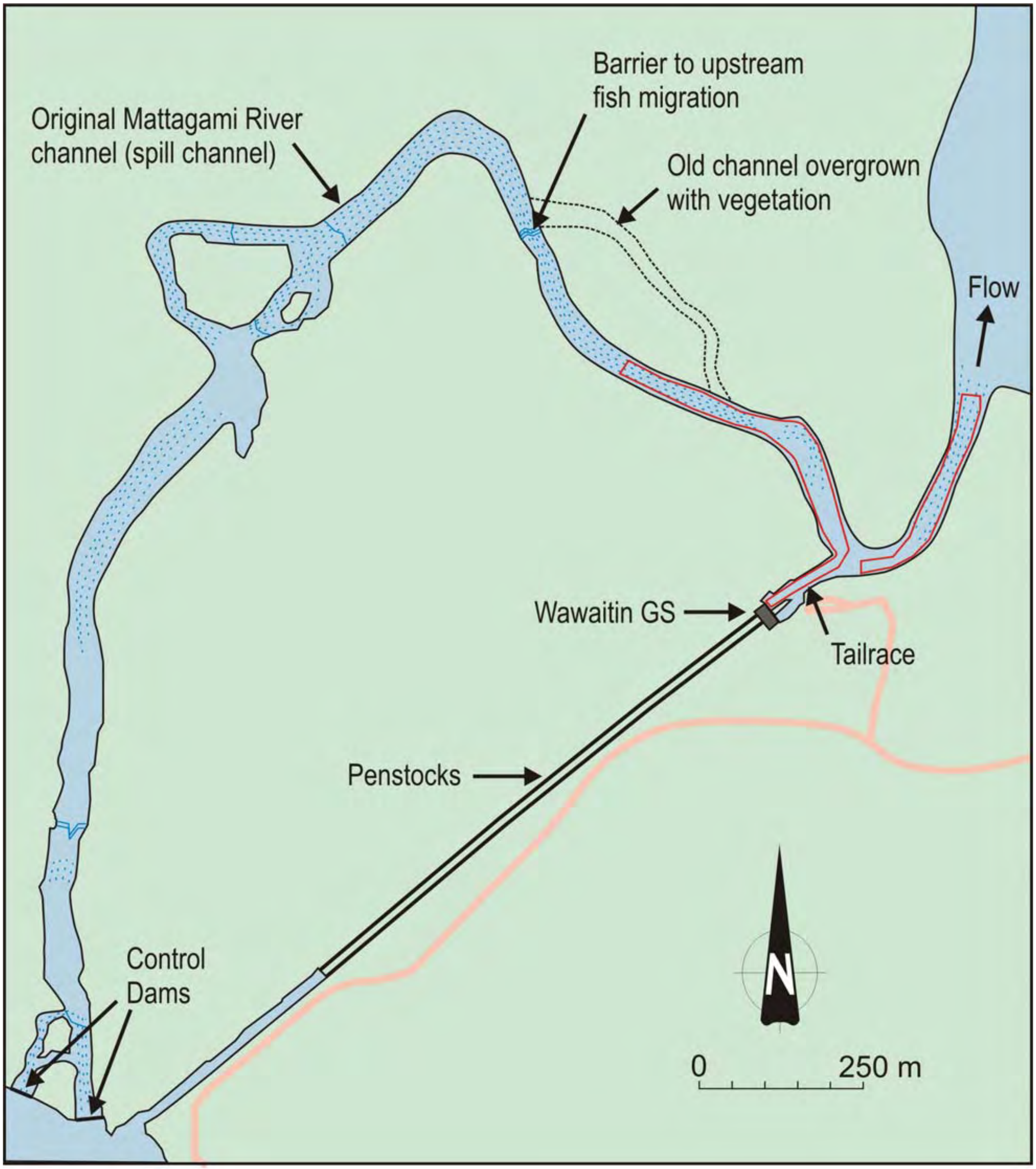
The 10.4 MW Wawaitin GS is located within the City of Timmins municipal boundaries approximately 25 km southwest of the urban centre (see Figure 4-1.). The plant, placed in service in 1912, is accessed by a municipal road. Photograph 4-1 depicts the Wawaitin GS.

Photograph 4-1: Wawaitin Generating Station

The Wawaitin GS has a main dam at the northern end of Kenogamissi Lake (see Figure 4-3) with two concrete control structures, which have a total of 12 sluices that have timber stoplogs and two stoplog lifters (KGS Group, 2003). The east and west control dams are 42.7 m and 29 m long, respectively. The two control dam sluiceways discharge into a spillway bypass channel which in turn discharges into the Mattagami River just downstream of the concrete powerhouse. The spillway is the original river bed which extends for a distance of approximately 2.6 km to the north of the intake canal and penstocks which convey water to the Wawaitin GS powerhouse.

The intake canal extends 360 m from Kenogamissi Lake to the intake structure (see Figure 4-3). The canal is 14 m wide, with concrete walls over its entire length on the north side and a boulder bank over most of its south side. Water is conveyed from the intake structure to the powerhouse via two 800 m long underground penstocks, consisting of 2.7 m diameter pipelines (one wood stave and the other fibre-reinforced plastic and steel). The two penstocks are connected to individual steel surge tanks part way to the powerhouse. Beyond the surge tanks, the two penstocks are split into four smaller separate steel penstocks with diameters ranging from 2.1 to 2.4 m leading to the four generating units located in the powerhouse. Water from the Wawaitin GS is returned to the Mattagami River via an approximately 115 m long tailrace.

Figure 4-3: Current Facilities, Wawaitin Generating Station



4.2.1.1 Operating Pattern

The Wawaitin GS depends on upstream storage at the Kenogamissi Lake and Mattagami Lake control dams and has a relatively small upstream drainage area of 3,527 km^2 (KGS Group, 2003). Based on recently completed Dam Safety Analysis (based on 1999 MNR Guideline), the total Inflow Design Flood, has been established as 1:100 year return period with a value of 381 m^3/s. The annual drawdown is a managed process with water spilled to supply downstream plants and to capture spring runoff. The two control dams spill water through the original river channel when flows exceed the 40 m^3/s capacity of the generating station, which occurs approximately 23% of the time. When flows are less than 40 m^3/s, the generating station is capable of taking all of the river flow.

The existing powerhouse is operated remotely. Plant operation is controlled to ensure optimal energy production, while satisfying concerns of Kenogamissi Lake cottagers regarding water levels and flooding concerns downstream at Timmins. Typically, water levels are not allowed to fluctuate more than 0.4 m in Kenogamissi Lake during the summer, with sufficient water passage through the Wawaitin GS and/or spilling to ensure adequate downstream supply to Timmins and the pulp and paper mill in Smooth Rock Falls. Water level fluctuations must all be in compliance with the Water Management Plan for the Mattagami River System (OPG *et al.*, 2006).

4.2.2 Description of Proposed Facilities

The proposed Wawaitin powerhouse is planned to be located adjacent and to the north of the existing powerhouse (see Figures 4-4 and 4-5). The proposed Wawaitin powerhouse will have two Francis generating units with a total nominal capacity of 15 MW.

Water in the existing intake canal would be conveyed through a new intake structure via a new 850 m long steel penstock to the new powerhouse. This penstock will be buried parallel to and north of the existing twin penstocks that feed the existing Wawaitin GS.

A new tailrace section, approximately 10 m wide, 7 m deep and 30 m long, will be excavated from the new powerhouse to the existing tailrace to facilitate return of water from the proposed Wawaitin GS.

Geotechnical studies at the new powerhouse, along the new penstock and tailrace locations have been undertaken. These studies indicate an overburden depth of about 1.4 to 17 m (Hatch Acres, 2006). With an approximate tailrace section depth of 7 m, limited blasting of the bedrock will likely be required for the construction of the new powerhouse. On-land excavation will terminate back of the shoreline to provide a barrier for water intrusion. This plug will be removed after nearshore excavation is completed.

Water depth in this existing tailrace segment is approximately 2.5 m (Coker and Portt, 2006a), necessitating excavation of the shoreline to accommodate water discharge from the deeper new tailrace section. Coker and Portt (2006a) reported that the existing tailrace segment has a bottom of cobble, boulder, gravel and sand. Sediment depth to bedrock is unknown, but is expected to be shallow.

Figure 4-4: Proposed Facilities, Wawaitin Generating Station

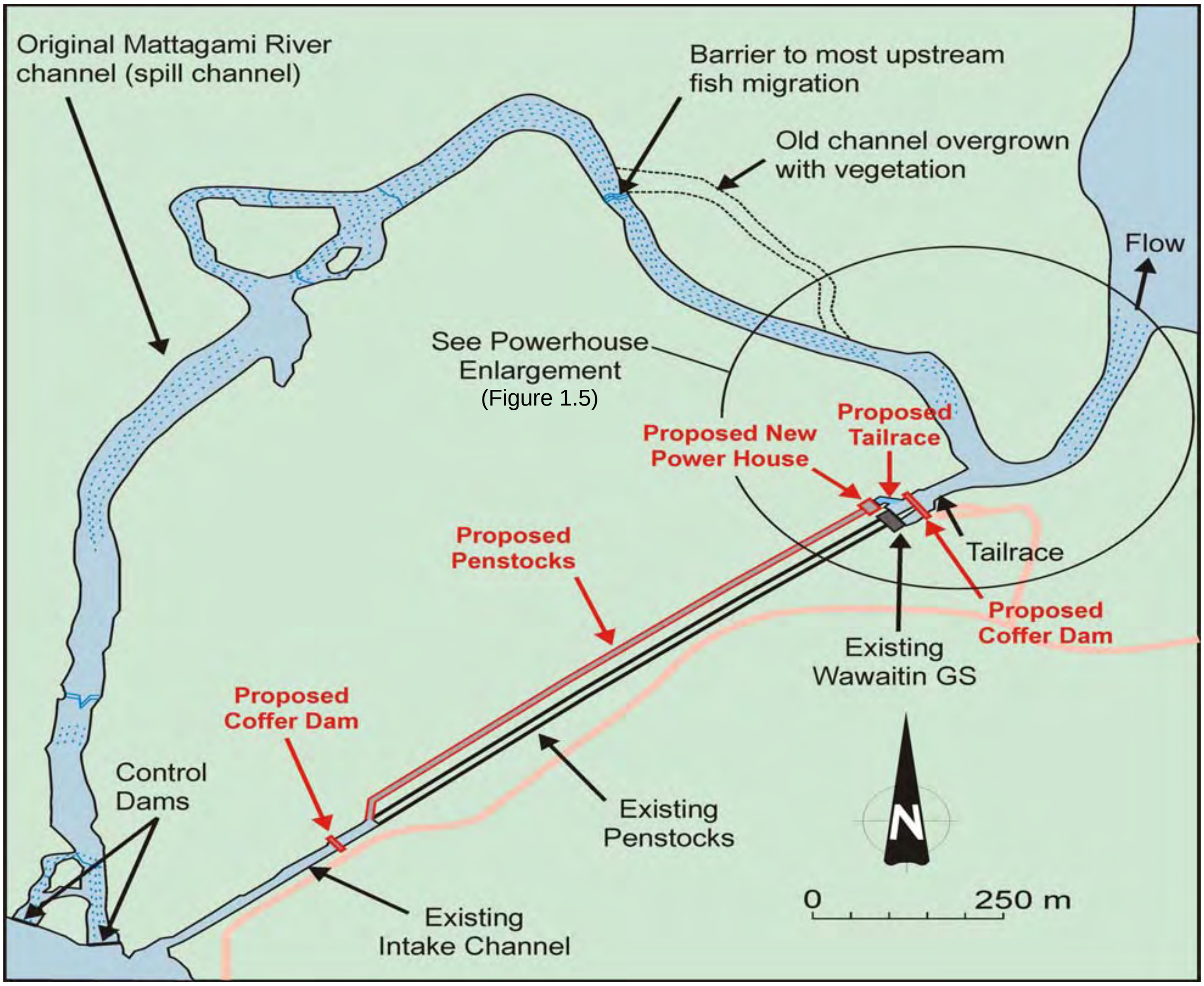
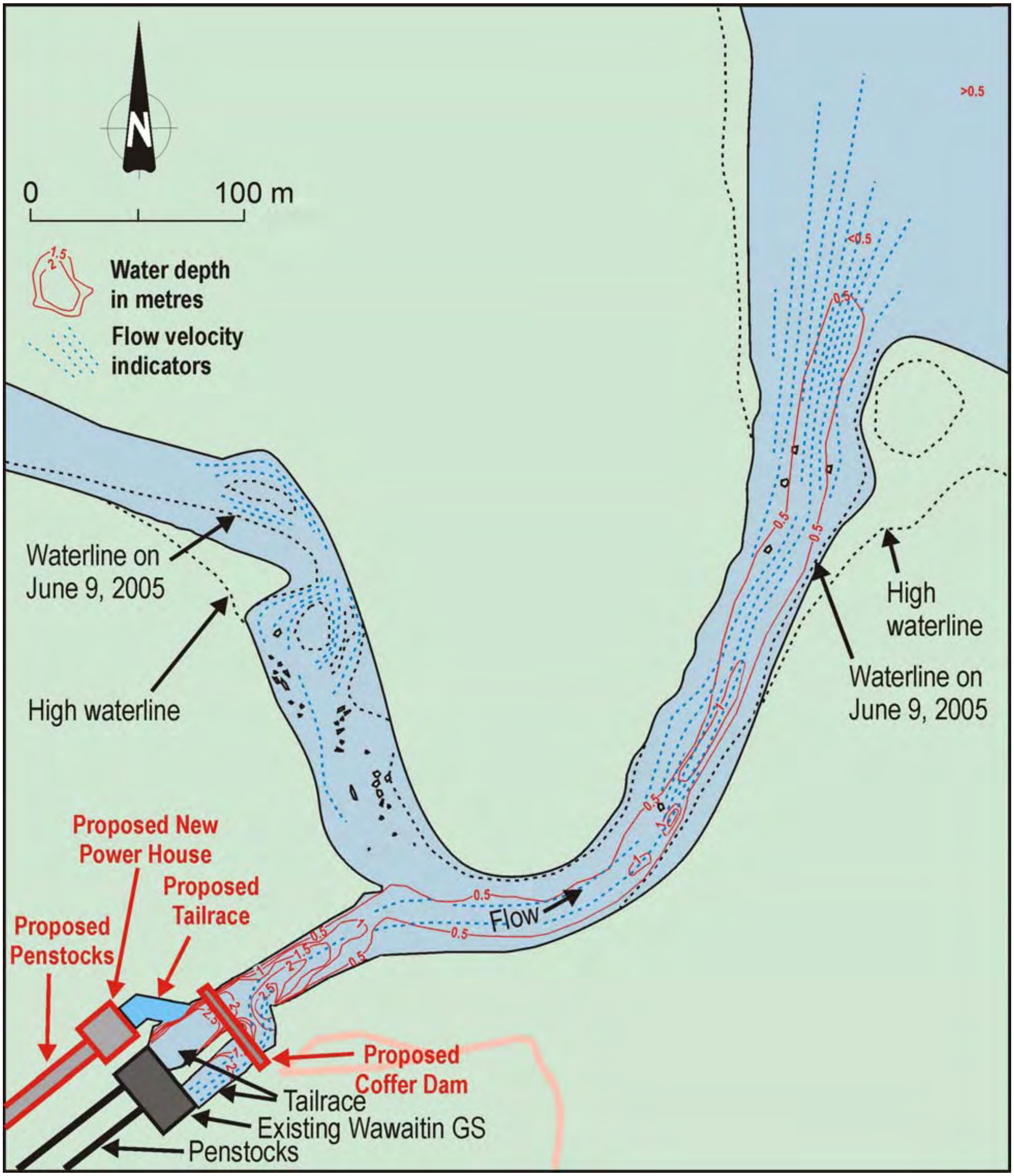


Figure 4-5: Proposed Facilities, Wawaitin GS Powerhouse



A temporary cofferdam will be constructed around the tailrace segment to be excavated (see Photograph 4-2). Once the cofferdam is constructed, the area enclosed by the cofferdam will be de-watered to facilitate nearshore excavation. Blasting of the bedrock will likely be required with the rock fragments removed by backhoe. Once excavation is completed, the shoreline plug will be removed. The cofferdam is expected to be in place approximately 12 to 14 months and is estimated to dewater an area of about 0.3 ha (2,950 m^2). The approximate location of the cofferdam is indicated on Photograph 4-2.

Photograph 4-2: Proposed Cofferdam Location in Wawaitin GS Tailrace

The main dams, intake canal and spillways and associated equipment are in good condition but some refurbishment is required. There is a need to de-water a portion of the intake canal to undertake the construction of the new intake and the conversion of the old intake into a gravity structure and also to remove the remnants of an obsolete structure that is impeding the flow of water into the canal. This cofferdam will be in place from three to six months and is estimated to dewater an area of approximately 630 m^2 (0.06 ha). The approximate location of this temporary cofferdam is indicated on Photograph 4-3.

Water in the existing intake canal would be conveyed through a new intake structure via a new steel penstock about 850 m in length to the new powerhouse. This penstock will be buried parallel to the north of the existing twin penstocks that feed the existing Wawaitin GS.

The proposed facilities will be connected to the local Hydro One distribution system at 27.6 kV to feed into the Ontario electricity grid.

Upon completion of the new generating station, the existing powerhouse with its four Francis generating units will be decommissioned and all sections of the structure above grade will be removed. Existing surge tanks and aboveground penstock sections will be removed. The buried penstock sections will be excavated. The obsolete electrical switching equipment and transformers will also be removed.

Photograph 4-3: Proposed Cofferdam Location in Wawaitin GS Intake Canal

Table 4-1 provides a summary of the existing and proposed plant operating characteristics. The gross head, i.e., the difference in elevation between the water surface at the intake and the tailrace, will remain the same. However, the rated flow through the Wawaitin GS will increase from 40 to 45 m^3/s, decreasing the frequency of river bypass (spill) from approximately 23% to 10% of the time. Overall, downstream river flows will not change from historical operations. The facility will continue to operate as a run-of-the-river site.

Table 4-1: Existing and Proposed Plants Operational Summary

Parameter	Wawaitin GS		Sandy Falls GS		Lower Sturgeon GS	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
Number of Units	4	2	3	1	2	2
Capacity (MW)	10.4	15	3.0	5.5	5.3	14
Annual Energy Production (GWh)	54.4	81	16.9	32	37.0	65
Gross Head (m)	37.8	37.8	9.6	9.6	12.9	12.9
Rated Flow (m^3/s)	40	45	44	65.4	56	123
Capacity Factor (%)[1]	59.7	57.0	85.0	66.0	79.0	66.0

[1] Ratio of the actual energy produced to the maximum energy which could be delivered under continuous operation at maximum rating.

4.3 SANDY FALLS GENERATING STATION

4.3.1 Description of Existing Facilities

The 3 MW Sandy Falls GS is located within the Timmins municipal boundaries approximately 10 km northwest of the urban centre (see Figure 4-1). The plant, placed in service in 1911, is easily accessible by municipal roads. Photograph 4-4 depicts Sandy Falls GS.

The Sandy Falls GS receives water upstream of a 216 m long spillway weir dam across the Mattagami River (see Figure 4-6). The dam consists of an overflow spillway in two sections, two extremely small log chutes and a concrete intake structure (Gestion Conseil S.C.P. Inc., 2003). Water is conveyed to the powerhouse via three 150 m long steel penstocks (one 3.5-m diameter above ground and two 2.4 m diameter below ground) and three surge tanks. The powerhouse is a wooden frame structure with galvanized sheeting atop of a concrete foundation.

Photograph 4-4: Sandy Falls Generating Station

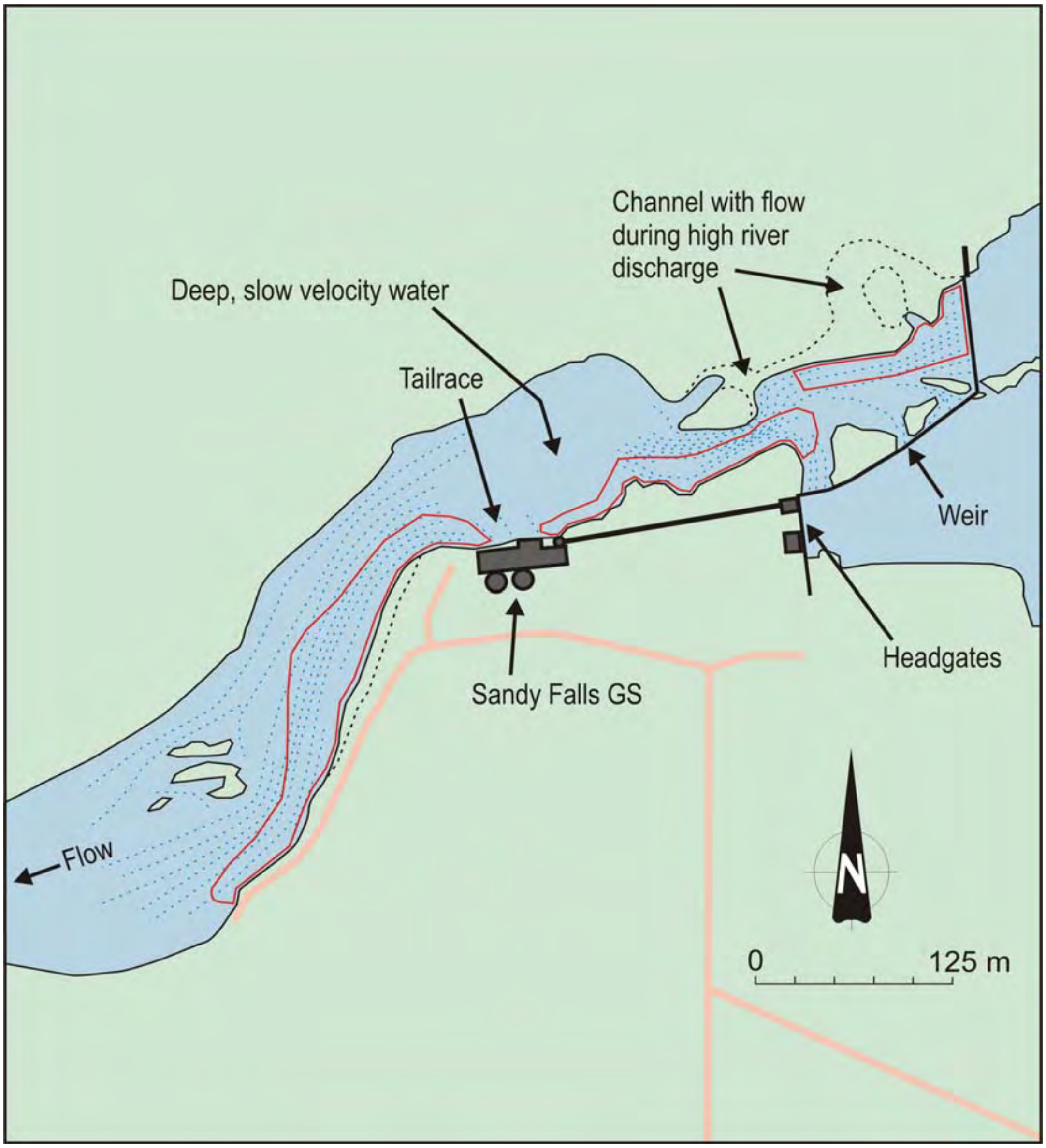
4.3.1.1 Operating Pattern

Excess water is spilled over the weir dam and through a set of rapids when flows exceed the 44 m^3/s capacity of the existing generating station. This occurs approximately 48% of the time. The water diverted through the Sandy Falls GS is returned to the river at a point between the upstream steep, mostly bedrock rapids below the weir dam, and the downstream gentler-sloped cobble, gravel and sand rapids.

The discharge capacity of the weir dam is provided by two free overflow spillway sections: the central spillway and the spillway wall of the intake canal. The total discharge capacity is 596.2 m^3/s.

As a run-of-the-river plant, the Sandy Falls GS utilizes available water only. Water levels in the headpond are not controlled by plant operation, but are the result of natural water level fluctuations and/or upstream controls and activities. Water levels are maintained to provide sufficient water for Timmins by drawing down the upstream storages when inflows drop in late summer.

Figure 4-6: Current Facilities, Sandy Falls GS

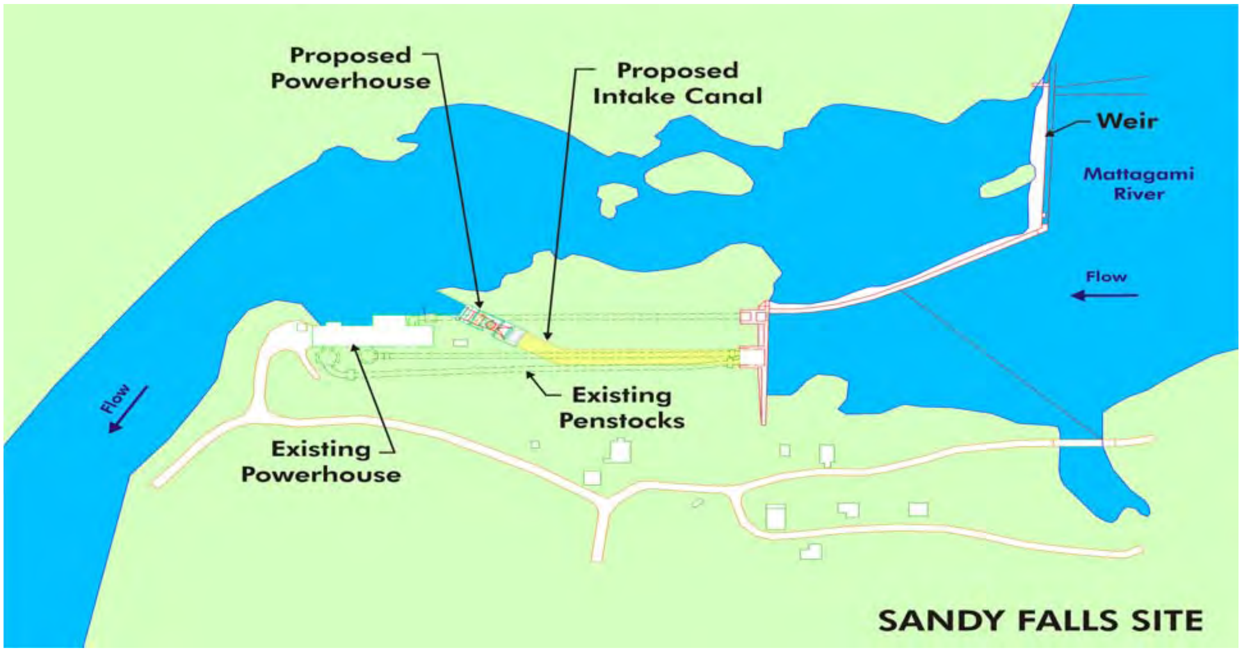


4.3.2 Description of Proposed Facilities

Initially, the new powerhouse was to be located to the west of the old powerhouse (Gestion Conseil S.C.P., Inc., 2003). However, based on a walleye spawning survey undertaken by Coker and Portt (2005a), it was determined that the originally proposed powerhouse discharge location would impinge on walleye spawning habitat.

As a result, an alternative site was selected (Gestion Conseil S.C.P., Inc., 2006) that would not impact the walleye spawning habitat. The proposed Sandy Falls GS is located adjacent to and east of the existing powerhouse (Figure 4-7). The new powerhouse will enclose one Kaplan generating unit with a nameplate capacity of 5.5 MW. An intake canal will connect the new powerhouse to the existing intake structure.

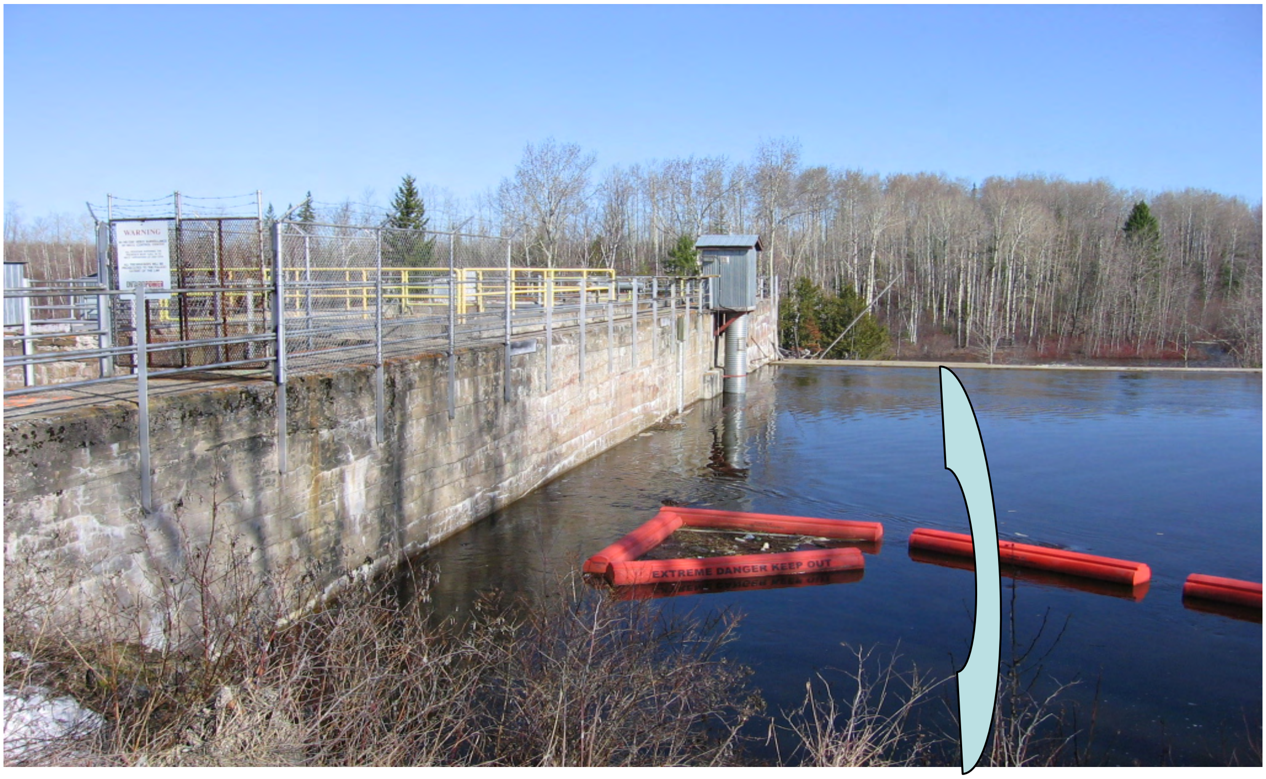
Figure 4.7: Proposed Facilities, Sandy Falls GS



Refurbishment of the intake structures and weir dam will be facilitated by the construction of a temporary cofferdam extending from the intake to the old log sluice on the left side of the central spillway (Gestion Conseil S.C.P., Inc., 2003). Once the cofferdam is constructed, the area enclosed by the cofferdam will be de-watered to facilitate refurbishment of the intake structure. Refurbishment will primarily involve the application of a new concrete cover on all exposed surfaces (including the downstream dam face) which have undergone significant deterioration.

The dam will also require, rock anchoring, grout injections to the dam concrete/bedrock joints, construction joints and any other leakage locations. Once refurbishment is completed, the temporary cofferdam will be removed. This cofferdam will be in place for approximately 6 months and will de-water an area of approximately 870 m^2 (0.09 ha). The location of the cofferdams is indicated on Photographs 4-5 and 4-6.

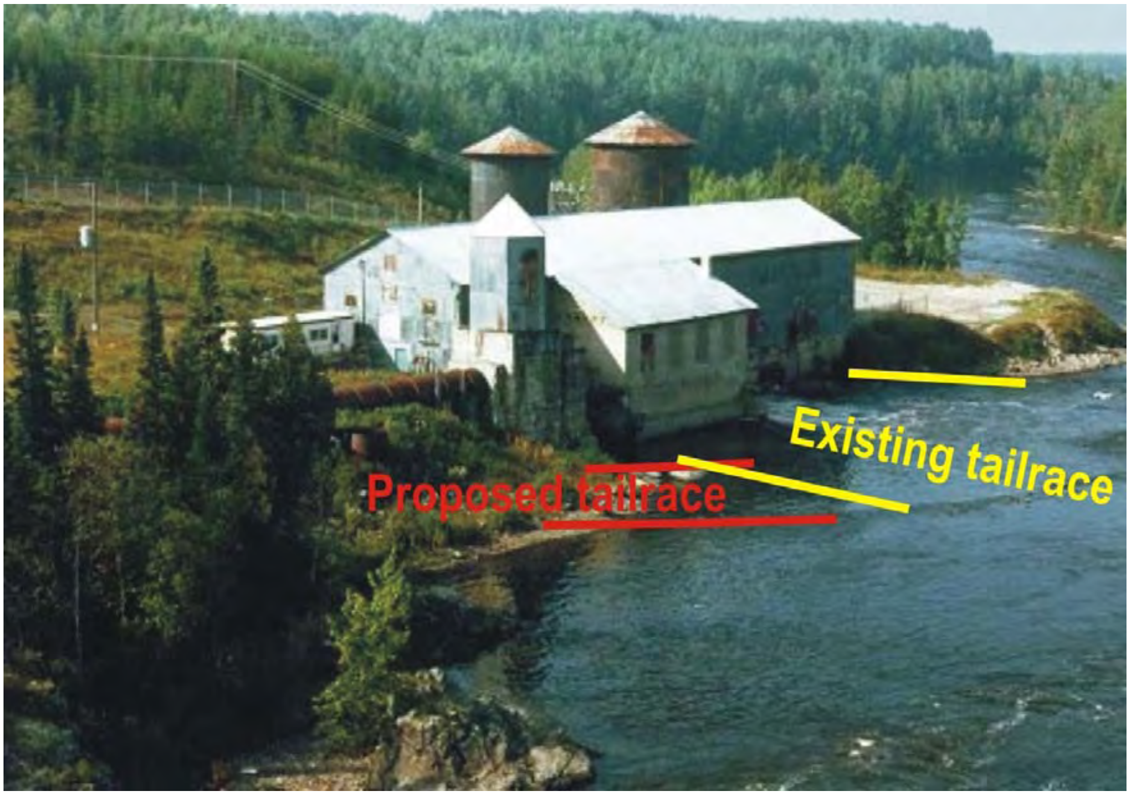
Photograph 4-5: Proposed Cofferdam Location at Intake Structure



Excavation and slope stabilization will be required for the new powerhouse foundation and underground tailrace canal. The tailrace canal will discharge towards the existing tailrace in the river. The tailrace canal will be about 7 m wide and 4 to 6 m high. Bedrock blasting to facilitate tailrace canal construction will likely be required. During tailrace canal construction, a plug will be maintained at the outlet location to prevent water ingress. At the outlet location, water depths are 0.5 to 1 m with cobble, gravel and sand overlying bedrock (Coker and Portt, 2006b). As a result, blasting and excavation will be required in the nearshore to a depth of 4 to 6 m to accommodate water discharge from the new powerhouse to the existing tailrace. It is anticipated that the excavated area will extend approximately 20 m offshore widening from 7 to 14 m. Photograph 4-6 shows the existing tailrace and the approximate location of the proposed tailrace. A temporary cofferdam will be installed around the area to be excavated with the water pumped out to facilitate excavation. This cofferdam will be in place for approximately 12 to 14 months to dewater an area of approximately 500 m^2 (0.05 ha). Once excavation is completed and the tailrace canal outlet plug demolished, the temporary cofferdam will be removed.

A new electrical substation, composed mainly of new switchgear and new dry type power transformer, will be built inside the new powerhouse. The proposed facilities will be connected to the Hydro One Timmins TS at 27.6 kV to feed into the Timmins local distribution system.

Photograph 4-6: Sandy Falls GS Existing Tailrace and Approximate Location of Proposed Tailrace



Upon completion of the new generating station, the existing powerhouse with its three Francis generating units will be decommissioned. The existing surge tanks and aboveground penstock will be removed. The buried penstocks will be removed. The obsolete electrical switching equipment and transformers will also be removed.

A summary of the existing and proposed plant operating characteristics is provided in Table 4-1. The gross head will remain the same. However, the rated flow through the generating station will increase from 44 to 65.4 m^3/s, decreasing the frequency of river overflow from approximately 48% to 30% of the time. However, discharge from the proposed plant will occur at the steep, mostly bedrock rapids below the dam just upstream of the current discharge location. As the proposed plant will continue to operate as a run-of the-river facility, the river flow and level will continue to be managed as per the Water Management Plan (OPG *et al.*, 2006).

4.4 LOWER STURGEON GENERATING STATION

4.4.1 Description of Existing Facilities

The 5.3 MW Lower Sturgeon GS is located in the unorganized Township of Mahaffy, District of Cochrane, approximately 48 km north of Timmins (see Figure 4-1). The plant, placed in service in 1923, is accessed by a road west of Highway No. 655. Photograph 4-7 depicts the Lower Sturgeon GS.

Photograph 4-7: Lower Sturgeon GS

The Lower Surgeon GS has a dam, 165 m in length, constructed in three differently angled sections, extending across rock outcrops along almost the entire width of the river (Figure 4-8). The dam incorporates a series of 16 sluiceways with one equipped with a heated control gate and the other 15 with wooden stoplogs (AMSL, 2003).

Water flows from the upstream headpond into the powerhouse through concrete intakes and discharges back to the river from the downstream side of the powerhouse. The powerhouse is of tile construction, steel frame, concrete roof and steel sash.

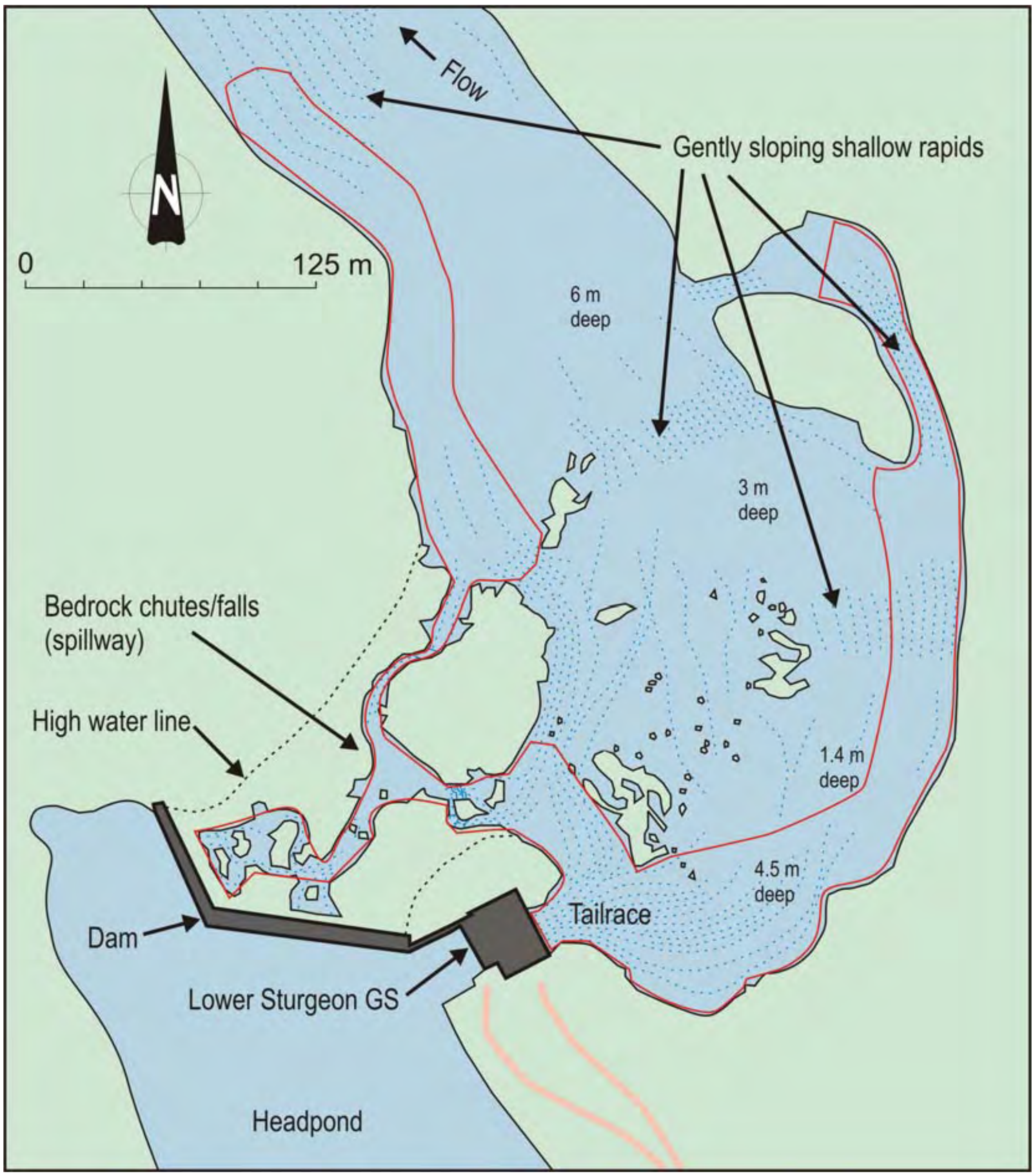
4.4.1.1 Operating Pattern

The Lower Sturgeon GS bypasses a series of bedrock chutes/falls, approximately 120 m wide and ranging from approximately 75 to 100 m in length. Water is spilled through the dam when river flows exceed the 56 m^3/s capacity of the plant, which occurs about 65% of the time. A series of gently sloping rapids with deeper low-velocity sections in between occurs downstream of the bedrock chutes/falls.

The discharge capacity of the sluiceway consisting of 15 log sluices and one power gate is 1,438 m^3/s.

As a run-of-the-river plant, there is no drawdown of the headpond. Any upstream water level fluctuations are the result of either natural water levels and/or upstream controls or activities. In most years, sufficient water exists to operate the plant at full-load on a continuous basis. At all times OPG passes a minimum flow of 15.0 m^3/s of water for dilution of effluent discharge at the pulp and paper mill at Smooth Rock Falls. In late winter, the forebay is drawn down to provide water to Little Long GS downstream.

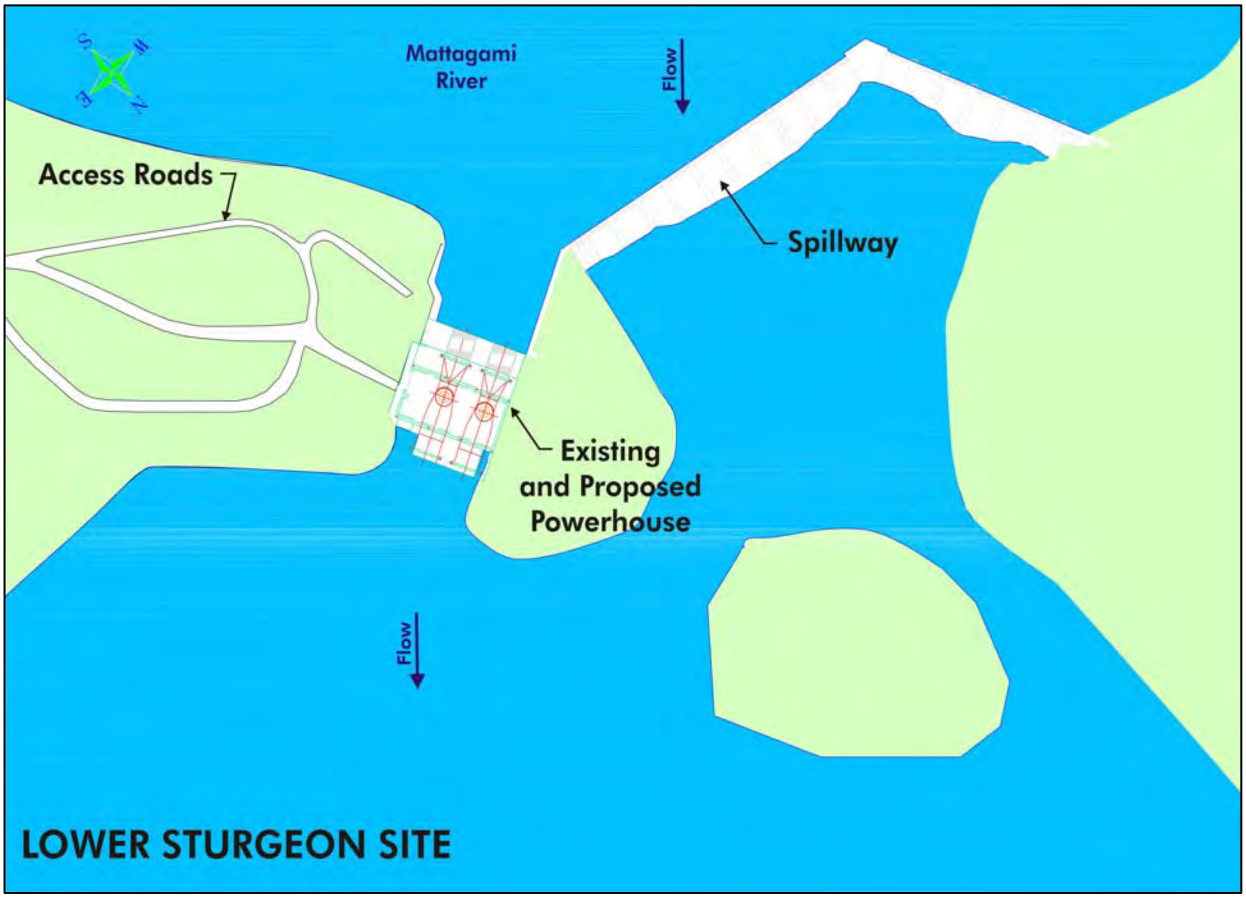
Figure 4-8: Current Facilities, Lower Sturgeon GS



4.4.2 Description of Proposed Facilities

The proposed Lower Sturgeon powerhouse is planned to be located on the same footprint as the existing powerhouse (Figure 4-9). The proposed new powerhouse will enclose two Kaplan generating units with a station capacity of 14 MW.

Figure 4-9: Proposed Facilities, Lower Sturgeon GS



Some excavation of the power intake channel, which will involve blasting and rock fragment removal, will be undertaken behind a cofferdam at the headpond inlet location. Excavation and slope stabilization will be required for the powerhouse foundation and underground tailrace. Blasting and excavation will be required in the nearshore to a depth of 4 to 6 m, extending approximately 20 m offshore and widening from 7 to 14 m to create the new tailrace. Temporary cofferdams on both the upstream and downstream sides will need to be constructed around the areas to be excavated with the water pumped out to facilitate excavation. Both cofferdams are likely to be in place for 12 to 14 months with the upstream and downstream cofferdams dewatering an area of approximately 520 m^2 (0.05 ha) and 1,080 m^2 (0.11 ha), respectively. Once the construction of the new powerhouse is completed the temporary cofferdams will be removed. The approximate location of the temporary cofferdam on the downstream side of the powerhouse is indicated on Photograph 4-8.

Photograph 4-8: Proposed Cofferdam Location, Lower Sturgeon GS Tailrace

Dam refurbishment will also be required (AMSL, 2003). With the headpond water level lowered to the minimum possible (within the operating range as stated in the WMP) and water discharged through the sluiceways, each sluiceway will be repaired. After surface preparation, new concrete will be placed over any deteriorated areas. In addition the concrete around the log gains and sills for sluiceway stoplogs will be refurbished and the piers will be anchored to the bedrock.

The proposed facilities, including a new substation, will be connected to the Hydro One Laforest TS at 27.6 kV to feed into the Timmins local distribution system.

The existing and proposed plant operating characteristics are summarized in Table 4-1. The gross head will remain the same. However, the rated flow through the generating station will increase from 56 m^3/s to 123 m^3/s, decreasing the frequency of dam spillage from approximately 65% to 26% of the time. The site will remain as a run-of-the-river facility and will continue to operate as per the existing Water Management Plan for the Mattagami River System (OPG *et al.*, 2006).

4.5 SCHEDULE

OPG has pre-qualified a number of possible Design-Build Contractors (DBCs). A preferred Contractor is expected to be selected in the summer of 2007. Once the contractor is selected detailed design drawings will be submitted to agencies for permitting.

OPG plans to go to its Board of Directors for final approval in the summer 2007.

Construction is expected to commence in 2007. The three projects may be initiated at the same time or staggered in their inception. It is expected that construction will be complete and the plants in operation by the end of 2009.

5.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 Study Area and Methods

Study areas were selected for each major component of the natural and socio-economic environment. This selection was based on a preliminary assessment of the areas that were expected to be affected directly or indirectly by the undertaking.

Data sources used to document the existing environment included: published and unpublished literature, government files, personal interviews, public open houses and field studies. Where possible, existing data sources were used; however, extensive field studies were required to complete the study. Principal methods for the research are documented in the Technical Support Documents for the various disciplines.

5.2 Biological

5.2.1 Terrestrial Environment

5.2.1.1 Climatic Conditions

The climate of this region of Northeastern Ontario is classified as modified continental, moderated by the Great Lakes (Lake Huron and Georgian Bay) to the south and, to a lesser extent, by Lake Superior to the west and Hudson Bay to the north (Chapman and Thomas, 1968). The modified continental climate is characterized by short, warm summers and long, cold winters, with moderate precipitation. In summer, warm humid air masses from the south alternate with cooler, drier air masses from the north to produce periods of clear, dry weather followed again by warm, humid weather. Winters are characterized by snow squalls and high winds alternating with clear, cold, dry weather.

Based on the Ecoclimatic Region classification system (Ecoregions Working Group, 1989), the Proposed Undertaking on the Mattagami River occurs within the Humid Mid-Boreal Ecoclimatic Region of the Boreal Ecoclimatic Province. In this Ecoclimatic Region, summers are warm and rainy, averaging about 100 mm per month from June to September. Winters are cold, with half as much precipitation received as during the summer months. Total annual precipitation is approximately 800 to 900 mm. Mean daily temperatures greater than 0°C last up to seven months, although frosts are common except from mid-June to early September.

5.2.1.2 Geology and Soils

From a geological standpoint, the Proposed Undertaking occurs within the Abitibi Belt Subprovince of the Superior Province of the Canadian Shield (Stockwell *et al.*, 1970). Bedrock in the regional study area is a classic granite-greenstone domain, dominated by supracrustal and granitoid rocks (Jackson and Fyon, 1991). In the Timmins area, bedrock is comprised of metasedimentary-metavolcanic sequences intruded by large regional domes and pods of felsic plutonic rocks (Ayer and Trowell, 1998).

Bedrock on the three proposed redevelopment sites is not acid generating (Martin, 2006). Based on modified acid base accounting analyses, all rock samples tested had a low potential for acid rock drainage (ARD). Acid potential (AP) is calculated from sulphide sulphur content. The sulphide sulphur levels ranged from <0.01 to 0.02%, 0.01 to 0.05% and 0.06 to 0.10% in bedrock samples from the Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS properties, respectively. A sulphide sulphur level of less than 0.3% is used as a draft guideline by Price (1997) as having low potential for ARD, unless the rock has elevated metal levels and/or the levels of neutralizing potential (NP) are low. The NP/AP ratio is commonly used to assess the potential for ARD. Based on this ratio, one of the Lower Sturgeon GS rock samples had low potential for ARD, whereas the remaining rock samples from the three proposed redevelopment sites had negligible potential.

From a physiographic standpoint, the Proposed Undertaking occurs within the Abitibi Upland Subregion of the James Bay Physiographic Region (Bostock, 1970). Glaciation has modified the surficial features of this region. In this area, the peneplained landscape typical of the Shield is modified by variable (<1 m in areas dominated by bedrock), and in some areas considerable (>10 m), thicknesses of Quaternary glacial sediments, as well as by recent organic surficial materials. These sediments tend to obscure the already low relief of the underlying bedrock.

More specifically, the proposed Sandy Falls GS and Lower Sturgeon GS redevelopments are situated within the Great Clay Belt, a flat plain underlain by stratified glaciolacustrine clays and silts deposited by glacial lakes during the waning of Quaternary glaciation, among them glacial Lake Barlow-Ojibway (Hughes, 1965). The Wawaitin GS is located at the northern edge of the Canadian Shield.

As indicated above, the three generating stations are situated within or at the edge of the Great Clay Belt (Webber and Hoffman, 1967). This area of deep clay and silty soils formed from lacustrine deposits associated with glacial Lake Barlow-Ojibway. The dominant soil group in the Great Clay Belt is gleysolic. These fine mineral soils are characterized by poor drainage and are saturated during parts of the year. Extensive organic soil deposits also occur in this area.

The Wawaitin GS is located at the northern edge of the Canadian Shield. Five different soil types are present on the proposed Wawaitin GS redevelopment site (OIP, 1978a): Abitibi sandy loam; Frederick sandy loam; Gaffney Lake organics; Hanna sandy loam and Precambrian rock.

At the proposed Sandy Falls GS redevelopment site, soils consist of Delray clay loam (OIP, 1978b).

Soils at the proposed Lower Sturgeon GS redevelopment site consist of Devitt silt loam to silty clay loam (OIP, 1978c).

Agricultural land use in this area is only of local importance near Timmins. The cold, moist climate limits the range of crops that can be grown and reduces productivity.

Phase I Environmental Site Assessments (ESAs) were undertaken previously at each of the three generating stations (Monczka, 1995; Gartner Lee, 2001 a, b). Based on the Phase I ESA findings for Sandy Falls GS and Lower Sturgeon GS, no further investigations were required. At Wawaitin GS, after implementation of a remediation program, no further work was required. Details of the ESA findings are provided below.

Based on a Phase I ESA, Monczka (1995) identified possible soil contamination by oil, PCBs, arsenic trioxide, gasoline, lead, creosote and/or unknown chemicals at a number of locations within the Wawaitin GS property and recommended that a Phase II Site Investigation be conducted.

The Phase II Site Investigations involved soil sampling in the areas of the switchyard, powerhouse, transformer yard, battery house, oil house, decommissioned gas pump, surge tanks and coal cinder piles (Semec, 1999, 2000). The soil chemistry results were compared against the MOEE (1997) Table A (potable groundwater) criteria for industrial/commercial sites with coarse-textured soils and Table F soil background concentrations for non-agricultural land use, where applicable. There were no exceedances of the MOEE (1997) Table A and F criteria for the parameters analyzed, i.e., total petroleum hydrocarbons (TPH) (diesel), TPH (heavy oils), arsenic, lead, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) in the soil samples collected in the switchyard, battery house, oil house and surge tanks areas. Total PCBs were not detected in the 58 soil samples analyzed (Semec, 2000).

Two of four soil samples collected from the powerhouse area had TPH (diesel) concentrations (441 and 588 µg/g) that exceeded the MOE (1997) Table A criterion of 100 µg/g. The TPH (heavy oils) concentrations (1,460 and 2,405 µg/g) in these two samples also exceeded the Table A criterion of 1,000 µg/g.

Of the 75 soil samples collected from the transformer yard, the TPH (diesel) concentrations (101 to 8,061 µg/g) in 14 samples exceeded the 100 µg/g criterion. The TPH (heavy oils) concentration (1,282 µg/g) in one of these 14 samples also exceeded the 1,000 µg/g criterion. The arsenic concentrations (46 to 344 µg/g) in seven of the 75 samples exceeded the MOEE (1997) Table A criterion of 40 µg/g.

Of the 34 soil samples collected from the decommissioned pump area, the TPH (diesel) concentrations (146 to 320 µg/g) in six samples exceeded the 100 µg/g criterion. In addition, the benzo(a)pyrene concentrations (2 µg/g) in two samples slightly exceeded the MOEE (1997) Table A criterion of 1.9 µg/g.

Of the 14 soil samples collected from the coal cinder pile area, the arsenic concentrations (42 and 44 µg/g) in two samples exceeded the Table A criterion of 40 µg/g. The zinc concentrations (1,000 and 1,050 µg/g) in these two samples exceeded in the Table A criterion of 600 µg/g. The copper concentration (279 μg/g) in one of these two samples also exceeded its criterion of 225 μg/g. In addition, the nickel concentration (160 μg/g) in one of the 14 samples collected slightly exceeded its criterion of 150 μg/g.

Subsequently, a Screening Level Risk Assessment (SLRA) was undertaken to assess whether the contaminants present on the Wawaitin GS property were likely to be associated with any adverse health or environmental risks (Ager, 2000, 2001). It was concluded that direct or indirect exposure to contaminated soil in the transformer yard, powerhouse and coal cinder pile areas could potentially be associated with adverse health or ecological impacts.

The main transformers at the Wawaitin GS were refurbished in 2000-2001 and a new oil spill containment system was installed in 2001. As part of the installation of the oil spill containment system, approximately 676 m^3 of contaminated soil was removed from the transformer yard and disposed of at an approved facility in Timmins (Semec, 2002). The TPH (diesel) concentration in one of 18 verification soil samples exceeded the MOE (1997) Table A criterion of 100 μg/g. Because of the lag time between construction activity and the availability of the laboratory results, this soil located in the area of the former surface storage tank for insulating oil could not be removed. This occurrence is considered to be very small, localized and contained within the fenced off area of the transformer yard.

With the decommissioning of the station service transformers, installation of a new oil spill containment system for the main power transformers and transformer yard soil remediation, no further work was required on the Wawaitin GS property.

Based on a Phase I Environmental Site Assessment of the Sandy Falls GS property, Gartner Lee (2001a) observed oil stains at the base of the transformers in the switchyard. In addition, there is a potential for environmental issues associated with past application of herbicides on both the Sandy Falls GS and Lower Sturgeon GS properties and adjacent Hydro One transmission corridors (Gartner Lee, 2001a,b). Based on the Phase 1 ESA findings, no further investigations were required.

As part of the testing program, soil samples from below the penstock were collected at three depths at the Sandy Falls and Wawaitin Generating Stations, and tested for PAHs and semi-volatile organic compounds (SVOCs). A wood sample taken from the buried timber support for the Wawaitin GS penstock was also analyzed for PAHs and SVOCs. A composite soil sample was analyzed using the MOE O.Reg. 347 (as amended to O.Reg. 558/00) Toxicity Characteristic Leaching Procedure (TCLP) to determine whether the material might be classified as hazardous based on leachate toxicity.

All soil test results for each location and depth were below the applicable MOE (2004) Table 3 standards. The composite soil sample submitted for TCLP testing had no analytical results exceeding Schedule 4 of O.Reg. 347, indicating that the soil is not a hazardous waste based on leachate toxicity.

The laboratory test results indicated the presence of 16 PAH/SVOC compounds in the wood sample from the Wawaitin GS site indicating that the wood was chemically treated with creosote or with coal tar which contains creosote. None of the hazardous waste categories in Schedule 1 of O.Reg. 347 (i.e., wastewaters, process residuals, preservative drippage, spent formulations, bottom sediment sludge and wastewater treatment sludge) associated with creosote production applies to the creosote-treated wood staves at the Wawaitin GS site. Creosote is identified as a hazardous waste chemical in Schedule 2B.

5.2.1.3 Vegetation

The three sites are wholly within the Northern Clay Belt Section of the Boreal Forest Region, with Wawaitin GS located near the northern edge of the Missinaibi-Cabonga Section to the south (Rowe, 1972). White spruce and black spruce are characteristic species of the Boreal Forest Region. Other common species are tamarack, balsam fir and jack pine. Although the forests are primarily coniferous, there is a general mixture of broadleaved trees such as white birch, trembling aspen and balsam poplar, as well as species typical of the more southerly Great Lakes-Saint Lawrence Forest Region, such as eastern white pine, red pine, yellow birch, sugar maple, black ash and eastern white cedar.

The Northern Clay Forest Section is dominated by black spruce which forms large stands on both the poorly-drained lowland flats of the clay plain and the gently rising uplands (Rowe, 1972). Tamarack occurs infrequently in these stands. In the wetter areas, eastern white cedar grows in association with black spruce. Pure hardwood and mixed wood stands of trembling aspen, balsam poplar, balsam fir, white spruce and black spruce grow in better-drained areas, such as in areas of higher relief and along margins of lakes and rivers. Balsam fir is a common component of the forest understorey and has increased in abundance by regeneration on cut-over black spruce woods. Jack pine forms extensive stands on dry, sandy areas, while white birch is also typically found growing in the sandy soils of old beaches, eskers and outwash deposits.

Although dominated by typical boreal species, the Missinaibi-Cabonga Forest Section is a transitional zone incorporating elements from the Great Lakes-Saint Lawrence Forest Region (Rowe, 1972). The predominant forest is mixed woods in character, consisting of an association of balsam fir, black spruce and white birch with scattered white spruce and trembling aspen. Yellow birch, sugar maple, white pine and red pine, which reach their northern limit in this forest section, occur on rocky shorelines and ridges. Jack pine occurs on sand terraces adjacent to rivers. In wet lowland areas, coniferous swamps dominated by associations of black spruce-tamarack and black spruce-eastern white cedar are present. Black ash and white elm are also present in this forest section.

At the proposed Wawaitin GS redevelopment site, a small area (less than 1 ha) of vegetation and trees, predominantly balsam poplar, will be displaced by the new powerhouse. The new penstocks will only affect a grassed/meadow area that is cleared for the existing penstocks. At the Sandy Falls GS the new water canal is proposed in the grassed/meadow area of the existing penstocks. The construction of the new powerhouse will result in the clearing of a small area (less than 1 ha) of vegetation and trees (white cedar, white birch, alder and spruce) at the shoreline. At Lower Sturgeon GS the proposed powerhouse will be located on the site of the existing one resulting in no clearing of vegetation or trees. The Lower Sturgeon GS site is generally dominated by meadow/grassland areas. Some grassed/meadow areas may be used as material laydown and assembly sites during construction at the three redevelopment sites.

Field surveys were undertaken in August 2006 to identify the vegetation communities and inventory the flora at the locations to be affected by construction activities.

Of the 56 plant taxa (55 species) identified at the locations to be affected by construction activities at the proposed Wawaitin GS redevelopment site, 48 are designated by the Natural Heritage Information Centre (NHIC, 2006a) as S5, i.e., very common in Ontario and demonstrably secure. The remaining seven species are designated SE, i.e., exotic not believed to be a native component of Ontario's flora.

Of the 37 plant species identified at the locations to be affected by construction activities at the proposed Sandy Falls GS redevelopment site, 32 are ranked by the NHIC (2006a) as S5, i.e., very common in Ontario and demonstrably secure. The remaining five species are designated SE, i.e., exotic, not believed to be a native component of Ontario's flora.

Of the 29 plant species identified at the locations to be affected by construction activities at the proposed Lower Sturgeon GS redevelopment site, 23 are ranked by the NHIC (2006a) as S5, i.e., very common in Ontario and demonstrably secure. The remaining six species are designated SE, i.e., exotic, not believed to be a native component of Ontario's flora.

Several individuals of orchid (*Platanthera* sp.) were present in a small area of rocky shoreline immediately adjacent to and downstream of the Lower Sturgeon GS powerhouse. The 19 species of this orchid genus are variously ranked by the NHIC (2006a) from S5, i.e., very common in Ontario and demonstrably secure to S1, i.e., extremely rare in Ontario.

None of the flora species identified during the field surveys are designated as species at risk nationally (COSEWIC, 2006) or provincially (MNR, 2006).

Some small wetland areas (bogs) are present west of the Wawaitin GS (Sears, 1992). There are no Provincially Significant Wetlands, Areas of Natural and Scientific Interest (ANSIs) or (Environmentally Sensitive Areas) ESAs within the 5-km radius local study areas for the three proposed hydroelectric plant redevelopments (NHIC, 2006b).

Most of the lands around the three hydroelectric power plant redevelopment sites remain in native vegetation consisting of coniferous species such as black spruce, white spruce, balsam fir and eastern white cedar, as well as deciduous species such as white birch and poplars. There is an abundance of wetland habitat throughout the area.

5.2.1.4 Wildlife

The two big game species of significance in northeastern Ontario are moose and black bear. The areas to the south of the Wawaitin GS, on both sides of Kenogamissi Lake have been reported by the MNR as very good moose summer range habitat (Sears, 1992). In addition, a moose wintering area has been identified by the MNR along both sides of the Mattagami River just south of the Lower Sturgeon GS in Reid Township (Sears, 1992).

The Proposed Undertaking occurs at the northern extent of white-tailed deer distribution. Only four small herds are known to exist in MNR Timmins District. Of these, one remnant herd is reported to exist within 10 km to the southeast of the Wawaitin GS. Habitat and climatic factors, particularly snow depth, are the major constraints for deer.

The numerous wetlands in the Timmins area may provide suitable habitat for a number of aquatic mammals such as beaver, otter and muskrat. Other furbearers that are relatively abundant throughout the area include mink, marten, weasel, fisher, lynx, red fox, coyote, wolf and squirrels.

Because of its greater remoteness compared to the Wawaitin GS and Sandy Falls GS, greater wildlife utilization of habitat can be expected to occur around the Lower Sturgeon GS.

Of the 41 native species likely to occur in the Timmins area, 33 are ranked by the NHIC (2006a) as S5, i.e., very common in Ontario and demonstrably secure; four are S4, i.e., common in Ontario and apparently secure; one rock vole is S3S4 status uncertain, i.e., rare to common in Ontario; one is S3 (northern long-eared bat), i.e., possibly rare to uncommon in Ontario; and one is SU, i.e., status uncertain. No ranking is provided for the eastern timber wolf.

The terrestrial birds in the areas of the three proposed hydroelectric power plant redevelopment sites tend to be migratory. Very few species reside in the region year-round, e.g., grosbeaks, chickadees, woodpeckers, ravens, jays and grouse.

Of the 165 species observed in the Timmins area, 107 breed or likely breed in the Timmins area. Of these, 86 are considered by the NHIC (2006a) to be S5, i.e., very common in Ontario, demonstrably secure; two are S4S5, i.e., common to very common in Ontario; 12 are S4, i.e., common in Ontario, apparently secure; two great grey-owl, pine grosbeak are S3S4 (), i.e., rare to common in Ontario; two are SZN, i.e., no clearly definable occurrences; and three are SE, i.e., exotic, not believed to be a native component of Ontario's fauna.

Numerous passerines that are typical boreal species occur in the areas of the three proposed redevelopment sites. In black spruce-dominated forests these include spruce grouse, boreal chickadee, gray jay, yellow-bellied flycatcher, winter wren, Swainson's thrush, ruby-crowned kinglet, Nashville warbler, magnolia warbler, yellow-rumped warbler, dark-eyed junco, chipping sparrow and white-throated sparrow (Erskine, 1977). In stands dominated by balsam fir, the spruce grouse and gray jay are replaced by the ruffed grouse and blue jay, respectively. Jack pine stands support a less diverse avian community. Birds occurring in jack pine communities include American robin, hermit thrush, Swainson's thrush, ruby-crowned kinglet, solitary vireo, Tennessee warbler, Nashville warbler, chipping sparrow and white-throated sparrow.

The bird community typical of the open agricultural areas found in the Great Clay Belt includes American kestrel, killdeer, barn swallow, American crow, European starling, yellow warbler, common yellowthroat, bobolink, common grackle, brown-headed cowbird, American goldfinch and Savannah sparrow.

Grouped together, amphibians and reptiles are called herpetiles. They are generally dependent on more mesic (wetter) habitats and particularly wetland habitats associated with mature forests. Of the 14 species likely present in the Timmins area, ten are ranked by the NHIC (2006a) as S5, i.e., very common in Ontario and demonstrably secure; and four as S4, i.e., common in Ontario and apparently secure.

Of the many terrestrial species that have been designated by COSEWIC (2006) or the Committee on the Status of Species at Risk in Ontario (COSSARO) (MNR, 2006a) as endangered, threatened or of special concern, only ten have ranges in Ontario overlapping the study area (Table 5.1).

Table 5.1: Wildlife Species at Risk with Ranges Overlapping the Regional Study Area

Common Name	Scientific Name	Habitat Requirements[1]	Status
Golden eagle	*Aquila chrysaetos*	Sparsely treed rock crags and cliffs along rivers and lakes	Endangered[2]
Loggerhead shrike*	*Lanius ludovicianus*	Open country with hedgerows, copses, scattered trees, tall shrubs, telephone polls and fenceposts providing nesting sites and lookouts	Endangered[2,3]
Peregrine falcon*	*Falco peregrinus*	Open forest, with cliffs and crags, especially near water	Threatened[2,3]
Easter timber wolf	*Canis lupus lycaon*	Coniferous, mixedwoods and deciduous forests	Special concern[2,3]
Bald eagle	*Haliaeetus leucocephalus*	Forests (especially coniferous) near large rivers and lakes	Special concern[2]
Red-shouldered hawk	*Buteo lineatus*	Riparian forest, wooded swamp	Special concern[2,3]
Short-eared owl	*Asio flammeus*	Bogs, marshes	Special concern[2,3]
Great grey owl	*Strix nebulosa*	Boreal forest	Special concern[2]
Red-headed woodpecker*	*Melanerpes erythrocephalus*	Open deciduous woods and fields, pastures, city parks, river edges and roadsides where scattered large trees occur	Special concern[2,3]
Monarch butterfly	*Danaus plexippus*	Open areas with milkweed	Special concern[2,3]

* Considered to be accidental in the Timmins area.
1 References used to determine habitat requirements: Banfield (1974); Peck and James (1983, 1987); Godfrey (1986); Cadman *et al.* (1987); Opler (1992).
2 MNR (2006a).
3 COSEWIC (2006).

Examination of the NHIC (2006a) database indicated that no species at risk have been recorded within a 5-km radius of any of the three generating stations. The loggerhead shrike, peregrine falcon and red-headed woodpecker are considered to be "accidental" in the Timmins area.

During the summer months, the monarch butterfly may also be found in open habitats in the Timmins area. The monarch butterfly has been designated as a species of special concern by COSEWIC (2006) and COSSARO (MNR, 2006a).

5.2.2 Aquatic Environment

5.2.2.1 Site Surface Hydrology and Groundwater

At the three hydroelectric facilities, surface water drainage is towards the Mattagami River (Monczka, 1995; Gartner Lee, 2001a,b).

Groundwater is generally shallower in the Great Clay Belt area than in the Canadian Shield area due to greater permeability and water retention capability. Groundwater yields in the overburden are generally less than 1 L/s (MNR, 1984). These well yields are suitable for domestic purposes. In areas of organic deposits, the water table may come within 1 m of the surface.

5.2.2.2 Mattagami River Hydrology

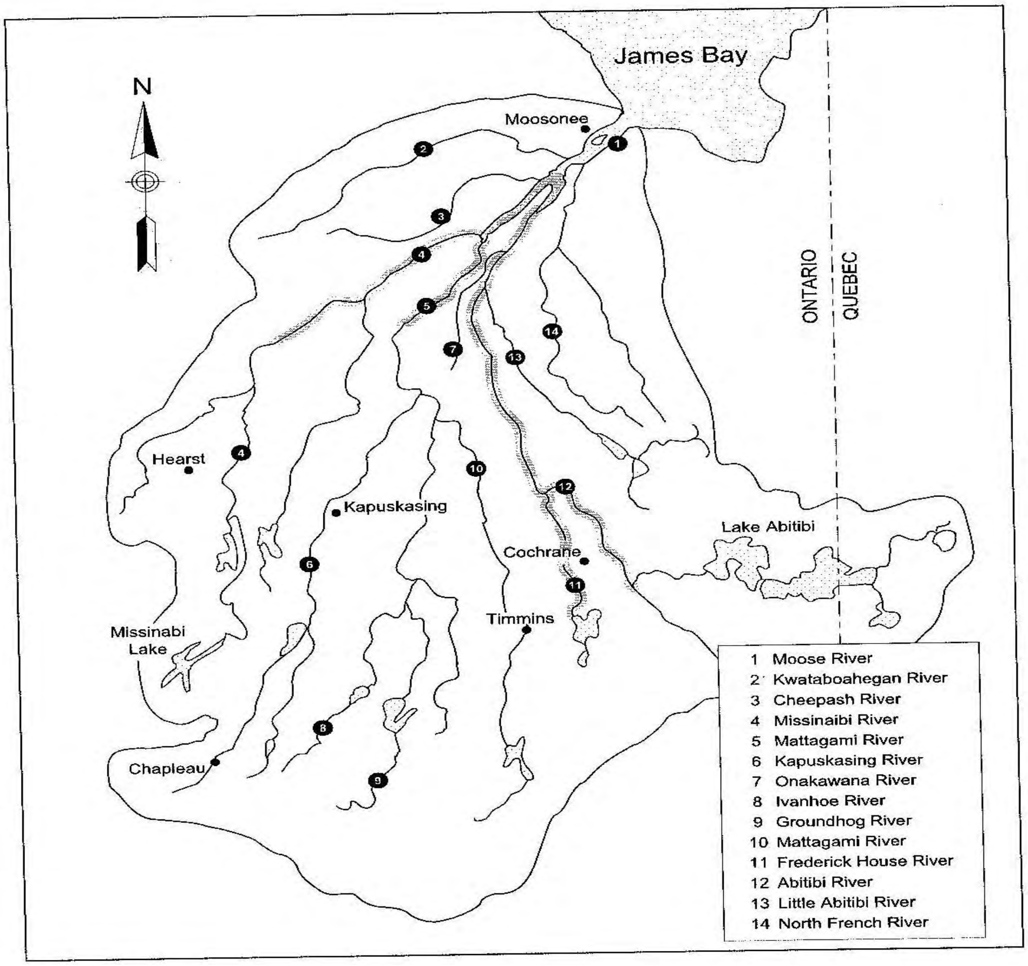
The Mattagami River is located within the Moose River drainage basin of the Hudson Bay Drainage System (Figure 5.1). The Moose River drainage basin drains approximately 109,000 km^2 traversing three physiographic regions: the Canadian Shield, the Great Clay Belt and the Hudson Bay Lowlands (Brousseau and Goodchild, l989).

The Mattagami River extends approximately 418 km from its headwaters at Mesomikenda Lake, draining other major tributaries such as the Groundhog River, Grassy River, Kapuskasing River, Ivanhoe River, Makami River, Remi River, Opasatika River, Hull Creek and Lost River to its confluence with the Moose River (OPG *et al.*, 2006). The Mattagami River and its tributaries drain approximately 35,612 km^2.

Total drainage areas upstream of the Proposed Undertaking are 3,527 km^2, 6,472 km^2 and 8,414 km^2, respectively (ERDE, 1998a, b, c). The downstream distances from Wawaitin GS to Sandy Falls GS and Lower Sturgeon GS are approximately 37 km and 74 km, respectively. The downstream distance from Lower Sturgeon GS to Smooth Rock Falls GS is approximately 60 km.

Based on historical hydrological data, greatest stream flow occurs during the spring freshet in April, May and June with the lowest flows occurring generally during the summer near Timmins. Maximum, mean and minimum daily discharges of the upper Mattagami River near Timmins are depicted in Figure 5.2.

Figure 5.1: Moose River Drainage Basin



Annual flow metrics based on data from 1972 to 1995 for the Mattagami River at Wawaitin, Sandy Falls and Lower Sturgeon are presented in Table 5.2.

Figure 5.2: Maximum and Minimum Daily Discharge for the Mattagami River Near Timmins (1969-1997)

Table 5.2: Annual Flow Metrics for the Mattagami River at Wawaitin, Sandy Falls and Lower Sturgeon[1]

	Value		
Descriptive Metric	**Wawaitin Falls**	**Sandy Falls**	**Lower Sturgeon Falls**
Drainage Area (km^2)	3,466	6,348	8,409
Mean Annual Flow (m^3/s)	39.4	76.3	100.0
20% Time Exceeded Flow (m^3/s)	55.5	106.0	140.0
Median Flow (m^3/s)	18.5	38.4	50.1
80% Time Exceeded Flow (m^3/s)	9.6	19.0	24.7
Month of Maximum Median Flow	May	May	May
Month of Minimum Median Flow	March	March	March

1 Source: Metcalfe, et. al. (2003).

As indicated in Section 4, tributaries entering the upper Mattagami River between the furthest upstream Wawaitin GS and the furthest downstream Lower Sturgeon GS account for the much greater average flows at the downstream plants (see Figure 4.2). The flatter curve for the Wawaitin GS as shown on Figure 4.2 reflects the greater ability and need to control spring runoff upstream of Timmins by using the control dams at Mattagami Lake and at Kenogamissi Lake.

Operation of the Wawaitin GS is controlled to ensure optimal energy production, regulate water levels in Kenogamissi Lake and prevent downstream flooding, as well as ensure an adequate municipal supply of water to Timmins and industrial supply to the pulp and paper mill in Smooth Rock Falls (Sears, 1992). The Sandy Falls GS and Lower Sturgeon GS are run-of-the-river plants only utilizing available water. Any upstream water level fluctuations are the result of natural water levels and/or upstream controls or activities. Flows in this section of the Mattagami River are influenced by the operation of water control structures at the three generating stations and the Mattagami Lake Dam at Mattagami Lake, and to a lesser extent by the headwater Mesomikenda Lake Dam. The headwater and mainstream storage reservoirs on the upper Mattagami River are drawn down 2 to 4 m during the late fall and winter in order to maintain downstream flows, and periodically in the spring for flood control.

5.2.2.3 Mattagami River Morphology and Bathymetry

On the Canadian Shield, the upper Mattagami River has irregular gradients and is typically less than 100 m wide extending further within in-stream lakes such as Lake Mattagami and Lake Kenogamissi (Seyler, 1997). The river channel is tightly contained with bedrock outcrops common and manifested as extensive riffle and rapid areas. Inflowing tributaries are generally small.

Within the Great Clay Belt, gradients are more regular with bedrock outcrops tending to occur along significant faults. River channels are contained within well-defined, narrow flood plains. Long meandering runs occur between rapids and falls. Channel widths generally vary between 100 and 200 m.

An escarpment marks the beginning of the Hudson Bay Lowlands. This bedrock fault is manifested as the Lower Mattagami GS complex (Smoky Falls). North of this point, the Mattagami River tends to consist of long, straight reaches punctuated by numerous riffle areas and by sand and gravel shoals. Gradients are typically 0.5 to 1 m/km. Channel is shallow, with a width of about 200 m.

There have been no public complaints relating to OPG operations affecting shoreline conditions, water levels and flooding (ERDE, 1998a, b, c).

5.2.2.4 Mattagami River Water Quality

Based on its good water quality, the Mattagami River is the source of the Timmins potable water supply. The Aquatic Environment Technical Support Document presents available water quality data.

Turbidity levels are generally higher in the Great Clay Belt section compared to the upstream Canadian Shield section of the Mattagami River due to increased concentration of suspended clay particles, particularly during the spring freshet and rainfall events.

Based on a Phase I Environmental Site Assessment (ESA), Monczka (1995) identified possible groundwater contamination by oil, PCBs, arsenic trioxide, gasoline, lead, creosote and/or unknown chemicals at a number of locations within the Wawaitin GS property. In addition, unknown contamination was possible from an active (opened in 1978) waste disposal site east (upgradient) of the Wawaitin GS property. As there is a high potential for off-site contaminant migration, as well as potential for contaminants to migrate towards the station property, it was recommended that a Phase II ESA be conducted.

The Phase II Site Investigations involved soil sampling in the areas of the switchyard, powerhouse, transformer yard, battery house, oil house, decommissioned gas pump, surge tanks and coal cinder piles (Semec, 1999, 2000). The findings of these studies are presented in the Terrestrial Environment Technical Support Document.

The Phase II ESA also involved the installation of a total 15 groundwater monitoring/sampling wells in the areas of the powerhouse, transformer yard, oil house and decommissioned gas pump, as well downgradient from the municipal landfill located about 500 m southeast of the Wawaitin GS (Semec, 1999, 2000). Groundwater samples collected from these wells were analyzed for total petroleum hydrocarbons (TPH) (diesel), TPH (heavy oils), metals, pentachlorophenol, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) and/or polycyclic aromatic hydrocarbons (PAHs). In addition, samples of a groundwater spring on the Wawaitin GS property were analyzed for TPH (diesel), TPH (heavy oils), metals, pentachlorophenol, PCBs and/or PAHs, whereas surface samples of the Mattagami River were analyzed for TPH (diesel), TPH (heavy oils), metals, PCBs and/or PAHs. The groundwater chemistry results were compared against the MOEE (1997) Table A (potable groundwater) criteria for industrial/commercial sites with coarse-textured soils. However, the domestic water wells on the Wawaitin GS property have been demolished and contaminant migration to off-site water wells is unlikely as groundwater flow appears to be towards the Mattagami River. As a result, the analytical data were also compared with the MOEE (1997) Table B (non-potable groundwater) criteria. The surface water analytical data were compared with the PWQOs (MOEE, 1994).

The lead concentration (23 µg/L) in the groundwater sample collected in the powerhouse area exceeded the MOEE (1997) Table A criterion of 10 µg/L but not the Table B criterion of 32 µg/L.

Arsenic concentrations (26 to 42 µg/L) in all four groundwater samples collected from the transformer yard were above the Table A criterion of 25 µg/L but below the Table B criterion of 480 µg/L. Lead concentrations (15 and 20 µg/L) in two of three samples analyzed were above the Table A criterion but below the Table B criterion. The TPH (diesel) concentration (3,100 μg/L) in one of two samples analyzed exceeded the Table A criterion of 1,00 μg/L.

One groundwater sample collected in 1999 in the decommissioned gas pump area had concentrations of benzo(a)anthracene, chrysene and benzo(b)fluoranthene above their respective MOEE (1997) Table A criteria, whereas benzo(k)fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene and benzo(a)pyrene concentrations were above both their respective Table A and B criteria. However, there were no exceedances of Table A criteria for these PAHs in five groundwater samples collected in 2000.

There were no exceedances of Table A criteria by parameters analyzed in groundwater samples collected in the oil house area (one sample), downgradient from the municipal landfill (three samples) and from the spring (two samples).

Although small amounts of transformer oil, arsenic and lead may be entering the Mattagami River via the groundwater, there was no detectable effect on surface water quality. The concentrations of cadmium, iron and zinc in a few surface water samples exceeded their respective PWQOs; however, it was concluded in the Phase II ESA that these exceedances were isolated occurrences, not representative of the overall surface water chemistry, and most likely not site related.

PCB concentrations in all groundwater and surface water samples were below the laboratory method detection limit (MDL).

Subsequently, a Screening Level Risk Assessment (SLRA) was undertaken to assess whether the contaminants present on the Wawaitin GS property were likely to be associated with any adverse health or environmental risks (Ager, 2000, 2001). As indicated above, lead, arsenic, TPH (diesel) and PAH concentrations in some groundwater samples collected within the Wawaitin GS property exceeded the MOEE (1997) Table A criteria for potable groundwater. Since domestic water wells on the property have been demolished, exposure to on-site groundwater is not considered to represent a relevant exposure pathway at the present time. Moreover, migration of contaminated groundwater to off-site water wells is unlikely because the groundwater appears to be flowing towards the Mattagami River (i.e., not to water wells that may occur in the area). However, if a well were to be installed on the Wawaitin GS property at some future date, ingestion of contaminated groundwater could potentially be associated with adverse health impacts.

With the decommissioning of the station service transformers, installation of a new oil spill containment system for the main power transformers and transformer yard soil remediation, no further work was required on the Wawaitin GS property.

Based on a Phase I ESA of the Sandy Falls GS property, Gartner Lee (2001a) reported that there is potential for water discharged from the powerhouse to the Mattagami River to contain oil since there is no oil-water separator or oil-detecting system in place for the cooling water and turbine floor trench discharges. A septic tank covered under a Certificate-of-Approval (C-of-A) issued by the MOE for sanitary discharges from the lunchroom is pumped out by a contractor on an as needed basis. Based on the Phase 1 ESA findings, no further investigations were required.

The Phase I ESA for the Lower Sturgeon GS property indicated that there was a potential environmental issue with respect to localized water quality associated with discharges of sewage effluent and transformer cooling water, as well as potential discharge of oil via drains and sumps from the powerhouse to the Mattagami River (Gartner Lee, 2001b). The sewage treatment system, transformer cooling water oil-water separators/alarm systems, as well as the portable oil skimmer, drain oil control valve and sump oil detector/alarm systems, are covered under C-of-As issued by the MOE. Based on the Phase 1 ESA findings, no further investigations were required.

On the Lower Sturgeon GS property, there is also a potential for environmental issues with respect to groundwater and localized surface water quality associated with the waste disposal site located on a slope along the shores of Jocko Creek which outlets to the Mattagami River about 600 m upstream of the dam (Gartner Lee, 2001b).

As part of the testing program, water samples were collected from the penstocks at the Sandy Falls GS and Wawaitin GS sites, and tested for PAHs and semi-volatile organic compounds (SVOCs). The results of the laboratory testing indicated that all parameter concentrations in the penstock water sample from the Wawaitin GS site were below the laboratory MDLs which are considerably below the MOE (2004) Table 3 standards. For the water sample from the Sandy Falls GS site, the concentrations of 12 PAH parameters were above their MDLs with the concentrations of three parameters being at or slightly below the MOE (2004) Table 3 standards. As there was a concern that a wood particle may have been present in the first Sandy Falls GS penstock water sample, a second sample was collected for analysis. The laboratory results for this sample indicated that all parameter concentrations were below the laboratory MDLs. The water testing results indicate that water leaking from the penstocks would not be a source of contaminants to the soil and groundwater.

5.2.2.5 Mattagami River Sediments

Sediments in the Mattagami River within the Great Clay Belt can be expected to be predominantly silt and clay, particularly in the in-stream lakes and slower moving sections of the river. Sediment type immediately upstream of the three generating stations is unknown; however, it likely consists of finer sediments overlying bedrock and/or boulder bottom (Sears, 1992).

The spillway channel at Wawaitin GS has a bedrock base that is covered by boulders and cobble along more than half of its length (Coker and Portt, 2006a). Substrates of gravel, cobble or finer materials are rare. The tailrace has a bottom of cobble and gravel with the interstitial spaces filled with finer material. Downstream of the Wawaitin GS, the river bottom consists primarily of cobble and some boulder on a bedrock base.

In the rapids downstream of the Sandy Falls GS tailrace, the river bottom consists primarily of cobble, gravel and sand with some boulder on a bedrock base (Coker and Portt, 2006b). Upstream, a steep mostly bedrock rapids occur below the river to the tailrace.

At the Lower Sturgeon GS downstream of the bedrock chutes/falls spillway, there are shallow rapids along each shoreline with a deeper low-velocity section in the middle of the river (Coker and Portt, 2006c). Substrate consists of bedrock, boulder, cobble, and/or sand and gravel.

A more detailed description of substrate type and distribution downstream of the three generating stations is provided in the Aquatic Environment Technical Support Document.

Based on the good water quality of the Upper Mattagami River and predominantly coarse sediment type (particularly downstream of the generating stations), the sediments can be expected to have low concentrations of contaminants. This is supported by high benthic macroinvertebrate diversity values downstream of the generating stations (see Section 5.2.2.8).

5.2.2.6 Aquatic Vegetation

Within the Great Clay Belt, aquatic vegetation in the main channel of the Mattagami River is sparse, often consisting of a narrow fringe less than 1 m wide (Seyler, 1997). This is due to the steep-sided channel morphology, turbidity and annual water level fluctuations which range from 2 to 4 m.

Coker and Portt (2006a) reported horsetail (*Equisetum*) along the water edge of the shallow lentic (lake-like) section of the river downstream of the Wawaitin GS. No submergent aquatic plants were observed. Coker and Portt (2006b) observed no aquatic plants downstream of the Sandy Falls GS. At the Lower Sturgeon GS, wild celery (*Vallisneria* sp.) and pondweed (*Potamogeton* spp.) are sparsely scattered in small patches or individual plants along the east shore opposite the station (Coker and Portt, 2006c).

5.2.2.7 Plankton

There are two algal communities in most lotic (fast river) systems: the potamoplankton, or drift plankton, and the periphyton (Aufwuchs), or benthic algae. Lakes on lotic systems are the major source of potamoplankton, with diatoms almost universally the most important constituents (Williams and Scott, 1962). However, the periphyton is by far the more important algal community in terms of the ecology and productivity of rivers. Similarly, lakes are the major source of zooplankton with rotifers the dominant taxon in rivers (Williams, 1966).

5.2.2.8 Benthic Macroinvertebrates

The composition of the benthic fauna has been the most widely used indicator of water quality. This is because the macroinvertebrates form relatively sedentary communities in the sediments, thereby reflecting the character of both the water and the sediment. Alteration of benthic community structure is used to assess the trophic or general pollutional status of a waterbody. This assessment is usually based on interpretation of indicator species, changes in the relative numbers of individuals and species, and/or the derivation of a species diversity or community comparison index.

The benthic macroinvertebrate community downstream of the Wawaitin GS was characterized by eight taxa with a total density of 354 organisms per m^2. The Shannon-Wiener diversity index value was 3.82 indicative of unpolluted conditions (good water quality). There were no dominant major taxa, with caddisfly nymphs, nematodes and ceratopogonids (biting midge fly larvae) representing 27.4, 18.4 and 18.1% of the benthic community, respectively. The remaining major taxa each comprised approximately 9% of the community.

The benthic macroinvertebrate community downstream of the Sandy Falls GS was characterized by significantly more taxa (29) and higher density (5,787/m^2) than downstream of the Wawaitin GS, with the higher productivity likely reflecting nutrient inputs from upstream Timmins. The Shannon-Wiener diversity index value (3.81) was comparable to that downstream of the Wawaitin GS indicative of good water quality. Although there were no dominant taxa, species composition reflected the more productive conditions, with tubificid oligochaetes (sludge worms), chironomids (midge fly larvae), the aquatic beetle *Stenelmis* and the blackworm *Lumbriculus variegatus* representing 27.4, 25.7, 18.5 and 12.9% of the benthic community, respectively.

The benthic macroinvertebrate community downstream of Lower Sturgeon GS had intermediate number of taxa (16) and density (1,291/m^2) with a somewhat lower Shannon-Wiener diversity index value of 3.10, still reflective of good water quality. Chironomids were the dominant taxon comprising 32.5% of the community, with nematodes, the aquatic beetle *Psephenus*, caddisfly nymphs and the snail *Physella* each representing about 10% of the benthic community. The remaining taxa comprised less than 10% of the community. The species composition, number of taxa and total density are reflective of lower secondary production due to further distance downstream of Timmins.

5.2.2.9 Fisheries Resources

The Mattagami River provides coolwater fish habitat, with walleye the most important fish species common throughout the river (Seyler, 1997). Northern pike and white sucker are also common throughout the river. Lake sturgeon has been documented downstream of Lower Sturgeon GS (Sturgeon Falls). Cypress Falls, a suspected spawning area located upstream of the Missinaibi River confluence, form an impossible barrier for upstream migration of lake sturgeon. Lake whitefish have been documented between Wawaitin GS and Lower Sturgeon GS as well as other upstream and downstream locations. Smallmouth bass occur only in the upper reaches of the Mattagami River upstream of the Kenogamissi Falls Dam. Longnose sucker have been documented downstream of the Sandy Falls GS, whereas shorthead redhorse occur in the lower reaches downstream of the OPG Mattagami GS Complex. Other common fish species include yellow perch, burbot, mottled sculpin and various minnows.

Seyler (l997) reported the presence of 28 resident fish species in the Mattagami River proper, with brook trout also present in those smaller tributaries providing coldwater habitat (Table 5.3).

Table 5.3: Fish Species Recorded in the Mattagami River[1]

Common Name	Scientific Name	Status
Lake sturgeon	*Acipenser fulvescens*	River resident, lower reaches only
Goldeye	*Hiodon alosiodes*	River resident, lower reaches only
Lake chub	*Couesius plumbeus*	River resident
Common shiner	*Luxilus cornutus*	In-stream lakes resident
Golden shiner	*Notemigonus crysoleucas*	River resident
Emerald shiner	*Notropis atherinoides*	River resident
Blacknose shiner	*N. heterolepsis*	In-stream lakes resident
Spottail shiner	*N. hudsonius*	River resident
Fathead minnow	*Pimephales promelas*	River resident
Longnose dace	*Rhinichthys cataractae*	River resident
Fallfish	*Semotilus corporalis*	River resident, lower reaches only
Pearl dace	*S. margarita*	River resident
Longnose sucker	*Catostomus catostomus*	River resident
White sucker	*C. commersoni*	River resident
Shorthead redhorse	*Moxostoma macrolepidotum*	River resident, lower reaches only
Northern pike	*Esox lucius*	River resident
Cisco (Lake herring)	*Coregonus artedi*	River resident
Lake whitefish	*C. clupeaformis*	River resident
Brook trout	*Salvelinus fontinalis*	Present in tributaries, occasional residents in in-stream lakes
Burbot (Ling)	*Lota lota*	River resident
Trout-perch	*Percopsis omiscomaycus*	River resident
Brook stickleback	*Culaea inconstans*	River resident
Ninespine stickleback	*Pungitius pungitius*	River resident
Mottled sculpin	*Cottus bairdi*	River resident
Smallmouth bass	*Micropterus dolomieu*	Introduced, upper reaches only
Yellow perch	*Perca flavescens*	River resident
Walleye	*Sander vitreus*	River resident
Johnny darter	*Ethestoma nigrum*	River resident
Logperch	*Percina caprodes*	River resident

[1] Source: Seyler (1997).

Site-specific electrofishing surveys were undertaken downstream of the three generating stations during the summer of 2005 and 2006 (see Table 5.4). A total of 18 fish species were captured. Longnose dace, trout-perch, mottled sculpin and logperch were collected at all three locations. Spottail shiner and young-of-the-year (YOY) white sucker were collected downstream of the Wawaitin GS and Sandy Falls GS. Yellow perch were collected downstream of Wawaitin GS (YOY) and Lower Sturgeon GS. Lake chub, emerald shiner, mimic shiner (*Notropis volucellus*) and juvenile burbot were collected downstream of the Sandy Falls GS and Lower Sturgeon GS. Golden shiner, YOY cisco and YOY northern pike were only captured downstream of the Wawaitin GS; brassy minnow (*Hybognathus hankinsoni*) were collected only downstream of the Sandy Falls GS; and Iowa darter (*Etheostoma exile*), johnny darter and juvenile smallmouth bass were only collected downstream of the Lower Sturgeon GS. Three of the 18 species, mimic shiner, brassy minnow and Iowa darter, were not included in the list of species recorded for the Mattagami River (see Table 5.3).

Table 5.4: Fish Species and Numbers Collected by Electrofishing in the Mattagami River Downstream of the Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS, 2005 and 2006[1]

Common Name	Wawaitin GS		Sandy Falls GS		Lower Sturgeon GS	
	2005	2006	2005	2006	2005	2006
Lake chub			1		2	2
Brassy minnow				2		
Golden shiner		1				
Emerald shiner			1		4	
Spottail shiner		3		1		
Mimic shiner				2	6	1
Longnose dace	31		1	2	2	
White sucker	5	53		24		
Northern pike	4	1				
Cisco		1				
Burbot			3	2		2
Trout-perch	3		1			3
Mottled sculpin	12		12	2	25	2
Smallmouth bass						2
Yellow perch		1				3
Iowa darter					1	
Johnny darter					4	5
Logperch		3		12	5	23

[1] Source: Coker and Portt (2006a,b,c, d, e, f).

During the underwater video surveys, walleye and suckers were observed in the deeper portions of the river downstream of the Sandy Falls GS and Lower Sturgeon GS, whereas longnose sucker and trout-perch were observed in the tailrace of the Wawaitin GS (Coker and Portt, 2006a,b,c).

Of the fish species listed in Tables 5.3 and 5.4, only lake sturgeon and goldeye are considered to be rare to uncommon by the MNR (nhic.mnr.gov.on.ca/nhic_.cfm). Neither species is considered at risk federally by COSEWIC (2006) or provincially by COSSARO (MNR, 2006a).

There are nine man-made barriers on the entire Mattagami River. These dams, as well as Cypress Falls, impede upstream movement of many fish species. In some cases where barriers have been constructed, natural impediments to movement probably existed prior to development, e.g., Sandy Falls, Sturgeon Falls. The downstream movement of species and mixing of stocks likely continues despite in-stream development.

The river sections downstream of the Sandy Falls GS and Lower Sturgeon GS have been designated as Fish Sanctuaries by the MNR. The sanctuary below Sandy Falls extends approximately 2 km downstream to protect spawning populations of walleye and northern pike. The Lower Sturgeon sanctuary extends approximately 12 km downstream to protect spawning walleye, lake sturgeon and northern pike. There is also a Fish Sanctuary at the southern end of Lake Kenogamissi to protect spawning walleye, lake whitefish and northern pike extending approximately 3 km downstream of the Upper Dam. For all three sanctuaries, fishing for any species is prohibited from 01 April to 14 June (MNR, 2005a).

Although lake sturgeon are not known to have occurred upstream of Sandy Falls, 50 lake sturgeon from the Little Long Reservoir on the lower Mattagami River were transferred upstream of Sandy Falls in 2002 (OPG *et al.*, 2006). Thirteen of these fish were radiotagged and some of these are known to have passed downstream over the Sandy Falls dam (Coker and Portt, 2006b). Some of these fish may still reside between the Wawaitin GS and Sandy Falls GS.

5.2.2.10 Fish Habitat and Communities

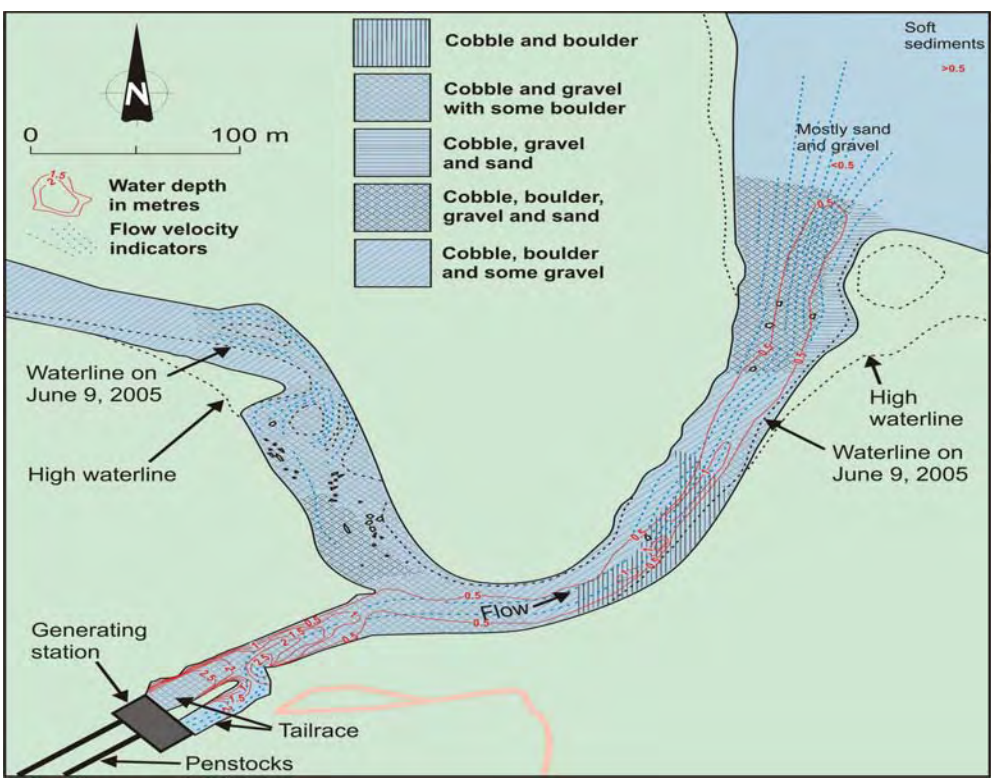
<u>Wawaitin GS</u>

Existing habitat at the Wawaitin GS that likely or might be affected by the proposed redevelopment includes the spillway, the tailrace and the Mattagami River downstream of the confluence of the spillway and tailrace (Coker and Portt, 2006a). The 2.6 km-long spillway for the Wawaitin GS is the original Mattagami River channel that conveyed all river flow prior to power plant construction. The elevation difference between Kenogamissi Lake and the tailrace confluence is approximately 38.4 m. Consequently, the spillway channel has a steep slope, long sections of rapids, four low waterfalls and one more substantial waterfall. These waterfalls likely pose seasonal or complete barriers for some species of fish. The spillway has a bedrock base that is covered by boulders and cobble along more than half of its length (see Figure 5.3). Habitat conditions in the spillway are greatly influenced by flow. Flow in the spillway can experience extreme changes in flow volume, i.e., from zero flow when the Wawaitin GS is capable of taking all the Mattagami River flow to a mean average daily flow of approximately 30 m^3/s during the freshet.

The rather simple fish community identified within the spillway channel in 2005 (Coker and Portt, 2006a), consisting of longnose dace, mottled sculpin and white sucker, is consistent with the extreme variation in flow that occurs periodically through the spillway, as well as the barrier to fish movement. One YOY northern pike was also collected in the lower reach of the spillway channel.

The tailrace of the Wawaitin GS is a steep-sided channel, excavated through bedrock, that is approximately 115 m long with a maximum depth of 2.5 m (Figure 5.3). Water depth decreases to approximately 1 m at the spillway channel confluence. Substrate is mostly gravel and cobble with a few boulders; however, the occurrence of fine gravel and debris, and a layer of epipelic growth, results in a rather closed substrate, particularly closer to the station. This substrate provides little habitat structure. A number of longnose sucker and a school of trout-perch were observed by underwater video in the tailrace in 2005 (Coker and Portt, 2006a).

Figure 5.3: Aquatic Habitat Downstream of the Wawaitin GS



Downstream of the tailrace and spillway channel confluence, the Mattagami River conveys its full flow in a "typical" natural channel for approximately 390 m, and then widens into a broad and shallow lentic section. Substrate throughout is a patchy mixture of primarily cobble and gravel, with some boulder and sand (Figure 5.3). The shallow lentic area has fine substrate, whereas in the transition area between the faster flowing lotic and slower moving lentic conditions, the water is very shallow and substrate is primarily sand and gravel. This section of rapids/riffle extending from the spillway channel confluence to the lentic area provides a variety of swift-water habitats due to the diversity of flow velocities, depths and substrate size. This section provides habitat for a variety of fish species that reside in fast water, such as golden shiner, spottail shiner, longnose dace, white sucker, YOY cisco, mottled sculpin, trout-perch, YOY yellow perch and logperch (Coker and Portt, 2006a,d). This area also has suitable substrate that provides extensive areas of potential walleye and sucker spawning habitat (as evidenced by the presence of many YOY white sucker in 2005 and 2006), as well as spawning habitat for smaller fishes such as trout-perch. The YOY northern pike captured in the quieter shallow rearing habitats along the shore in 2005 and 2006 likely originated from lentic spawning areas downstream.

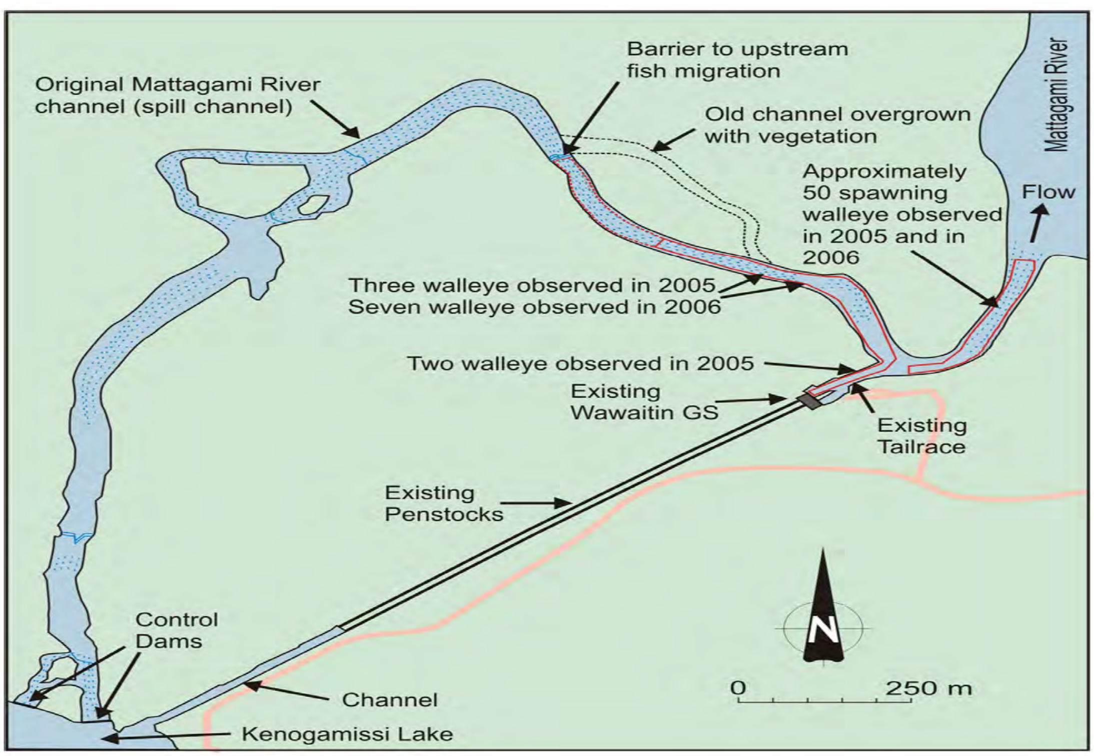
This rapids/riffle area downstream of the Wawaitin GS appear to be the only rapids along 43 km of the Mattagami River downstream to the weir dam at Sandy Falls that provide spawning habitat for walleye (Coker and Portt, 2005b, 2006g). Based on review of topographic maps, rapids also occur in the Grassy River and the Tatachikapika River approximately 12 and 7 km upstream, respectively, of their confluence with the Mattagami River; however, the significance of these rapids as walleye spawning areas is unknown. At Wawaitin GS, walleye can access the rapids downstream of the tailrace, the tailrace upstream to the generating station, and the lower 676 m of the spillway channel, at which point a barrier prevents farther upstream migration. Walleye typically spawn at temperatures of 5.6 to 11.1°C over boulder to coarse gravel (Scott and Crossman, 1973), generally in water less than 1.2 m deep (Smith, 1985), and in velocities from 0.3 to 1.0 m/s (McMahon *et al*., 1984). The tailrace does not appear to provide suitable habitat for walleye spawning, as it is too deep and has a bottom of cobble and gravel with the interstitial spaces filled with finer material. The spillway channel downstream of the migration barrier, as well as the rapids downstream of the confluence of the tailrace and spillway channel, have suitable substrate and provide extensive areas of potential walleye spawning habitat. As flow velocities throughout these two areas will vary depending upon river discharge, optimal walleye spawning habitat will also vary in location and extent.

On 06 May 2005, approximately 50 spawning walleye were observed by Coker and Portt (2005b) on the east side of the river in the rapids downstream of the confluence of the tailrace and spillway channel (see Figure 5.4). Two and three single walleye were observed along the edge of the tailrace and in the lower 400 m of spillway channel examined, respectively.

The walleye spawning survey was repeated on 01 May 2006 (Coker and Portt, 2006g). Approximately 50 spawning walleye were again observed in the same area as 2005, i.e., from the east side of the river in the rapids downstream of the confluence of the tailrace and the spill channel (see Figure 5.4). No walleye were observed within the tailrace. Seven single walleye were observed in the lower 300 m of the spill channel, upstream of its confluence with the tailrace. No walleye, or other fishes, were observed in the remainder of the spill channel up to the 4-m barrier that is located 676 m upstream of the confluence with the tailrace.

In summary, although extensive potential spawning areas for walleye were identified downstream of the Wawaitin GS and in the lower portion of the spill channel, walleye were only observed in the spring of 2005 and 2006 spawning in the rapids downstream of the confluence of the generating station tailrace and spill channel. Based on the nature of the habitat in the tailrace, it is unlikely that it ever provides significant spawning habitat for walleye. The accessible portion of the spillway may provide walleye spawning habitat when flow conditions are appropriate. Although flow velocity and substrate appeared to be appropriate for spawning in the spring of 2005 and 2006, the flow volume (<1 m^3/s) may have been too small to entice walleye to enter relative to the flow volume in the rapids downstream. Potential spawning habitat for suckers and walleye occurs at the shallower downstream end of the tailrace where the substrate is more open. However, spawning fish were not observed during the spawning surveys (Coker and Portt, 2005b, 2006g).

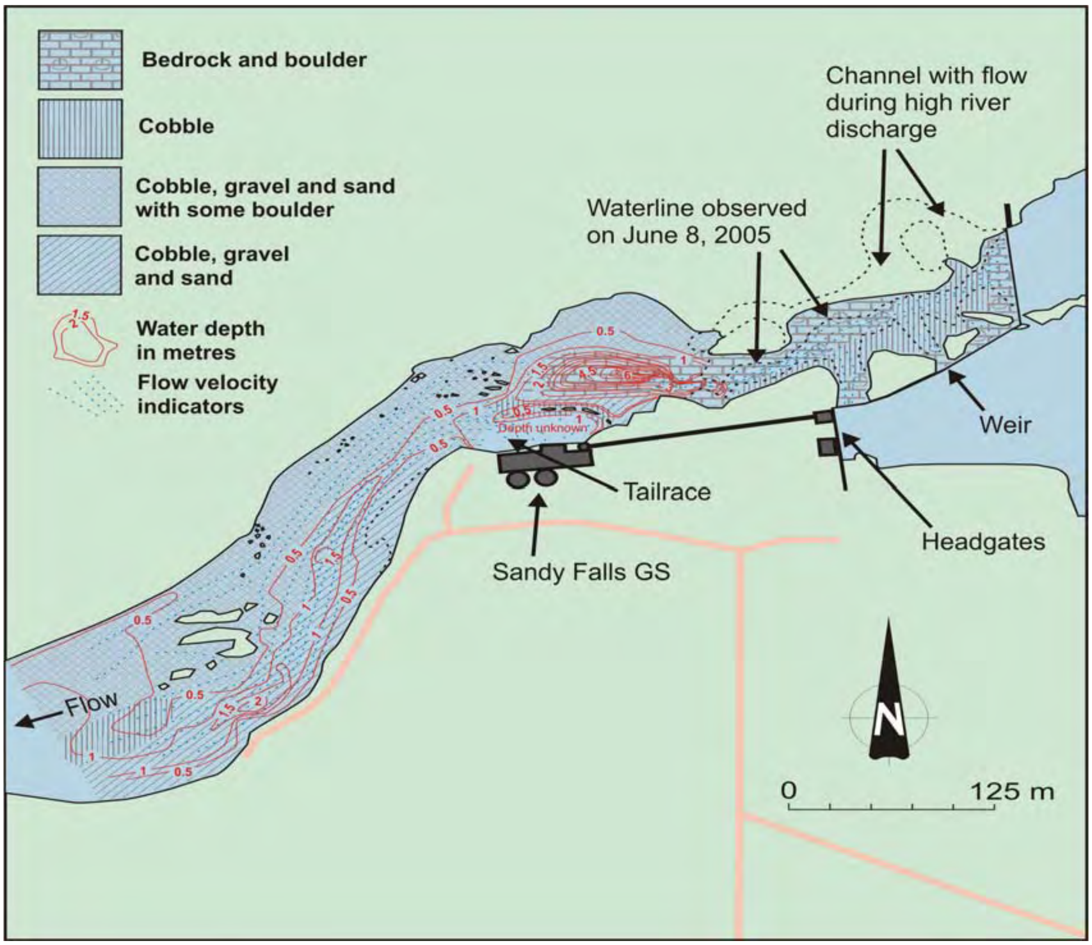
Figure 5.4: Walleye Spawning Survey Observations, Wawaitin GS



Sandy Falls GS

Within the spill channel immediately downstream of the Sandy Falls dam, habitat is subjected to flows that vary widely, depending on the total river flow and the proportion that passes through the Sandy Falls GS. This river section consists of bedrock chutes and boulder and cobble rapids (see Figure 5.5), and combined with the variable flow, is not likely very productive habitat (Coker and Portt, 2006b).

Figure 5.5: Aquatic Habitat Downstream of the Sandy Falls GS



The deeper area in the vicinity of the Sandy Falls GS tailrace is likely the result of scouring by flows exiting the spill channel. Substrate consists of bedrock and boulders (Figure 5.5). Larger fish (walleye and suckers) were observed by video in 2005 (Coker and Portt, 2006b).

Downstream of this deep area for approximately 250 m, the river is rather shallow with swift flows and mostly cobble, gravel and sand substrate. Lake chub, emerald shiner, spottail shiner, mimic shiner, longnose dace, YOY white sucker, juvenile burbot, trout-perch, mottled sculpin and logperch were collected in the offshore riffle areas and/or quieter shallow habitats along the nearshore during the 2005 and/or 2006 surveys (Coker and Portt, 2006b,e).

The rapids downstream of the Sandy Falls GS tailrace provide spawning habitat for a number of fish species, including walleye, white sucker, longnose sucker and trout-perch. In fact, they are the only rapids along the 40.5-km section of the Mattagami River from the Sandy Falls GS to the Lower Sturgeon GS that provide spawning habitat for walleye (Coker and Portt, 2005a) (see Figure 5.6). Immediately upstream (to the east) of the tailrace, water depth is greater (~5 m) and flow is less than that usually required for walleye spawning. With some difficulty due to rapid flows, walleye could access the steeper rapids that extend from upstream of the tailrace to the base of the weir; however, the rapid flow velocities and boulder and bedrock that dominate this area do not provide good walleye spawning habitat.

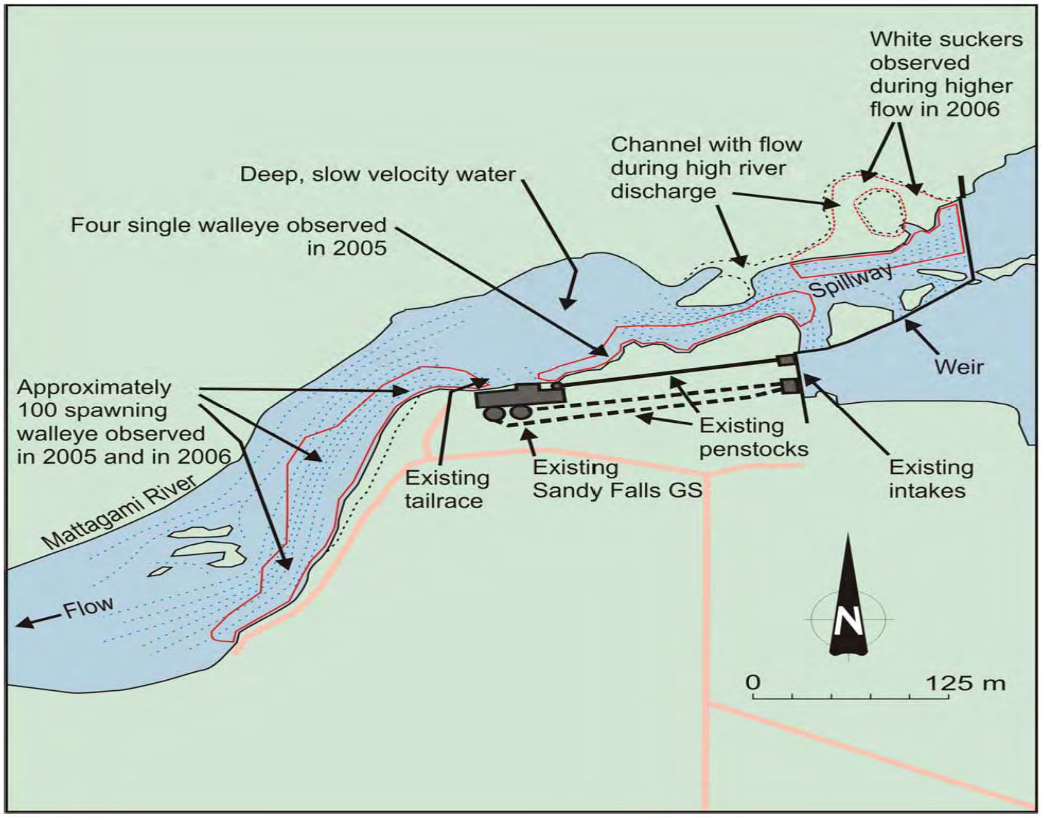
On 06 May 2005, approximately 100 spawning walleye were observed in the rapids downstream of the tailrace. (Coker and Portt, 2005a). Longnose sucker in similar numbers were also observed spawning among the walleye. Four single walleye were observed in deep slow-moving water upstream of the tailrace. None were observed in the steep rapids below the weir.

On 01 May 2006, Coker and Portt (2006h) observed approximately four walleye and a few longnose sucker in the rapids downstream of the tailrace. At the time, water temperature was 8.5°C, water was turbid and flow was high.

On the following day (02 May) with water temperature at 10.3°C and less turbid conditions, walleye were observed in the rapids downstream of the tailrace in similar numbers and distribution as in 2005 (see Figure 5.6). No walleye were observed upstream of the tailrace. Longnose sucker and four common sucker were also observed spawning in the same area among the walleye. Numerous white sucker were also observed in the shallow, temporary, high flow channels on the north side of the river below the weir. Some large yellow perch were observed in the flooded grasses along the shore.

In summary, although observations were conducted in all the sections of the rapids downstream of the Sandy Falls weir in 2005 and 2006, spawning walleye were only observed in the shallow cobble, gravel and sand riffles downstream of the Sandy Falls GS tailrace (Coker and Portt, 2005a, 2006h). Large numbers of longnose suckers were also observed spawning among the walleye.

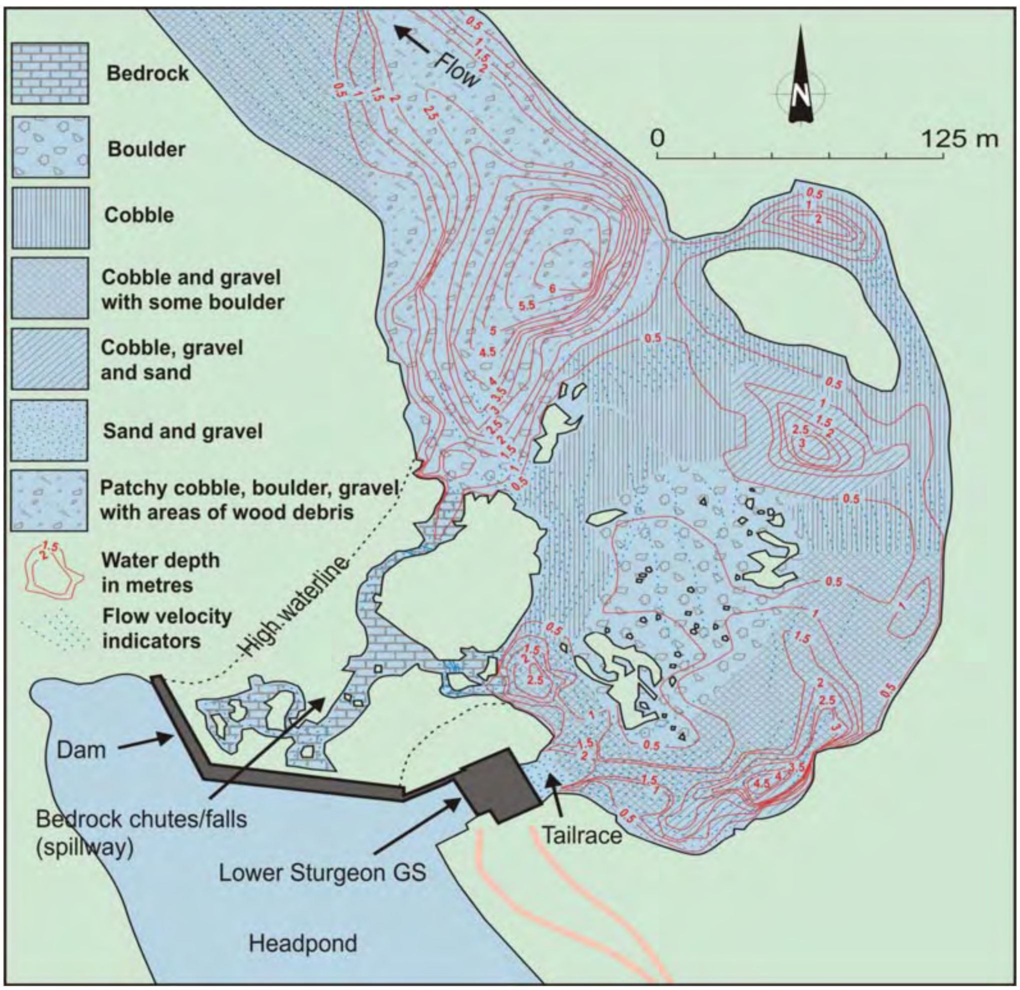
Figure 5.6: Walleye Spawning Survey Observations, Sandy Falls GS



Lower Sturgeon GS

Much of the aquatic habitat immediately downstream of the Lower Sturgeon GS is shallow, with flow velocities ranging from swift rapids to quiet nearshore and bar areas. A few isolated deep areas exist, with the most extensive of these located downstream and north of the bedrock chutes/falls (see Figure 5.7). Substrate outside of the chutes/falls section consists of various mixtures of cobble, gravel and/or boulder, together with sand in some lower gradient areas. Large woody debris occurs in the deep area located downstream and north of the bedrock chutes/falls.

Figure 5.7: Aquatic Habitat Downstream of the Lower Sturgeon GS



Lake chub, emerald shiner, mimic shiner, longnose dace, juvenile burbot, trout-perch, mottled sculpin, juvenile smallmouth bass, yellow perch, Iowa darter, johnny darter and logperch were present in the offshore riffle areas and/or in the quieter shallow habitats along the nearshore

(Coker and Portt, 2006c,f). Walleye and longnose sucker were observed in the deeper portions of the area immediately downstream of the Lower Sturgeon GS (Coker and Portt, 2006c). During the MNR lake sturgeon intensive gill netting program in 1985, white sucker, northern pike, longnose sucker and walleye were captured within the deeper area downstream of the dam spillway.

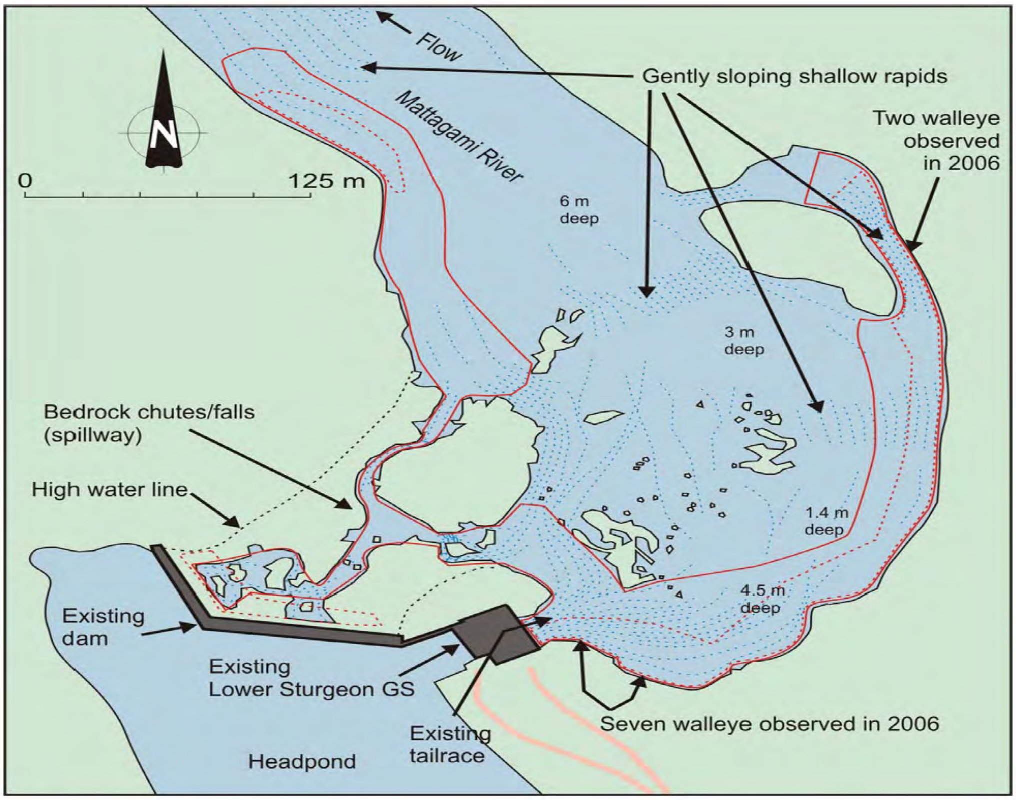
The gently sloped rapids downstream of the bedrock spillway and the tailrace appear to provide good spawning habitat (Cocker and Portt, 2005c) (see Figure 5.8). Extensive areas of these rapids have appropriate substrate, and a variety of flow velocities and water depths that included those preferred by spawning walleye. However, no walleye were observed during the May 2005 survey. This location has historically been known as an important walleye spawning area.

On 01 May 2006, Coker and Portt (2006i) again observed no walleye downstream of the bedrock spillway and the tailrace. At the time, water was significantly more turbid and deeper than during the May 2005 survey, reducing the area that could effectively be monitored for walleye.

The same area was examined on 03 May 2006 (Coker and Portt, 2006i). Although the water was still turbid, seven walleye were observed as a group along the shore just downstream of the tailrace and two other walleye were observed in the channel between a small island and the shore (see Figure 5.8). Flows through the spill channel during the 2006 surveys were significantly higher than in 2005, rendering observation within the spill channel and downstream impossible, except from the walkway on top of the dam. Such high flows would generally exclude walleye from the spillway.

In summary, Coker and Portt (2006c) concluded that the series of bedrock chutes/falls below the dam in the spillway does not provide good walleye, sucker or sturgeon spawning habitat due to the mostly bedrock substrate. Appropriate flow velocities may also be limiting in this area. At the time of the 05 May 2005 survey, it was deemed that this area was inaccessible to walleye due to waterfalls at the downstream end of the bedrock chutes/falls; however, it would be accessible during higher spill flow and elevated tailwater (Coker and Portt, 2006i). Walleye have been observed in large numbers within the bedrock spillway beneath the dam on some occasions (G. Deyne, MNR Timmins District, 2005, pers. comm.), likely during higher spill flow and elevated tailwater conditions. The habitat downstream of the Lower Sturgeon GS is deeper than is typically used by walleye for spawning along much of the accessible shoreline; however, this depth also makes observations more difficult, particularly under turbid conditions. A small number of walleye were observed during the second 2006 survey (Coker and Portt, 2006i); moreover, three larval walleye were captured in drift nets in June 2005, indicating that some walleye spawning had occurred (Coker and Portt, 2006c). The considerable extent of rapids downstream of the Lower Sturgeon GS probably provides many potential spawning locations.

Figure 5.8: Walleye Spawning Survey Observations, Lower Sturgeon GS



5.2.2.11 Aquatic Avifauna

The Mattagami River is considered be very productive for waterfowl nesting and brood rearing in the Sandy Falls and Timmins area, downstream of the Wawaitin GS (Sears, 1992). Mallard, black duck, wigeon, teal and goldeneye, as well as shorebird species, are common. A small marsh and wild rice stand at the mouth of Craft Creek, approximately 5 km upstream of the Sandy Falls GS, attract large numbers of waterfowl. The pattern of water level fluctuations, i.e., high levels in the spring followed by gradual reductions over the summer, are extremely beneficial for the nesting waterfowl and wild rice stands. Kenogamissi Lake upstream of the Wawaitin GS may also offer nesting, brood rearing and staging areas for local waterfowl.

Of the 77 aquatic avifauna species recorded in the Timmins area, 23 breed or likely breed in the Timmins area. Of these, 11 are designated by the Natural Heritage Information Centre (NHIC, 2006a) as S5, i.e., very common in Ontario and demonstrably secure, whereas 12 are S4, i.e., common in Ontario and apparently secure.

5.2.2.12 Significant Aquatic Wildlife Species

As indicated in Section 5.2.2.9, only lake sturgeon and goldeye are considered to be rare to uncommon by the MNR. Both species occur in the lower reaches of the Mattagami River downstream of the Lower Sturgeon GS. As indicated in Section 5.2.2.9, 50 lake sturgeon were recently transplanted to the river section between the Wawaitin GS and Sandy Falls GS. The American white pelican is designated as endangered provincially and is protected by regulation under the Ontario *Endangered Species Act* (MNR, 2006a). COSEWIC (2006) lists the American white pelican in the not at risk category.

In addition, the yellow rail and black tern have been designated as being species of special concern by COSSARO but not listed in regulation under the Ontario Endangered Species Act (MNR, 2006a). These species are not afforded habitat protection under the Provincial Policy Statement (OMMAH, 2005) of the Planning Act. Federally, the yellow rail is also designated as a species of concern by COSEWIC (2006), whereas the black tern is considered to be not at risk.

Examination of the NHIC (2006a) database indicated that there were no records of these three aquatic bird species within a 5-km radius of the proposed redevelopment sites.

5.3 AIR AND NOISE

On a land use continuum the Sandy Falls GS, Wawaitin GS and Lower Sturgeon GS range from rural to accessible wilderness to remote wilderness. Sandy Falls GS is located in the rural area just outside of Timmins and its air quality largely reflects that of the City with a variety of industrial uses and a large volume of vehicles that travel to, from and through the City. Its noise environment is characterized by rural land uses. Wawaitin GS is located in largely a wilderness area that is well accessed and used by the public. Local air quality is reflective of a wilderness area with the predominant noise being truck and vehicle traffic on local roads. Lower Sturgeon GS is located in a remote wilderness area with no other permanent use. No other human noises are generally present in the area and local air quality is good. At all three sites, the most significant source of noise is the sound of water being spilled around the generating stations.

The existing air quality was not assessed as part of the project, as hydroelectric generating stations do not produce air emissions.

The existing noise conditions at the three sites were not assessed as hydroelectric generating stations produce very little detectable noise. This is because most of the equipment is housed in the powerhouse.

5.4 SOCIO-ECONOMIC ENVIRONMENT

5.4.1 Demographics, Community and Economy

Northern and Northeastern Ontario has a resource based economy driven primarily by the forest products, mining, tourism and government services sectors. Most of the other sectors of the Northern Ontario economy such as retail and wholesale trade, other manufacturing, construction and services are generally dependent on and strongly impacted by the economic cycles within the resource industries.

Timmins is the major economic centre for a vast section of Northeastern Ontario stretching from Hearst in the west to James Bay in the North, the Quebec border in the east to the northern section of Timiskaming District in the south (Sudbury and North Bay become the major centres further south). Timmins is the centre for industry, commerce, distribution and finance for communities in this region such as: Cochrane, Smooth Rock Falls, Kapuskasing, Hearst, Chapleau, Iroquois Falls as well as many other smaller communities serving a regional market territory of approximately 118,000 people (City of Timmins, 2006).

Major settlement of Timmins began in the early 1900s when the area became known for the discovery of gold at the Dome Mine. The City itself was founded in 1912, a by-product of the Porcupine Gold Rush (1912). Since that time the City's economy has been driven by resource industries. In the 1960s, base metals were discovered in Timmins.

Today, approximately 25% of the workforce is directly employed in mining and forest products. Several of the largest resource industry employers in Timmins include: the Falconbridge Kidd Creek gold mining and metallurgical operations, the Grant Forest Products oriented strandboard mill, the Tembec softwood sawmill and the Domtar McChessney softwood sawmill. A very large number of privately owned businesses in Timmins supply these companies with essential goods and services such as independent loggers, chemical companies, silvicultural services, business services, construction services, etc. Other major employers in Timmins include: Timmins and District Hospital, Porcupine Joint Venture (mining), the City of Timmins, Teletech Inc. (call centre), The Redpath Group (mining), local school boards, Northern College and Leo Alarie & Sons Ltd. (construction) (City of Timmins, 2006).

OPG's Northeast Plant Group (NEPG) employs 170 people in its operations centred in Timmins, Dymond and Kapuskasing.

Timmins has an estimated population of 43,685 with a median age of 37.1 compared to 37.2 for Ontario and 39 for Canada.[2] Thirty-one percent of the population falls between the ages of 25-44 indicating a large available workforce. The total number of households in Timmins in 2001

[2] Unless otherwise identified, all the social data presented in this report is based on 2001 Statistics Canada census information.

was 17,050, with an average dwelling value of $113,941. The unemployment rate in Timmins remains higher than the provincial average (6.1%) at 11.2% but lower than many of the smaller communities such as Moonbeam (18.7%), Opasatika (13.3%) and Foleyet (18.2%).

In the vicinity of each of the generating stations there are a number of other more localized socio-economic uses.

Wawaitin GS is located south of Timmins in largely a wilderness area characterized by other socio-economic uses such as cottaging, fishing, logging, trapping, hunting and also permanent residences. At Wawaitin GS, the dams and powerhouse are fenced and locked for public safety.

The area around the Sandy Falls GS is rural in character with some cleared fields used for agricultural use, although large blocks of forest cover remain in patches over these lands. The area is not densely populated but there are numerous homes in the area including one situated on the hill above the GS and located approximately 100-200 m from the facility situated on the hill above. At Sandy Falls GS, the powerhouse, penstocks and intake canal are fenced and locked from public use and an informal boat launch is located about 100 m downstream of the facility. While the parking is limited, angling is observed by OPG NEPG staff. The rapids downstream of the generating station are identified as a Fish Sanctuary area by MNR with corresponding seasonal fishing restrictions (see Section 5.2.2.9). It is likely that most of the public use of the parking lot and boat launch is associated with angling.

Lower Sturgeon GS is situated in largely a wilderness setting. Use along the public portion of the road is very light and likely by anglers and hunters. While the road is not currently used for logging, it is possible that harvest blocks are occasionally identified in the area requiring this road for access. Canoeists along the Mattagami River are very rarely observed in this location. A portage exists on the western side of the river for canoeists to traverse the facility.

5.4.2 Land-Use Planning

Both the Wawaitin GS and Sandy Falls GS are located within the City of Timmins, while the Lower Sturgeon GS is located in an unorganized territory.

Sections 1.8.2 and 1.8.3 of the *Provincial Policy Statement* (OMMAH, 2005) encourage increased energy supply from waterpower resources as follows:

> "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[3] and alternative energy systems, where feasible."
>
> "Alternative energy systems and renewable energy systems shall be permitted in settlement areas, rural areas and prime agricultural areas in accordance with provincial and federal requirements. In rural areas and prime agricultural areas, these systems should be designed and constructed to minimize impacts on agricultural operations."

Described below is the land-use planning context for each station.

5.4.2.1 Wawaitin GS

Wawaitin GS is located about 25 km south of the City of Timmins in Thornloe Township. While the area is within the City of Timmins boundaries, the land around the generating station is primarily general use crown land, except for isolated pockets of private patent lands primarily along Kenogamissi Lake and Hydro Bay (MNR, 2006b).

Wawaitin GS is located within the Kenogamissi-Mattagami Recreation Corridor general use area, which was identified in the Timmins District Land Use Guidelines (MNR, 1983). This area consists of 120 m on each side of the southern section of the Mattagami River as far south as Kenogamissi Lake and the entire northern section of the Mattagami River north of the Sandy Falls GS. Commercial hydro development is a permitted activity in this zone (MNR, 2006). The land around the Kenogamissi-Mattagami Recreation Corridor is known as the Tatachikapika Complex, an 88,562 ha general use area allowing resource harvesting, extraction and recreation that was also developed during the Timmins District Land Use Guidelines (MNR, 1983) process.

Wawaitin GS was constructed prior to the City's establishment of an Official Plan. The area around the facility is identified as "Wilderness" in Schedule 2 of the City's Official Plan. The Timmins Official Plan and Wilderness zoning recognize the importance of resource industries to the Timmins economy (Part One, Section 4) and permits industrial uses to occur in these areas. This area is zoned "Rural Wilderness" and referred to as "AW" in the City's Zoning By-Law. The nearby trailer park and cottages along Kenogamissi Lake and Hydro Bay in the area are identified as "Cottage Development" in the Official Plan and "Commercial Resort (CR)" and "Rural Seasonal" in the Zoning By-Law. Wawaitin GS is a legal non-conforming use according to the Official Plan and Zoning By-Law. Within the Definitions section of the City of Timmins Zoning By-Law (2.63) a Non-Conforming Use is defined as:

[3] Renewable energy systems means the production of electrical power from an energy source that is renewed by natural processes including, but not limited to, wind, water, a biomass resource or product, or solar and geothermal energy.

> "Non-Conforming Use means the use of land, building or structure which does not comply with the provisions of the By-law for the zone in which such land; building or structure is situated, provided that such use of land, building or structure existed at the date of the passing of this By-law by the Council"

The City of Timmins is currently undergoing a review of its Official Plan, which was most recently amended in 1999. An interview conducted with the Director of Planning for the City of Timmins confirmed that there are no planning issues associated with the Wawaitin GS (Jensen, 2006).

OPG's Water Power Lease from the Crown covers the land containing the existing dams, intake canal, powerhouse, penstocks and spillway. Some additional lands need to be added to the existing Water Power Lease in order to accommodate the new powerhouse and penstock.

5.4.2.2 Sandy Falls GS

The Sandy Falls GS is located in a rural/agricultural area about 10 km northwest of the City of Timmins centre. Sandy Falls is accessed by Mahoney Drive which terminates at the Generating Station. This road is maintained by the City of Timmins. Most of the land around the Sandy Falls GS is private patent land except for a thin riparian crown general use area along the Mattagami River.

Sandy Falls GS is also located within the Kenogamissi-Mattagami Recreation Corridor general use area, which was identified in the Timmins District Land Use Guidelines (MNR, 1983). This area consists of 120 m on each side of the southern section of the Mattagami River as far south as Kenogamissi Lake and the entire northern section of the Mattagami River north of the Sandy Falls Generating Station. Commercial hydro development is a permitted activity in this zone (MNR, 2005). The land around the Kenogamissi-Mattagami Recreation Corridor is known as the Mountjoy-Matheson Agricultural Complex. This is a general use area of 24,131 ha encompassing five high quality agricultural areas. The land use priority in this area is the protection of agricultural lands and the continued development of agricultural activities and associated infrastructure (MNR, 2006).

Sandy Falls GS was also constructed prior to the City developing an Official Plan. The generating station is located in Mountjoy Township in an area known as the Mountjoy Planning Area. The area around the facility is identified as "Agricultural" in the City's Official Plan. This area around the GS is generally zoned "Rural-Agriculture" and referred to as "AT" in the City's Zoning By-Law. Lands along the river are zoned AT-F indicating that they are flood fringe zones. Sandy Falls GS is a legal non-conforming use according to the Official Plan and Zoning By-Law, as defined in the Timmins Zoning By-Law (2.63) a Non-Conforming Use is defined as:

> "Non-Conforming Use means the use of land, building or structure which does not comply with the provisions of the By-law for the zone in which such land; building or structure is situated, provided that such use of land, building or structure existed at the date of the passing of this By-law by the Council"

An interview conducted with the Director of Planning for the City of Timmins (Jensen, 2006) confirmed that there are no planning issues associated with the Sandy Falls GS.

OPG's Water Power Lease from the Crown is wholly contained within Mountjoy Township and covers Lot 9, Concession 5; Lot 10, Concession 5; Lot 11, Concession 5; and Lot 11, Concession 4. This covers the dams, intake structure, powerhouse and penstocks and significant areas upstream and downstream of the facility.

5.4.2.3 Lower Sturgeon GS

The Lower Sturgeon GS is located in an area of Crown general land use land known as the Kidd Creek Complex, a 103,000 ha area of land traversing the northernmost part of Timmins District. The primary resource use in the area is resource extraction and hydroelectric development is permitted. Private patent land occurs east of the generating station beyond the Kidd Creek Complex general use area. The Mahaffy Township Ground Moraine Conservation Reserve Complex is located a couple km northwest of the complex.

Lower Sturgeon GS is located in an unorganized township and therefore, there are no local planning controls. Therefore, the Province is the planning authority. There are no Minister's zoning orders applicable to this section of the Province.

OPG's Water Power Lease from the Crown is wholly contained within Mahaffay Township and covers part of Lot 2, Concession 1, Lot 3, Concession 2, Lot 3, Concession 1 and Lot 2, Concession 1. This covers the dams, intake structure, and powerhouse and significant areas upstream and downstream of the facility and on both banks of the river.

5.4.3 Resource Use

The area around the Wawaitin GS is wholly contained within the Romeo Malette Forest, a Sustainable Forest Licence issued to Tembec. The Licence stipulates that most of the conifer resource is directed to Tembec mills and most of the hardwood is directed to Grant Forest Products. A Forest Management Plan for the Romeo Malette Forest has historically been prepared on a five year term. Tembec has many harvest contractors that have logging trucks on the roads between Timmins and Wawaitin.

Kenogamissi Lake is an important recreational lake for the cottagers and home owners as well as local anglers and the occasional canoeist. Anglers also have been observed further downstream of the Wawaitin GS. It is likely that walleye and to a lesser extent Northern Pike are the primary targeted species by the local angler population. A small trailer park (approximately 30 trailers) and boat launch is located about 500 m east of the intake canal along the municipal road. The closest cottages are located about 1.5 km from the intake canal at Hydro Bay.

Two mining claims overlapping a small portion of OPG's Water Power Lease have been identified at the Wawaitin Generating Station and OPG is currently in discussions with claim holders around mutual interests of rights and access to the property. A solid waste disposal site that is primarily used by the local cottagers and residents is located northeast of the Wawaitin GS and accessed by the municipal road.

At Sandy Falls the powerhouse, penstocks and intake canal are fenced and locked from public use. The public does use the parking lot that serves the facility. An informal boat launch is located about 100 metres downstream of the facility. While the parking is limited, angling is observed by OPG NEPG staff. The rapids downstream of the GS are identified as a Fish Sanctuary area by MNR with corresponding seasonal fishing restrictions. It is likely that most of the public use of the parking lot and boat launch is associated with angling. The area around the generating station is rural in character with some cleared fields used for agricultural use, although large blocks of forest cover remain in patches over these lands. The area is not densely population but there are numerous homes in the area including one approximately 100-200 metres from the facility situated on the hill above.

The Lower Sturgeon GS is located in Mahaffy Township, 48 km north of Timmins and accessed via Highway 655 and then a gravel road leading west. This road is open to the public for about 10 km and then gated by OPG about 2 km from the station. The transmission line connecting the facility generally runs north-south along this section of the river.

5.5 BUILT HERITAGE AND ARCHAEOLOGICAL RESOURCES

5.5.1 Built Heritage

Unterman McPhail Associates, Heritage Resource Management Consultants were retained to undertake a cultural heritage resource assessment and to present mitigation recommendations for the built heritage and cultural heritage landscape resources as part of the study for the redevelopment of the existing Sandy Falls GS, Wawaitin GS and Lower Sturgeon GS on the Upper Mattagami River, District of Cochrane. The full cultural heritage report in full appears as a separate Technical Support Document to this Environmental Report.

Sandy Falls, Wawaitin and Lower Sturgeon GS were built on the Upper Mattagami River to provide power to the mines of the Porcupine gold camp. The Sandy Falls GS was put in service in 1911, delivering power to the Hollinger Mine, which was 9.7 km away. Construction at the Wawaitin GS was initiated in 1911 and was brought into service in 1912. Lower Sturgeon GS which was the most isolated of the three sites was put in service in 1923. The isolation of the site at the time of construction required the transportation of heavy machinery first to Sandy Falls GS by scow, by skid over a 1.6 km long portage and by scow again to Sturgeon Falls where the machinery was hauled by block and tackle up the hill to the powerhouse.

The Hydro Electric Power Commission, a predecessor to OPG acquired the three generating stations on November 30, 1944; it did not start operating the plants until March 15, 1945.

None of the three sites are designated under the Ontario's Heritage Act. *Planning for Hydroelectric Generating Stations as a Cultural Resource*, a study undertaken in the early 1980s by the former Ministry of Citizenship and Culture, in co-operation with Ontario Hydro, provided a preliminary ranking of Class A, B or C for the hydroelectric generating stations now owned by OPG. Class A stations were deemed to be those of the greatest heritage importance, Class B a good example of a type and Class C a fair example. Sandy Falls GS was identified as a Class C structure. Neither the Wawaitin nor Lower Sturgeon GS were identified. The report cautions the rankings should be viewed as provisional since the environmental qualities and integrity could not be assessed for those stations that were not visited, such as the Upper Mattagami River plants. In addition, generally less historical information was available for those privately built plants like Sandy Falls, Wawaitin and Lower Sturgeon GS and which were later acquired by Hydro Electric Power Commission, later Ontario Hydro and now OPG.

5.5.2 Archaeological Resources

Woodland Heritage Services Limited conducted the archaeological and cultural heritage assessments at all three generating stations. This was because the projects may impact archaeological and cultural heritage sites including First Nations buried archaeological values. Ground based Stage 1 assessments were carried out at all three generating stations and a Stage 2 assessment was carried out at Wawaitin GS. This work was undertaken according to Ontario Heritage Act Regulations which involved field visits by a licensed archaeologist.

The complete "Archaeological and Cultural Heritage Impact Assessment of the Sandy Falls and Lower Sturgeon Generating Stations Redevelopment Projects Located on the Upper Mattagami River" and the Archaeological and Cultural Heritage Impact Assessment of the Wawaitin Generating Station Redevelopment Project Located on the Upper Mattagami River" appear as Technical Support Documents to this Environmental Report.

First Nations peoples have shared the Mattagami River area for more than 300 years with Europeans; however, their history in the area goes back a minimum of 6,000 years and perhaps several thousand years earlier, to the days of the glacial lake. The earliest known inhabitants of the Mattagami River area some 6,000 years ago were the Shield Archaic Peoples followed by the Laurel Tradition peoples some 2,000 years ago. Both practised a hunting/gathering subsistence pattern. During the Terminal Woodland Period some 800 years ago, recent data from northern Ontario suggests a trend towards an increase in population during the Woodland period reflected in an increased frequency of sites recovered during archaeological surveys. This trend seems to be repeated across Northern Ontario and whether this actually represents population increases or a bias in site recovery remains to be demonstrated.

At the time of first contact, the northern interior shield areas, including the southern portions of the Mattagami River area were inhabited by Anishnabeg (Ojibwa) and Algonquins. The northern reaches were the traditional territory of the Moose Cree.

The Mattagami First Nation (FN) (Mattagami Band #71) is situated on a small parcel of reserve land on the south side of Mattagami Lake. The Reserve was set apart under the provision of Treaty Number nine of 1906. Until the mid-1950s, the community was located on the north side of the lake on the main part of the reserve – which is the site of the Northwest Company/Hudson's Bay Company post of Mattawagamingue, originally built in 1794. Mattagami Lake was flooded in 1917, when a dam was built downriver at Kenogamissi Falls. Because of the connection of the Upper Mattagami River to the height of land portage routes, it was one of the major travel routes for First Nations and fur traders.

The goal of the archaeological work was to ascertain if any pre-contact First Nations archaeological sites might be present (these would mainly be found in undisturbed areas) and/or historic archaeological sites, artefacts and features. Historic archaeological features would include the foundations and footings of former buildings, houses, stables, root cellars, ice houses, dams, weirs and industrial machinery as well as hydro colony (residential) house foundation remains are of value since they provide evidence of the scale, location and function of worker communities that once existed on the site. As well, the project would document any archaeological features and artefacts that provide evidence of the physical evolution of the site which took place during the site's history. Any industrial and domestic refuse deposits or middens would also be useful as they would provide information on the historic generating station operations, generating technology and the domestic life of the historic plant operators.

Based on the initial archaeological field inspection, both Sandy Falls and Lower Sturgeon were determined to have overall low potential for buried archaeological sites owing to extensive prior disturbances. The Stage 1 Archaeological Assessment did not locate any undisturbed areas with high potential to contain cultural heritage values or archaeological heritage sites (buried sites and ruins).

At Wawaitin GS most of the area was determined as having low potential for buried archaeological sites, however one area of high potential near the proposed new penstocks and powerhouse was identified as high potential and a Stage 2 subsurface testing assessment was undertaken. Both the Stage 1 and 2 assessments did not locate any cultural heritage values or archaeological heritage sites (buried sites and ruins).

5.6 FIRST NATIONS

5.6.1 Context

A number of First Nations participated in the Mattagami River System Water Management Plan exercise between 2002 and 2004: Mattagami, Matachewan, Wahgoshig, Brunswick House, Chapleau Ojibwe, Taykwa Tagamou, Beaverhouse Aboriginal Community (not recognized by Indian and Northern Affairs Canada (INAC) as a First Nation) and Missinaibie Cree. Based on OPG's and SENES' experience in the region, previous correspondence with First Nations and direction provided by the MNR, inquiries were placed with four First Nations to see if they were interested in being consulted on the project. The First Nations identified for consultation were: Mattagami FN; Flying Post FN; and, Matachewan FN and Taykwa Tagamou Nation (TTN). More information on the consultation program with First Nations is summarized in Section 7.1.2 and is also provided in the First Nations Consultation Technical Support Document for this Environmental Report.

5.6.2 Mattagami First Nation

The Mattagami FN Reserve located near Gogama is approximately 40 km south of the Wawaitin GS and has a historical interest in hydro development on the river owing to the flooding of Mattagami Lake that affected their traditional and existing Reserve lands. The impact caused by the flooding has been addressed through a past grievance process.

Mattagami FN is a small First Nation with a total population of 416 and an on-reserve population of 154. Band members are employed in local band administration, logging operations, a community development corporation, the local school and a gas bar/restaurant/variety store along with other occupations. Mattagami FN is located about 100 km south of Timmins and about 20 km from Gogama. There are approximately 67 homes on the Mattagami FN reserve as well as a band office, church, variety store, fire hall, school, youth recreation centre, Binoogesh Center and storage buildings (OPG, et. al., 2006). Many band members continue to pursue traditional resource activities such as trapping, hunting, fishing and gathering.

5.6.3 Matachewan First Nation

The Matachewan FN Reserve is located near the unincorporated municipality of Matachewan in Temiskaming District. The Matachewan FN has a total population of 556 individuals of which 40 are on Reserve. Historically, the Matachewan FN has a traditional area along the upper Montreal River system; however, an offer to consult was made to the Matachewan FN as well. Many members continue to pursue traditional resource activities such as trapping, hunting, fishing and gathering.

5.6.4 Flying Post First Nation

The Flying Post FN is located in Nipigon, Ontario and has a total population of 162. The Flying Post FN has an uninhabited Reserve approximately 40 km west of the Lower Sturgeon GS.

5.6.5 Taykwa Tagamou Nation

The fourth First Nation identified is Taykwa Tagamou Nation (TTN). The main reserve of the TTN is located east of Cochrane and a second uninhabited reserve is located 88 km north of Cochrane and four km east of the Abitibi River. Many band members continue to pursue traditional resource activities such as trapping, hunting, fishing and gathering.

5.6.6 Tribal Councils and Metis

While no formal invitations to consult were sent to either Tribal Councils or Metis organizations, general public consultation notices were sent to the Wabun Tribal Council and the local Metis organization in Timmins. No response was received from either organization.

6.0 PREDICTED ENVIRONMENTAL EFFECTS AND PROPOSED MITIGATION MEASURES DURING CONSTRUCTION AND OPERATIONS

6.1 POTENTIAL SOURCES OF EFFECTS

This chapter describes the environmental effects expected as a result of the Proposed Undertaking. The chapter first highlights the potential source of the effect and then more fully describes the predicted effects attributed to the Proposed Undertaking. Typically, impacts relate to both the construction of the redeveloped sites and the operation of the new powerhouses. Operational impacts of the redevelopments are expected to be similar to the current operating conditions. Because the redeveloped facilities will continue to operate in accordance with the existing Water Management Plan and will not change the flows and levels, it is expected that almost all the incremental effects associated with the projects will be during the construction phase.

6.2 BIOLOGICAL EFFECTS

6.2.1 Terrestrial Environment

The available environmental baseline information and site-specific vegetation inventories provided the basis for an assessment of potential construction and operational effects on the terrestrial environment, e.g., due to vegetation clearing, soil erosion, noise, blasting and increased human activity.

Recommended mitigative measures for these effects on the terrestrial environment are based on the standard environmental construction guidelines, relevant government guidelines for proposed hydroelectric power plant development, as well as government agency and other organization consultation.

The significance of potential impacts is based on their magnitude, duration and extent after the implementation of recommended mitigative measures.

6.2.1.1 Geology and Soils

Blasting will likely be required to facilitate new powerhouse and/or ancillary infrastructure construction at the Wawaitin GS and Sandy Falls GS. At the Lower Sturgeon GS, blasting will be required to demolish the existing powerhouse and its foundation. Blasting may also be required at one or more of the sites for grading of rock outcrops in the proposed material laydown and assembly areas.

Explosives used in construction will be closely controlled, with their use restricted to authorized personnel who have been trained in the use of explosives in a manner so as to minimize impacts on the environment. Appropriate government agencies and the local residents will be informed of the blasting schedule in advance of construction, as well as just prior to the detonation program. All necessary permits will be obtained by the Design-Build-Contractor

(DBC), who will also comply with all legal requirements in connection with the use, storage and transportation of explosives, including, but not limited to, the Canada Explosives Act and the Transportation of Dangerous Goods Act. The DBC will be required to retain a consulting engineer with technical expertise in blasting to provide advice on maximum loading of explosives for all blasting, as well as an engineering report indicating recommended charges and blasting methods to be used at specific locations. All blasting will occur in such a way as to be in compliance with federal regulations and directions. Sampling and analysis of bedrock at the three proposed redevelopment sites indicated that it is not acid generating (Martin, 2006).

For Wawaitin GS and Sandy Falls GS, no effects on geology are anticipated beyond the new powerhouse footprints and any ancillary infrastructure requiring blasting for construction. For Lower Sturgeon GS redevelopment, no effects on geology are anticipated beyond the area currently affected by the existing powerhouse. In addition, possible rock outcrop grading in proposed laydown/assembly areas may be required at one or more of the redevelopment sites.

The physiography of the new powerhouse sites will likely be altered due to requisite slope stabilization, as well as at proposed laydown/assembly areas due to requisite grading. A Site Development Plan will be prepared by the DBC, including planning considerations; site and design considerations; site development scheduling; selection of construction equipment; and site development details.

As the effects of site development are expected to be negligible on overall physiography, no mitigation measures are required beyond those set out in the Site Development Plan.

No effects on geology and physiography are anticipated as a result of the operation of the Proposed Undertaking therefore, no mitigation is required.

Soils at the Wawaitin GS consist primarily of sandy loam, with some organic soil (see Section 5.2.1.2). At the proposed Sandy Falls GS and Lower Sturgeon GS redevelopment sites, the soils are clay loam and silt loam to silty clay loam, respectively.

During construction, soil erosion generally results from water or wind action on the disturbed terrain surfaces as a result of the removal of vegetative cover, alteration of topography and improper restoration. All construction work would be conducted so as to avoid unnecessary disturbance of the ground by the placement or excavation of materials, the disruption of established natural surface and subsurface, or the disturbance of natural vegetation cover that is to be preserved.

Till and gully erosion caused by channelized overland flow can be a major source of soil erosion. Sheet erosion can be an additional source of sediment.

Erosion and sediment control will be an integral component of the construction planning process. All personnel involved with the proposed works will be briefed on erosion and sediment control including engineers, contractors, inspectors and environmental staff. In general, the following guidelines will be applied in the development of the Erosion and Sediment Control Plan:

- fitting of proposed works to the terrain;
- timing of grading and construction activities to minimize soil exposure;
- retention of existing vegetation where feasible;
- restriction of the use of heavy construction equipment to within the approved work areas to minimize soil disturbance and vegetation destruction;
- storage of stripped soil at upland locations;
- implementation of erosion control measures, e.g., rip rap berms underlain by filter geotextile, straw bales used as filters, silt fencing along the shoreline and/or mulching for interim stabilization;
- diversion of runoff away from exposed areas;
- minimization of the length and steepness of slopes;
- maintenance of low runoff velocities;
- design of drainage works, such as ditches and outfalls, to handle concentrated runoff;
- retention of sediment on site;
- routine inspection and maintenance of erosion and sediment control measures; and,
- revegetation of disturbed areas by seeding and/or planting following construction as soon as seasonal conditions permit;

The site-specific Erosion and Sediment Control Plan will be part of a broader Environmental Management Plan for each redevelopment site.

After construction is completed the sites will be rehabilitated. A Site Rehabilitation Plan including planning considerations, soil stabilization and revegetation will be prepared for each redevelopment site.

Dust may be generated during the construction of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS due to heavy equipment movement. Dust generation during dry, windy conditions can be controlled by water trucks and/or sprinklers as necessary to reduce dust to acceptable levels (e.g., Cheminfo, 2005).

The implementation of the Erosion and Sediment Control Plan and the Site Rehabilitation Plan during construction and rehabilitation will obviate or minimize potential effects on soils.

Incidental spills of oil, gas, diesel fuel and other liquids to the environment could occur during construction. In addition, sanitary and other wastes will be generated during construction. Fuelling and lubrication of construction equipment should be carried out in a manner that minimizes the possibility of releases to the environment. Measures for containment and cleanup of contaminant releases should be followed to minimize contamination of the natural environment, e.g., placement of fuel tanks and generators on plastic sheets bermed around the edges, and use of suitable hydrocarbon absorbent material for cleanup and approved landfill or other disposal. Any spills with the potential to create an impact to the environment should be reported to the MOE as required by provincial spills legislation. Interim sanitary waste collection and availability of treatment facilities should be arranged for the duration of the construction period. All construction waste, washwater and wastewater should be disposed of in accordance with regulatory requirements.

A Hazardous Materials Management Plan, Waste Management Plan and a Spills Emergency Preparedness and Response Plan will be developed for each redevelopment site as part of the broader Environmental Management Plan.

The implementation of these pollution prevention plans will obviate or minimize the environmental effects of accidental releases to the natural environment.

The operation of the hydroelectric facilities is not expected to have an effect on property soils. Therefore, no mitigation is required.

6.2.1.2 Vegetation

As indicated in Section 5.2.1.3, at the proposed Wawaitin GS redevelopment site, a small area (less than 1 ha) of vegetation and trees, predominantly balsam poplar, will be displaced by the new powerhouse. The new penstocks will be constructed in a grassed/meadow area that had been cleared for the existing penstocks.

At the proposed Sandy Falls GS redevelopment site, the new water canal is proposed in the grassed/meadow area of the existing penstocks. The construction of the new powerhouse will result in the clearing of a small area (less than 1 ha) of vegetation and trees (white cedar, white birch, alder and spruce) at the shoreline.

For the proposed Lower Sturgeon GS redevelopment, the proposed powerhouse will be located on the site of the existing one resulting in no vegetation clearing.

Some grassed/meadow areas at the three redevelopment sites may be used for laydown/assembly during construction.

Based on vegetation surveys of those locations likely to affected by construction activities, no significant or unusual areas of native vegetation were identified that would preclude or be affected by the construction of the proposed Wawaitin GS, Sandy Falls, GS and Lower Sturgeon GS.

Several individual orchids (*Planthera* sp.) were present in the small area of rocky shoreline located within the possible construction footprint of the proposed Lower Sturgeon GS powerhouse. The 19 species of this orchid genus are variously ranked by the NHIC (2006a) from S5, i.e., very common and demonstrably secure, to S1, i.e., extremely rare in Ontario. If the area where the plants are to be used during construction, it is recommended that the plants will be transplanted to suitable riparian habitat not affected by construction activities.

Vegetation clearing will adhere to standard construction practices as listed below:

- vegetation clearing should be restricted to the minimum necessary for construction activities;
- brush and trees should be felled into the area to be cleared to prevent damage to adjacent vegetation;
- branches overhanging the cleared area should be cut (pruned) cleanly and stubs should not be dressed;
- merchantable timber should be cut and neatly stacked for removal as requested by the MNR;
- specimen trees marginal to the cleared area should be identified prior to construction, flagged and protected form damage, where possible;
- all slash, brush, roots and stumps are typically raked into piles for burning or disposed in a manner prescribed by the MNR; and
- slash material should not be stored near the Mattagami River.

Cutting of merchantable timber and burning of slash will require approval (permits) of the MNR.

After construction of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS, the cleared areas of natural vegetation that have not been displaced by permanent redevelopment infrastructure will be rehabilitated as described in the Site Rehabilitation Plan, emphasizing use of native plant species for revegetation of disturbed areas.

Overall, with the implementation of the standard vegetation clearing construction practices (including orchid transplantation at Lower Sturgeon GS), the construction and operation of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS will have minimal effect on vegetation communities or species.

OPG will instruct its Design Build Contractor to remove all treated wood (which to OPG's knowledge is restricted to the wooden penstocks) from the OPG site. It will be left to the DBC to decide whether the wood is to be re-used or deposited at a landfill that accepts such waste. While OPG has identified this as a Design Build Contractor responsibility, some guidelines on use and handling are provided below.

As indicated by Hutton and Samis (2000), if creosote-treated wood is to be used/deposited on land, placement must be in accordance with provincial and municipal legislation. The removal and disposal of treated timber will take into consideration best management practices (BMPs), including minimization of releases of treated timber fragments and sawdust into the environment, maximization of opportunities for re-use or otherwise disposal at a landfill licensed to accept this type of waste material.

The DBC contractor should also refer to the CCME's (1996) *Provisional Code of Practice for Management of Post-Use Treated Wood*, with respect to how the creosote wood is handled. In reviewing the decommissioning options for the wooden penstocks, this document was consulted to identify management practices and options for treated wood once it has been removed from service.

Should the DBC not find an end user for the treated wood, disposal will be the only option. In that case, the DBC will need to do a TCLP test on the wood to ensure that the landfill can accept such material.

After construction of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS, the cleared areas of natural vegetation that have not been displaced by permanent redevelopment infrastructure will be rehabilitated as described in the Site Rehabilitation Plan, emphasizing use of native plant species for re-vegetation of disturbed areas.

6.2.1.3 Wetlands and Environmentally Significant Areas

As indicated in Section 5.2.1.3, there are no environmentally significant areas within the 5-km radius local study areas for the three proposed hydroelectric plant redevelopments (NHIC, 2006b). Due to the geographic separation, construction and operation of the proposed generating stations will have no effect on environmentally significant areas.

As indicated in Terrestrial Technical Support Document, based on the Provincial Policy Statement (OMMAH, 2005), development and site alteration shall not be permitted in significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. There are no significant wetlands within the 5-km radius local study areas for the three proposed hydroelectric plant redevelopments (NHIC, 2006b).

6.2.1.4 Wildlife

As indicated in Section 5.2.1.5, most of the land around the Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS remains in native vegetation. The primary vegetation communities are a mixedwoods forest with open meadow areas.

The lands around the three generating stations are designated as Class 5 with moderately severe limitations for the production of moose, although Class 3 lands with slight limitations to moose production occur to the east of Lower Sturgeon GS. The areas to the south of the Wawaitin GS, on both sides of Kenogamissi Lake, provide very good moose summer range habitat. A moose wintering area occurs along both sides of the Mattagami River just south of the Lower Sturgeon GS.

Most native mammal and avian species likely present in the local study areas are ranked by the NHIC (2006a) as S5 and S4, i.e., very common and common in Ontario, respectively. All of the herpetofauna species are ranked by the NHIC (2006a) as S5 and S4.

Although one mammal species (eastern timber wolf), eight bird species (golden eagle, loggerhead shrike, peregrine falcon, bald eagle, red-shouldered hawk, short-eared owl, great grey owl, red-headed woodpecker) and the monarch butterfly are considered to be at risk by COSEWIC (2006) and/or COSSARO (MNR, 2006a) and have ranges in Ontario overlapping the study area, none have been recorded within the local study areas (NHIC, 2006a).

During the summer months, the monarch butterfly may also be found in open habitats in the Timmins area. The monarch butterfly has been designated as a species of special concern by COSEWIC (2006) and COSSARO (MNR, 2006).

Based on the SARA Schedule 1 Species at Risk Web Mapping Application (Environment Canada, CWS, 2004), of the ten species listed in Table 2.9, only the occurrence of the monarch butterfly has been documented to overlap with the local study areas of the three redevelopment sites. As indicated in Table 2.9, the monarch butterfly prefers open areas with milkweed (*Asclepius* spp.), which is not present on the three redevelopment sites (Table 2.4 of the Terrestrial Environment TSD).

Based on their locations relative to any environmentally significant areas (see Section 2.4), the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS will not affect significant wildlife habitat; thereby conforming with the Wildlife Policy of Canada (CWS, 1990) and the *Provincial Policy Statement* (OMMAH, 2005).

The construction disturbance will be sufficiently local that little displacement of wildlife will occur. Any resident animals can relocate temporarily to avoid noise and disturbance associated with construction activities.

As indicated in Section 2.5.2 of the Terrestrial Environment TSD, a number of terrestrial bird species are likely locally resident and may nest on the Wawaitin GS, Sandy Falls and Lower Sturgeon GS properties. Most of these species are protected under the *Migratory Birds Convention Act* (MBCA). Recently, the Canadian Wildlife Service (CWS) has stipulated that vegetation clearing should not be undertaken during the breeding season of migratory birds in order to avoid the destruction of any bird nests. Specifically, clearing should not take place between 01 May and 31 July in northern Ontario. Otherwise, a breeding bird survey must be conducted by a qualified avian biologist and any nests found must not be disturbed by the clearing activity until the young have fledged. A buffer zone with a 50-m allowance restricting active construction activities is usually applied around a nest. The CWS will be consulted on the appropriate mitigation measures. To preclude the potential institution of a buffer zone that may affect construction activities, it is recommended that vegetation be removed prior to nesting season initiation, i.e., 01 May, or after nesting season completion, i.e., 31 July.

A small colony of cliff swallows occupies the north side of the Lower Sturgeon GS powerhouse. Nests are usually jug- or gourd-shaped structures located on or in buildings with exteriors entirely composed of many mud pellets (Peck and James, 1987). Most exterior nest locations on buildings are under the eaves with the nest usually placed against both the vertical surface and eave overhang. Fewer nests occur on vertical side walls, under roof peaks, on light fixtures, as well as under veranda roofs, balconies and window ledges. If demolition is to be scheduled during the breeding season, which is approximately early May to mid September, measures to deter the birds from nesting on the powerhouse should be implemented prior to early May, e.g., removal of existing nests, covering parts of the building in fine mesh netting or plastic sheeting, and/or utilization of bird startle measures. Some of these measures could be tested prior to project initiation to evaluate their effectiveness.

Once construction of the proposed generating stations is completed, any displaced animals could reoccupy the habitat created on the rehabilitated areas of the properties and the habitat associated with the natural and cultural vegetation communities not directly affected by construction activities.

During operation, noise will be generated from the proposed facilities. This steady noise from the proposed plants will be similar to that of the existing facilities and not elicit an adverse reaction from nearby habituated wildlife.

Overall, the construction and operation of the Proposed Undertaking will have minimal effect on wildlife populations or wildlife-carrying capacity of the areas.

6.2.1.5 Summary and Conclusions

During proposed generating station construction, potential impacts on the terrestrial environment may occur due to soil erosion and fugitive dust; accidental spills; noise and human activity; and vegetation clearing. Based on an assessment of the available baseline information and potential effects, as well as the implementation of the recommended mitigative measures, SENES concludes that effects during construction will be minimal, localized and short-term.

During proposed generating station operations, potential impacts on the terrestrial environment may occur due to noise and accident spills. Based on assessment of the baseline information and potential effects, SENES concludes that the operation of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS will have negligible effects on the terrestrial environment.

Environmental protection during proposed generating stations construction and operation will be ensured by adherence to the site-specific Environmental Management Plans, as well as compliance with regulatory standards and guidelines.

The Environmental Management Plan for each redevelopment site will ensure that environmental protection will be achieved by addressing government agency requirements, Project requirements and recommended mitigation measures to be undertaken. The Environmental Management Plan will include the Erosion and Sediment Control Plan, Spills Emergency Preparedness and Response Plan, Hazardous Materials Management Plan, Waste Management Plan and Site Rehabilitation Plan.

Table 6.1 summarizes potential construction and operation effects, the recommended mitigative/remedial measures to minimize or obviate these impacts and the net effects.

Table 6-1: Summary of Potential Effects on Terrestrial Environment and Recommended Mitigative/ Remedial Measures

Effect	Recommended Mitigative/Remedial Measure	Net Effect
Construction		
Soil erosion	• Adherence to Erosion and Sediment Control Plan.	Negligible effect
Fugitive dust	• Use of water trucks and/or sprinklers (e.g., Cheminfo, 2005).	Negligible effect
Incidental spills of oil, gasoline and other liquids during construction	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect
Hazardous Materials/ Waste	• Adherence to Hazardous Materials Management Plan and Waste Management Plan. • Waste disposal in accordance with regulatory requirements.	Negligible effect
Displacement of nesting birds	• Vegetation clearing to be undertaken outside the migratory bird breeding season (01 May to 31 July).	Negligible effect
Vegetation clearing	• Implementation of the Site Rehabilitation Plan.	Net benefit
Blasting	• Adherence to blasting engineer recommendations. (DFO Guidelines)	Negligible effect
Operation		
Noise	• Ambient noise levels to remain unchanged.	Negligible effect
Incidental spills of oil, gasoline and other liquids during operation	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect

6.2.2 Aquatic Environment

The available environmental baseline information and site-specific aquatic vegetation, benthic macroinvertebrate and fisheries survey findings provided the basis for an assessment of potential construction and operational effects on the aquatic environment, e.g., due to cofferdam installation/ removal, dewatering, blasting/rock fragment excavation, soil erosion and turbidity generation, etc.

Recommended mitigative measures for the effects of the Proposed Undertaking on the aquatic environment are based on standard environmental construction guidelines, relevant government guidelines for proposed hydroelectric power plant development, as well as government agency and other organization consultation.

The significance of potential impacts was assessed based on their magnitude, duration and extent after the implementation of recommended mitigative measures.

6.2.2.1 Surface and Groundwater Hydrology

Drainage ditches are present on the Wawaitin GS and Lower Sturgeon GS properties. These drainage ditches may be affected by sediment loadings due to accelerated soil erosion during construction. Till and gully erosion caused by channelized overland flow can also be a major source of soil erosion. Sheet erosion can be an additional source of sediment.

As indicated in Section 6.2.1.1, site-specific Erosion and Sediment Control Plans, addressing the areas around the existing and new powerhouses and their ancillary infrastructures, as well as the construction laydown and assembly areas, will be prepared and implemented during construction. The site-specific Erosion and Sediment Control Plan will be part of a broader Environmental Management Plan for each Project.

For any new temporary crossings of these drainage ditches, standard construction procedures will be followed including crossing design (culvert or ford), installation and maintenance. For new crossings, a permit must be obtained from the MNR.

The implementation of these standard procedures during construction and rehabilitation will obviate or minimize potential effects on surface hydrology.

Blasting will likely be required at the three redevelopment sites. Blasting could have a potential effect on groundwater quality and flow in the immediate vicinity of the blasting operations (Fitchko *et al.*, 1998). It has been estimated that peak particle velocities produced from blasting operations in excess of 600 mm/s will cause cracks and discontinuities in sedimentary rock up to a 5-m radial distance from the blast using the sophisticated techniques and control measures employed in modern blasting practice. Damage (seam creation) will be less and more localized in Precambrian rocks. Minimization of the physical effects of blasting will be ensured by following the recommendations of the blasting engineer and the DFO Blasting Guidelines.

Wells providing potable or other service groundwater within 100 m of blasting activities should be identified and sampled for water quality and level prior to and after blasting to confirm no effects on groundwater resources.

No effects on surface hydrology and groundwater are anticipated as a result of the operation of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS; therefore, no mitigation is required.

6.2.2.2 Upper Mattagami River Construction Impacts

For the proposed Wawaitin GS redevelopment, a cofferdam will be required in the intake channel to dewater approximately 630 m^2 (0.06 ha) of the channel in the vicinity of the penstock intake. A second cofferdam will be required to dewater approximately 2,950 m^2 (0.295 ha) of the upper section of the existing tailrace to allow construction of the new tailrace and the decommissioning of the existing Wawaitin GS. It is anticipated that the cofferdams will be in place for 12 to 14 months. During the period when no flow is being diverted through the Wawaitin GS, all flow in the Upper Mattagami River will be passing through the spill channel.

For the proposed Sandy Falls GS redevelopment, a cofferdam will be required at the intake structure and for weir dam refurbishment to dewater approximately 870 m^2 (0.09 ha) of the Mattagami River. A second cofferdam will be required at the tailrace to dewater approximately 500 m^2 (0.05 ha) of river, part of which is presently existing tailrace, to allow construction of the new tailrace configuration. It is anticipated that the upstream cofferdam will be in place for 6 months and the downstream cofferdam will be in place for 12 to 14 months. During the period when no flow is being diverted through the GS, all flow in the Upper Mattagami River will be passing through the spill channel.

For the proposed Lower Sturgeon GS redevelopment a cofferdam will be required at the intake structure to dewater approximately 520 m^2 (0.05 ha) of the Upper Mattagami River. A second cofferdam will be required at the tailrace to dewater approximately 1,080 m^2 (0.11 ha) of river, most of which is presently existing tailrace, to allow the deepening of the new tailrace and decommissioning of the existing GS. It is anticipated that the cofferdams will be in place for 12 to 14 months. During the period when no flow is being diverted through the GS, all flow in the Upper Mattagami River will be passing through the spillway.

The temporary cofferdams at each of the three GS locations will be composed of clean rock fill. Temporary cofferdam construction will require the use of heavy equipment along the shoreline and on the rockfill wall as it is built up around the site. The work will also involve dewatering to the area downstream of the cofferdam and as necessary the placement of erosion control structures.

Blasting of bedrock will be required within the dewatered zone at most locations with the rock fragments removed by backhoe. The DFO has developed a number of guidelines on methods and practices which are intended to prevent or avoid the destruction of fish, or any potentially harmful effects to fish habitat that could result from the use of explosives (Wright and Hopky, 1998). The use of temporary cofferdams to permit blasting within the dewatered areas and adherence to the DFO Guidelines and blasting engineer recommendations will avoid the destruction of fish and or harmful alteration, disruption or destruction (HADD) of fish habitat.

Once construction is completed after blasting, the shoreline plug providing a barrier for water intrusion into the on-land excavation areas will be removed followed by the removal of the temporary cofferdam.

6.2.2.3 Hydrology

As indicated above during the periods when no flow is diverted through the three generating stations, all flow in the Mattagami River will be passed through the spill channel or spillway. As a result, the hydrology of the river will not be affected downstream of the generating stations during construction.

6.2.2.4 Water Quality

During the construction periods of the three generating station redevelopments, water quality of the Mattagami River may by affected by soil erosion and turbidity generation, in-water construction activities, accidental spills and waste material dispersion.

As indicated in Section 6.2.11, site-specific Erosion and Sediment Control Plans will be prepared and implemented during construction.

With the implementation of site-specific Erosion and Sediment Control Plans, the potential effects of soil erosion and turbidity generation in the Upper Mattagami River will be minimized or obviated.

The potential effects of in-water construction activities, such as cofferdam construction on water quality in the Upper Mattagami River, will be minimized by using clean rock fill, the placement of rock fill over similar coarse substrate and judicious selection of the discharge location and water pressure during dewatering.

As indicated in Section 6.2.1.1, a Hazardous Materials Management Plan, Waste Management Plan and a Spills Emergency Preparedness and Response Plan will be developed for each Project as part of the broader Environmental Management Plan.

The implementation of these pollution prevention plans will obviate or minimize the environmental effects of accidental releases to the natural environment that have the potential to affect water quality in the Upper Mattagami River.

During dam and outlet structure refurbishment, there is a potential for accidental loss of cement during surface application. Any dripped cement should be recovered from the river bottom for suitable disposal prior to temporary cofferdam removal. All trash and other solid debris should also be collected for appropriate disposal.

Overall, the effects of the construction of the three generating stations on Upper Mattagami River water quality are expected to be localized, temporary and negligible.

6.2.2.5 Sediments

As indicated in Section 5.2.2.5, bottom substrate in the Upper Mattagami River in the vicinity of the three generating stations consists predominantly of coarse material, e.g., sand, gravel, cobble, boulder and/or bedrock. After construction, substrate type and quality will be similar to that currently in place. The potential use of fragmented rock generated by blasting activities for fish habitat enhancement and/or use for nearshore/shoreline erosion protection will be discussed with DFO. Otherwise, the excess rock will be removed form the dewatered areas behind the temporary cofferdams for suitable upland disposal.

6.2.2.6 Aquatic Vegetation

As indicated in Section 5.2.2.6, no aquatic vegetation was observed by Coker and Portt (2006a, b) downstream of the Wawaitin GS and Sandy Falls GS. At the Lower Sturgeon GS, wild celery and pondweed are sparsely scattered in small patches or individual plants along the east shore opposite the station (Coker and Portt, 2006c). These plants will not be affected by construction activities.

6.2.2.7 Plankton

Plankton populations will not be affected by construction or operation of the three hydroelectric facilities. Any plankton confined behind the cofferdams will be returned to the river during dewatering.

6.2.2.8 Benthic Macroinvertabrates

The placement of rock fill may have a localized adverse effect on benthic macroinvertebrate communities on the surface and within the substrate. The extent of disruption depends on the type of bottom substrate, the extent of the disturbed area, any resultant turbidity and sedimentation, and the timing of construction. The substrate in the areas to be excavated consists primarily of boulder, cobble, gravel and/or sand over bedrock, or bedrock. The placement of rock fill over this type of similar substrate will minimize any detrimental effect on the benthic macroinvertebrate communities.

With the use of the larger-size rockfill, sufficient interstitial spaces will be available for the survival and migration of mobile benthic fauna. Recovery after cofferdam removal is expected to be rapid. For example, recovery rates from dredging activities range from six days (McCabe *et al*., 1998), 14 days (Rosenberg and Snow, 1977), three weeks (Diaz, 1994), 38 days (Griffith and Andrews, 1981) and up to one year (Griffiths and Walton, 1978).

Blasting of the three redevelopment nearshore areas will result in localized destruction of the benthic communities. Benthic mortality will be a function of distance from and intensity of the blast (Schwartz, 1961). However, recovery from blasting is expected to be rapid.

6.2.2.9 Fish Populations

Temporary cofferdam installation could disrupt fish spawning activities and impact on the early life stages of fish, e.g., eggs and fry. However, installation and removal of the temporary cofferdam will occur outside of the timing restriction for in-water construction to protect the fish spawning and egg incubation period for warmwater and coolwater fisheries of 01 April to 14 June.

The area within the temporary cofferdam will be dewatered to facilitate intake reconstruction, tailrace excavation and/or dam refurbishment. An impervious geotextile will be placed on the cofferdam face to preclude water ingress. Fish within the area to be dewatered will be collected during drawdown (i.e. electrofishing) and released to the river. The temporary unavailability of this habitat during the excavation period will have negligible effect on the local fish populations.

Blasting of bedrock will be required in the nearshore areas to be excavated. Numerous studies have been undertaken to assess fish mortality due to in-water blasting (e.g., Chamberlain, 1976, 1979; Teleki and Chamberlain, 1978). The degree of blasting impact on fish will depend on the type of explosive, type of substrate blasted, blasting technique, fish physiology and timing. Injury to fish from in-water blasting will result from physical abrasion from ejected debris and from pressure changes associated with the blast shock waves.

Common blast-induced injuries to fish include haemorrhage in the coelomic or pericardial cavity and rupture of the swim bladder. Differences in species-specific susceptibility to blast injuries are a function of the fish's shape and swim bladder formation (Teleki and Chamberlain, 1978). Physoclistic (with swim bladder isolated from oesophagus) and laterally compressed fish such as the centrarchids, e.g., smallmouth bass, are the most sensitive to pressure changes. Mortality within this group varies with orientation of the laterally-compressed body to the pressure front at the time of a blast. Physostomic (with swim bladder connected to the oesophagus by an open duct, which provides pressure release) fish with fusiform shape, such as the white sucker, are most resistant to pressure changes.

To obviate injury to fish, blasting will be undertaken in the “dry”, i.e., after dewatering and removal of fish. The shockwaves (peak particle velocities) produced from blasting using the sophisticated techniques and control measures employed in modern blasting practice will be attenuated rapidly within the bedrock. With the width of the cofferdam and its sufficient distance from the limit of blasting, no injury to fish from pressure changes associated with the blast shockwaves is expected. Moreover, blasting mats will be used to minimize the occurrence of fly-rock.

As indicated above, during the period when no flow is being diverted through the Wawaitin GS and Sandy Falls GS, all flow in the Upper Mattagami will be passing through the spill channel. For Lower Sturgeon GS, all flow will be passing through the spillway.

For the proposed Wawaitin GS redevelopment, the relatively small areas that will be temporarily dewatered are portions of constructed channels with granular substrate in a range of sizes (Coker and Portt, 2006d). Because these channels were designed to convey water efficiently, the bottom is relatively smooth with few protruding features that would provide structural habitat for fish. The areas impacted by the proposed cofferdams and dewatering are manmade habitats that are not thought to be critical for any life stages of any of the species present. The fact that they are temporarily unavailable is not expected to have any significant impact on the overall fish production of the system.

Diverting all flow through the Wawaitin GS spill channel will not result in increased erosion since the spill channel is the original channel of the Mattagami River, and has historically accommodated the total river flow. Flows in the important walleye and sucker spawning habitat that occurs downstream of the tailrace will not be altered during this construction period, as they are downstream of the confluence of the tailrace and the bypass channel, and flow in the Mattagami River will continue to be managed as it was prior to the redevelopment. Walleye spawning observations in 2005 and 2006 did not identify the spill channel as a significant spawning area for walleye or suckers (Coker and Portt, 2005b, 2006g). No other critical or important habitats are thought to occur here that may be impacted by this temporary change in spill channel flow (Coker and Portt, 2006a). The temporary change in spill channel flow is not expected to have a negative effect upon the resident fish community within the spill channel (Coker and Portt, 2006d).

For the proposed Sandy Falls GS and Lower Sturgeon GS redevelopments, the relatively small areas that will be temporarily dewatered have historically been impacted by the construction and operation of the existing generating stations, and are likely exposed bedrock or exposed bedrock overlain with a relatively thin layer of coarse granular material (Coker and Portt, 2006e, f). Because these areas were designed to convey water efficiently, the bottom has few protruding features that would provide structural habitat for fish. These areas are not thought to be critical for any life stages of any of the species present, and the fact that they are temporarily unavailable is not expected to have any significant impact on the overall fish production of the system.

Diverting all flow through the Sandy Falls GS spill channel and Lower Sturgeon GS spillway will not result in increased erosion since the spill channel and spillway are the original channels of the Mattagami River, and have historically accommodated the total river flow. Flows in the important walleye and sucker spawning habitat that occurs downstream of the Sandy Falls GS tailrace will not be altered during this construction period, as they are downstream of the confluence of the tailrace and the spill channel, and flow in the Mattagami River will continue to be managed as it was prior to the redevelopment. Similarly, flows in the walleye and sucker spawning habitat that may be, and probably are, present in the several kilometres of rapids downstream of the confluence of the Lower Sturgeon GS tailrace and the spillway will not be altered during this construction period, as flow in the Mattagami River will continue to be managed as it was prior to the redevelopment. Walleye spawning observations in 2005 and 2006 did not identify the Sandy Falls GS spill channel or Lower Sturgeon GS spillway as significant spawning areas for walleye or sucker (Coker and Portt, 2005a,c, 2006h,i). No other critical or important habitats are thought to occur here that may be impacted by the temporary changes in spill channel and spillway flows (Coker and Portt, 2006b, c). The temporary changes in spill channel and spillway flows are not expected to have a negative effect upon the resident fish community within the spill channel and spillway (Coker and Portt, 2006e, f).

To minimize or obviate effects on fish populations at the three GS redevelopment sites, Coker and Portt (2006d, e, f) recommended the followed mitigative measures:

- In-water construction activities should be timed to avoid the spawning and incubation period of spring spawning fishes, such as walleye and suckers, which typically excludes in-water work from 01 April to 15 June for the proposed Wawaitin GS and Sandy Falls GS redevelopments and from 01 April to 01 July for the Lower Sturgeon GS redevelopment due to the presence of lake sturgeon;

- If all water is being diverted through the spill channel at the time of the walleye, lake sturgeon and sucker spawning periods, all water should continue to be diverted through the spill channel until the end of the hatch (15 June or 01 July);

- Sediment and erosion control measures should be implemented as required prior to work and maintained during the work phase, to prevent entry of sediment into the water, including sediment removal from water pumped from within cofferdam enclosures;

- All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substances (e.g., petroleum products, debris, etc.) from entering the water;

- Blasting, if required, should adhere to the DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998); and

- Dredged material should be disposed on land above the high water level and suitably contained/ stabilized to prevent the dredged material from re-entering the water.

Upon review of the timing restrictions recommended by Coker and Portt (2006d,e,f), the MNR indicated that the presence of smallmouth bass in the reaches of the Upper Mattagami River encompassing the three proposed redevelopment sites would necessitate a timing restriction of 15 May to 15 July (J. Mucha, MNR, 2007, pers. comm.). As indicated in Section 2.2.6 of the Aquatic Technical Support Document, smallmouth bass is a non-native species introduced to the Moose River Basin headwater lakes. This species generally occurs upstream of the Kenogamissi Falls Dam; however, juveniles were captured at Lower Sturgeon GS in 2006 (see Table 2.13). Furthermore, due to the presence of lake sturgeon transferred upstream of Sandy Falls in 2002, the timing restriction of 01 May to 30 June should apply to all Mattagami River reaches from Wawaitin GS to downstream of Lower Sturgeon GS. With the incorporation of these in-water timing restrictions for the three fish species, the overall timing restriction would extend from 01 April to 15 July.

The MNR also indicated that the presence of lake whitefish, which is a fall spawner with eggs overwintering in the substrate, would necessitate a standard timing restriction of 15 September to 30 May. Lake whitefish spawning has been observed from late October to early December downstream of Mattagami Dam (G. Coker, C. Portt & Associates, 2007, pers. comm.). Spawning usually occurs in shallow water (less than 7.6 m) often over a hard or stoney bottom, but sometimes over sand (Scott and Crossman, 1973). The eggs are deposited more or less randomly above the spawning grounds, drifting downstream to settle in areas of lesser flows. With the hydroelectric plants in operation during cofferdam installation, it is highly unlikely that whitefish eggs will settle in the areas of higher turbulent flow proximate to the tailrace. The potential for increased turbidity generation and siltation is the main concern in protecting lake whitefish eggs. As indicated in Section 6.2.2.4, implementation of site-specific Erosion and Sediment Control Plans and use of clean rock fill over similar coarse substrate will minimize or obviate turbidity generation. The MNR has indicated that OPG should meet with Timmins District staff once construction details relating to the cofferdams and schedules have been finalized in order to discuss the potential impacts of the timing restrictions and possible mitigative measures.

6.2.2.10 Fish Habitat

As indicated in subsection 2.1.5 of the Provincial Policy Statement (OMMAH, 2005), development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements. Section 6.2.2.10 presents the recommended mitigation measures to be implemented for the three proposed redevelopments to meet regulatory requirements and therefore meet the intention of the PPS.

At the proposed Wawaitin GS redevelopment, direct physical impacts to small areas of previously constructed channel will occur where the existing intake structure will be replaced by a new intake structure at the same location, and where the tailrace of the new GS will connect to the existing tailrace (Coker and Portt, 2006d). The existing intake channel and the tailrace have been constructed to facilitate the efficient conveyance of flow, and are therefore relatively flat and provide little habitat structure. In the case of the intake a few metres (< 5 m) of the channel bed and sides, outside of the existing intake structure, will likely require re-contouring to smooth the transition between the existing channel and the new intake structure. The substrate in the intake channel near the penstocks is unknown, but it likely consists of granular material with the concrete walls.

In the case of the proposed Wawaitin GS tailrace connection, a small section of the vertical channel side will be removed and the bed of the channel may require re-contouring to smooth the transition between the new tailrace channel and the existing tailrace channel. The area that will be altered is relatively small and not critical habitat, consisting of the bedrock side wall of the tailrace and the relatively flat cobble and gravel tailrace floor. It is thought that the cobble and gravel is a thin layer over excavated bedrock. The addition of an approximately 20-m wide and 48-m long section of new tailrace will create additional habitat of the kind found within the existing tailrace. Provided that the following recommended mitigation measure, in addition to those listed above, is implemented, the net effect to fisheries production from direct habitat alterations will be negligible (Coker and Portt, 2006d):

- The floor of the proposed tailrace connection with the existing tailrace, as well as any area of the existing tailrace that is re-contoured, should be covered by a layer of cobble-sized material to provide better habitat.

Based on the fisheries impact assessment for the proposed Wawaitin GS, Coker and Portt (2006d) concluded that:

- No critical fish habitats, such as walleye spawning habitats, will be directly altered;
- There will be no changes in the volume of water passing over the critical walleye spawning habitat downstream from the proposed GS tailrace, and thus no change in velocities;
- The areas that will be directly altered are manmade habitats (the intake channel and the tailrace) and, although they do contain fish, the fact that they will be temporarily unavailable is not expected to have a significant impact on the productive capacity of the system; and
- Following completion of construction, the total amount of habitat in the intake will be essentially unchanged, and the total amount of habitat in the tailrace area will be slightly increased due to the construction of the new tailrace.

Overall, the proposed redevelopment and subsequent operation of the new and enlarged Wawaitin GS will not have a significant or measured effect on the composition or production, respectively, of the Upper Mattagami River fish community.

At the proposed Sandy Falls GS redevelopment, refurbishment and increasing the capacity of the intake structure will not result in any permanent alterations to fish habitat (Coker and Portt, 2006e). A section of the existing riverbank will be removed to accommodate the width of the proposed tailrace, and the riverbed will require re-contouring to smooth the transition between the new tailrace and the existing riverbed. Some of the riverbed re-contouring will likely occur within the existing tailrace. Although the extent of any re-contouring is presently unknown, it will extend, at a maximum, approximately 20 m offshore and will be approximately 14 m wide. The tailrace area and adjacent riverbed that will be altered are not thought to be critical habitat. Most of this area has a substrate of exposed bedrock or exposed bedrock overlain with a relatively thin layer of coarse granular material. However, the cobble shoals that have developed along the lip of the existing tailrace likely provide good general habitat for smaller fish and invertebrates, and for larger foraging fish. The cobble shoal material is expected to re-sort into similar deposits relative to the new tailrace configuration, resulting in an alteration of habitat, but not a habitat loss or a reduction in habitat productivity. Provided that the recommended mitigation measures are implemented, the net impact to fisheries production from direct habitat alterations will be negligible.

Proposed reconstruction of the Sandy Falls GS and maintaining the same intake and tailrace locations will result in permanent alterations to the floors of the short intake channel and the short tailrace, as both of these will need to be deepened close to the GS to accommodate the flows of the proposed larger GS (Coker and Portt, 2006f). The areas being altered are not thought to be critical habitats, and likely have substrates of exposed bedrock or exposed bedrock overlain with a relatively thin layer of coarse granular material. These works will result in a minor alteration of habitat, but not a habitat loss or a reduction in habitat productivity.

Provided that the following recommended mitigation measure, in addition to those listed above, is implemented, the net impact to fisheries production will be negligible (Coker and Portt, 2006e):

- The floor of the new tailrace and any area of the existing riverbed that is re-contoured to expose bedrock, should be covered by a layer of cobble-sized material to provide better habitat.

Based on the fisheries impact assessment for the proposed Sandy Falls GS, Coker and Portt (2006e) concluded that:

- No critical fish habitats, such as walleye or sucker spawning habitats, will be directly altered;
- There will be no changes in the volume of water passing over the critical walleye and sucker spawning habitat downstream, and thus no change in velocities;
- The areas that will be directly altered are mostly manmade habitats (the intake structure, the tailrace, and immediate tailrace vicinity) and, although they do contain fish, the fact that they will be temporarily unavailable is not expected to have a significant impact on the productive capacity of the system; and
- Following the completion of construction the total amount of habitat will be unchanged.

Overall, the proposed redevelopment and subsequent operation of the new and enlarged Sandy Falls GS will not have a significant or measurable impact upon the composition or production, respectively, of the Upper Mattagami River fish community.

Reconstruction of the proposed Lower Sturgeon GS upon the same footprint and maintaining the same intake and tailrace locations, will result in permanent alterations to the floor of the short intake channel and the floor of the short tailrace, as both of these will need to be deepened close to the GS to accommodate the flows of the proposed larger GS. The areas being altered are not thought to be critical habitats, and likely have substrates of exposed bedrock or exposed bedrock overlain with a relatively thin layer of coarse granular material. These works will result in a minor alteration of habitat, but not a habitat loss or a reduction in habitat productivity. Provided that the following recommended mitigation measure, in addition to those listed above, is implemented, the net impact to fisheries production will be negligible (Coker and Portt, 2006f):

- The floor of the tailrace and any area of the existing riverbed that is deepened and re-contoured to expose bedrock, should be covered by a layer of cobble-sized material to provide better habitat.

Since the orientation of the intake and the tailrace will not change post-development, habitat shifts in the vicinity of the intake and the tailrace that may occur due to changes in water flow over particular substrates are expected to be minimal. The primary change in habitat due to the operation of the expanded Lower Sturgeon GS will be subtle changes in flow velocity and water depth within the broader area below the GS and the spillway (see Figure 1.8). This area is generally shallow, with a few discrete deep locations, and the anticipated changes in the distribution of flow between the GS and the spillway will likely have some effect upon flow velocities over the riffles immediately below the GS and the spillway. It is anticipated that some portions of these riffles will be slightly faster, on average, under the post-development flows than what they would be under existing conditions and, conversely, some portions will be slower. Because of the complexity of the riffle habitats in this area, these changes will result in subtle, probably balanced, shifts in habitat utilization in close proximity to the tailrace and the spillway. These minor changes in flow velocity and depth will occur mainly near the tailrace and spillway outflows, and decrease in magnitude at greater distances downstream. No habitat will be lost. A deep habitat area downstream will buffer any residual flow changes caused by the post-development operating conditions, so that flows in the balance of the 4 km of riffles that provide potential spawning habitat downstream in this section of the Upper Mattagami River, will not change post-development.

Based on the fisheries impact assessment for the proposed Lower Sturgeon GS, Coker and Portt (2006f) concluded that:

- Following the completion of construction, the total amount of habitat will be unchanged;

- No critical fish habitats, such as walleye, sucker, or lake sturgeon spawning habitats, will be directly altered;

- Small changes in water depths and flow velocities are expected in the riffle areas that are in close proximity to the tailrace and spillway. However, because of the broad range of riffle habitats and the complex flow pattern in this area, the likely result of these flow changes will be a limited redistribution of subtle habitat conditions. These expected changes will occur in only a small portion of the total amount of riffle habitat found downstream of the Lower Sturgeon GS site; and

- The areas that will be directly altered are mostly manmade habitats (the intake structure, the tailrace, and small areas in the immediate vicinity of both) and, although they do contain fish, the fact that they will be temporarily unavailable during construction is not expected to have a significant impact on the productive capacity of the system.

Overall, the proposed redevelopment and subsequent operation of the new and enlarged Lower Sturgeon GS will not have a significant or measurable impact upon the composition or production, respectively, of the Upper Mattagami River fish community.

6.2.2.11 Aquatic Avifauna

As indicated in Section 5.2.2.10, a number of aquatic avian species likely use the Upper Mattagami River from Lake Kenogamissi to downstream of the Lower Sturgeon GS as breeding, staging, stopover and/or feeding habitat.

Canada Land Inventory (CLI) (1973) mapping for waterfowl production indicates that the Mattagami River between Wawaitin GS and downstream of Lower Sturgeon GS is categorized as 80% Class 6, 10% Class 5 and 10% Class 4 with severe, moderately severe and moderate limitations, respectively, due to adverse topography and free-flowing water conditions. Kenogamissi Lake upstream of Wawaitin GS is classified as Class 6 with severe limitations to waterfowl production due to adverse topography and excessive water depth. The MNR (1981) has identified the entire length of the Mattagami River as a waterfowl staging area.

Although three aquatic avian species at risk have been recorded in the Timmins area, i.e., American white pelican, yellow rail and black tern, there are no records of these species within a 5-km radius of the proposed redevelopment sites.

The construction disturbance will be sufficiently local that little displacement of aquatic avifauna will occur. Any resident birds can relocate temporarily to avoid human activity associated with construction activities. Most bird species habituate rapidly to noise and vehicular traffic.

Noise from blasting could have an initial effect on avian startle flight; however, it is anticipated that over time birds will become habituated to the impulse noise. For instance, during the St. Lawrence River crossing by a natural gas pipeline, blasting had no effect on waterfowl in the area (Silver and Fitchko, 1992). Noise effects due to other construction activities can be acceptably mitigated by conventional construction practices and are predicted to be localized, minor and transient.

6.2.2.12 Upper Mattagami River Operational Impacts

As indicated in Section 4.0, the three generating stations have operated as run-of-the-river plants and will continue to do so. The new facilities will continue to operate under the existing

Water Management Plan operating regimes. The river flows and levels will not be altered as a result of facility redevelopments, with the minor exceptions discussed below (OPG *et al.*, 2006).

6.2.2.13 Water Quality

As indicated in Section 6.2.1.1, a Hazardous Materials Management Plan, Waste Management Plan and a Spills Emergency Preparedness and Response Plan will be developed for each redevelopment project as part of the broader Environmental Management Plan. The implementation of these pollution prevention plans during facility operations will obviate or minimize the environmental effects of accidental releases to the natural environment that have the potential to affect water quality in the Upper Mattagami River.

6.2.2.14 Sediments

As the new facilities will continue to operate under the existing Water Management Plan operating regimes (OPG *et al.*, 2006), no alternation of sediment type or quality is anticipated.

6.2.2.15 Aquatic Vegetation

As indicated in Section 5.2.2.6, no aquatic vegetation was observed by Coker and Portt (2006a, b) downstream of the Wawaitin GS and Sandy Falls GS. At the Lower Sturgeon GS, wild celery and pondweed are sparsely scattered in small patches or individual plants along the east shore opposite the station (Coker and Portt, 2006c). These plants will not be affected by future operation of the generating station.

6.2.2.16 Plankton

Plankton populations will not be affected by operation of the three hydroelectric facilities.

6.2.2.17 Benthic Macroinvertebrates

As the proposed hydroelectric facilities will continue to operate under the existing Water Management Plan operating regimes (OPG *et al.,* 2006), no effect on benthic macroinvertebrate communities is anticipated.

6.2.2.18 Fish Populations

The three proposed redeveloped generating stations will remain as run-of-the-river hydroelectric plants, and therefore, continue to operate in accordance with the approved Water Management Plan (OPG et. al., 2006).

Wawaitin Generating Station

In the case of the proposed Wawaitin GS, the only difference will be in the distribution of water between the GS and the spill channel. Presently, water is spilled through the original river channel when flows exceed the 40 m^3/s capacity of the existing GS, which occurs approximately 23% of the time. The Wawaitin GS is capable of taking all river flow when flows are less than 40 m^3/s. The redeveloped Wawaitin GS will have a rated flow of 45 m^3/s which will decrease the frequency of water spilled through the spill channel from approximately 23% to approximately 10% of the time. Maximum mean flow velocities in the intake channel and in the tailrace are expected to increase from 0.8 to 0.9 m/s. Downstream of where the tailrace joins with the spill channel, flow velocity and volume will not differ between pre- and post-redevelopment.

Since there are no known critical or important habitats within the intake channel and the tailrace, Coker and Portt (2006d) do not anticipate that the approximately 0.1 m/s increase in the maximum mean water velocity that will occur periodically from March to early July will have a significant or measurable effect on the productivity of local fish communities. As a result, no mitigation is proposed.

Water is typically only spilled through the spill channel during the spring melt (March to June), and only when total river flow exceeds the capacity of the existing Wawaitin GS. Outside of that period the flow within the 2.6-km long spillway is approximately 1 m^3/s due to natural inflows. Coker and Portt (2006a) have surmised that this local watershed contribution is the limiting factor for fish productive capacity of the resident fish community in the lower reaches of the spill channel. Therefore, a further decrease in the frequency or duration of spill due to excessive river flow is not expected to have significant negative effects upon the productivity of the spill channel fish community (Coker and Portt, 2006d).

Sandy Falls Generating Station

In the case of Sandy Falls GS after redevelopment, the proposed GS will have a greater flow capacity, and therefore, will alter the distribution of flow volume between the GS and the 200 m-long overflow weir (see Figure 1.6). Presently, water is spilled over the overflow weir when flows exceed the 44 m^3/s capacity of the GS, which occurs approximately 48% of the time. The redeveloped Sandy Falls GS will have a rated flow of 65.4 m^3/s which will decrease the frequency of water spilled over the overflow weir from approximately 48% to 30% of the time. This further decrease in the frequency or duration of flows over the weir is not expected to decrease the productivity of the spill channel fish community (Coker and Portt, 2006e). No critical habitats have been identified within the spill channel that could influence productive capacity.

Downstream of where the tailrace joins with the spill channel, flow velocity and volume will not differ between pre- and post-redevelopment. However, the adjusted location and discharge direction will result in some changes in flow velocity pattern in the immediate vicinity of the new tailrace area. Changes in flow direction will likely cause some shifts in habitat utilization in the immediate vicinity of the tailrace; however, neither the types or quantities of habitat will change significantly, and no significant change in productivity is expected. There are no known critical habitats within the tailrace. The fact that the existing tailrace and the proposed tailrace will continue to discharge into the deep pool adjacent to the GS, ensures that any shifts in habitat utilization caused by flow direction or velocity changes will be local and will dissipate well upstream of the critical habitats located downstream of the existing Sandy Falls GS. As a result, no mitigation is recommended (Coker and Portt, 2006e).

Lower Sturgeon Generating Station

After redevelopment, the proposed Lower Sturgeon GS will also have a greater flow capacity and therefore, will alter the distribution of flow volume between the GS and the spillway. Presently, water is spilled through the spillway when flows exceed the 56 m^3/s capacity of the GS, which occurs approximately 65% of the time. The redeveloped Lower Sturgeon GS will have a rated flow of 123 m^3/s which will decrease the frequency of water spilled through the spillway from approximately 65% to 26% of the time.

Downstream of the confluence of the tailrace and spillway, flow velocity and volume will not differ between pre- and post-redevelopment. However, the increased capacity of the proposed Lower Sturgeon GS will result in more water, on average, being passed through the GS and less through the spillway, resulting in some changes in flow velocity within discrete areas immediately downstream of the tailrace and spillway.

Habitat within the spillway is poor, being almost exclusively a series of bedrock chutes that are subjected to extremes in flow (Coker and Portt, 2006c, f). The extremes of flow and bedrock substrate limit the amount of habitat available and its productivity. As a result, no mitigation is proposed (Coker and Portt, 2006f).

Overall, as the three new facilities will continue to operate under the existing Water Management Plan Operating Regime (OPG *et al.*, 2006), there will be no effect on fish populations. Moreover, impingement of fish on the intake bar racks of the three generation stations in the Upper Mattagami River has not been observed (Sears, 1992).

6.2.2.19 Aquatic Avifauna

During operation, noise will be generated from the Proposed Undertaking. This steady noise will be similar to that of the existing facilities and not elicit an adverse reaction from nearby habituated wildlife.

6.2.2.20 Summary and Conclusions

During proposed generating station construction, potential impacts on the aquatic environment may occur due to in-water construction activities, blasting, soil erosion and turbidity generation, and accidental spills. Based on an assessment of the available baseline information and potential effects, as well as the implementation of the recommended mitigative measures, SENES concludes that effects during construction will be minimal, localized and short-term.

During proposed generating station operations, potential impacts on the aquatic environment may occur due to accident spills. Based on assessment of the baseline information and potential effects, SENES concludes that the operation of the proposed Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS will have negligible effects on the aquatic environment.

Environmental protection during proposed generating stations construction and operation will be ensured by adherence to the site-specific Environmental Management Plans, as well as compliance with regulatory standards and guidelines.

The Environmental Management Plan for each redevelopment project ensures that environmental protection will be achieved by describing government agency requirements, OPG policy, project commitments and recommended mitigation measures to be undertaken. The Environmental Management Plan will include the Erosion and Sediment Control Plan, Spills Emergency Preparedness and Response Plan, Hazardous Materials Management Plan and Waste Management Plan.

Table 6.2 summarizes potential construction and operation effects, the recommended mitigative/remedial measures to minimize or obviate these impacts and the net effects.

Table 6-2: Summary of Potential Effects on the Aquatic Environment and Recommended Mitigative/ Remedial Measures

Effect/Activity	Recommended Mitigative/Remedial Measure	Net Effect
Construction		
Soil erosion	• Adherence to Erosion and Sediment Control Plan.	Negligible effect
Incidental spills of oil, gasoline and other liquids during construction	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect
Hazardous Materials/ Waste	• Adherence to Hazardous Materials Management Plan and Waste Management Plan. • Waste disposal in accordance with regulatory requirements.	Negligible effect
Blasting	• Adherence to DFO guidelines (Wright and Hopky, 1998) and blasting engineer recommendations.	Negligible effect
In-water construction activities	• Use of clean rock fill for cofferdam. • Placement of rock fill over similar coarse substrate. • Judicious selection of discharge location and water pressure during dewatering. • Adherence to in-water construction timing restrictions. • Confined upland disposal of dredged material. • Provision of cobble-sized material on the floor of the new tailrace areas of the proposed Wawaitin GS and Sandy Falls GS.	Negligible effect
Operation		
Incidental spills of oil, gasoline and other liquids during operation	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect

6.3 AIR/NOISE EFFECTS

A full analysis of the air and noise effects of the proposed development and recommended mitigation measures are identified in the “Air and Noise Technical Support Document for the Upper Mattagami”.

6.3.1 Noise

The proposed redevelopment of Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS is a potential source of local noise during the demolition and construction phase. All work is expected to be completed using conventional construction methods. The noise associated with this phase of the proposed project would most likely be a result of activities such as demolition, site grading, site preparation, pile driving and foundation work. All of these activities, which are expected to take approximately 18 months, will require the use of various pieces of heavy equipment including bulldozers, front-end loaders, small trucks, backhoes, bobcats, dump trucks, compactors, ready-mix concrete trucks and cranes. Other construction activities, such as those related to the placement of the facility components (e.g., generator) and activities inside the building (once built) are expected to generate less noise. The movement of worker vehicles will also result in minor increase in the background sound levels during the 24 month construction period.

The Proposed Undertakings will be constructed using standard construction best management practices. No unusual construction noise effects are anticipated at the nearby sensitive receptors therefore; no mitigation is required.

At Wawaitin GS the closest receptor to the proposed construction site is a small trailer park (approximately 30 trailers) and a boat launch. This receptor location is approximately 500 m east of the intake canal, and is located close to a well-travelled municipal road.

At Sandy Falls GS the closest potential noise receptor to the proposed construction site is a house located approximately 100-200 m south of the construction zone. There are also houses at approximately 500 m and 700 m southeast and southwest, respectively of the construction zone.

The Lower Sturgeon GS occurs in a wilderness setting and there are no homes or cottages within 5 km of the site. Therefore, no receptor noise impact during the demolition and construction phase of the undertaking is expected.

Since the Wawaitin GS and Sandy Falls GS are located within the City of Timmins, the demolition and construction activities are to comply with the City of Timmins By-Law No. 1983-1998, which prohibits and regulates noise for areas within the Town. This By-Law states qualitative prohibitions on noise from various activities, including construction. This By-Law appears in full in the Technical Support Document.

6.3.2 Air

The demolition of the existing powerhouse and the construction of all three proposed generating stations have the potential to affect the air quality in the vicinity of the sites. Emissions which are associated with construction activities are primarily dust and typical combustion emissions from construction equipment such as carbon monoxide, nitrogen oxides, sulphur dioxide and volatile organic compounds (VOCs). As with any construction site, these emissions will be of relatively short duration and unlikely to have any adverse effect on the surrounding areas.

A variety of best practices with respect to the control of air emissions have been identified and should be implemented on the construction site (Cheminfo, 2005). The best practices should include: plans to minimize dust generation through planning, site layout and the proper use of materials, tools and equipment; use of wind fencing; compacting disturbed soil; activity scheduling; storage piles management; minimization of drop heights; barriers to prevent dispersion of materials; avoidance of blasting where feasible; work practices for loading debris; avoidance of prolonged storage of debris; and proper techniques for the use of materials that include VOCs.

These mitigation measures are fully documented in the "Air and Noise Technical Support Document for the Upper Mattagami." Overall, the air and noise impacts of the proposed projects at Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS redevelopments will be minor, localized and temporary.

6.4 SOCIO-ECONOMIC ENVIRONMENT EFFECTS

6.4.1 Demographics, Community and Economics

The Proposed Undertaking will have a positive economic impact on the Province, Northeastern Ontario and locally in Timmins. The full economic impact of the project is documented in the Upper Mattagami Socio-Economic and Land Use Technical Support Document. The economic impact of the proposed undertaking was assessed using the Lake Abitibi Model Forest Community Constellation Impact Model of which the City of Timmins Economic Development Corporation has a licence.[4]

Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS were all assessed as separate projects and high and low estimates of the total project expenditures for each were identified. These expenditures were further broken down according to three geographies – Local, Provincial and National/International.[5] This was done in order to ensure that economic impacts within Northern

[4] OPG and SENES Consultants Limited set up the methodological analysis and assumptions and provided the input data to the Timmins Economic Development Corporation for the various model runs.

[5] Local was defined as expenditure in Timmins and Northeastern Ontario. Provincial was defined as the Province of Ontario. National/international was defined as anywhere else in the world.

Ontario and throughout the Province would not be overstated. The initial expenditure associated with the projects was primarily assigned to the non-residential construction sector and to a lesser extent other business services.

For Wawaitin GS it is estimated that expenditure in the range of $13 to $17M will be made in the Timmins and Northeastern Ontario economy. This initial expenditure will primarily occur in the non-residential construction sector but also in other business services. The expenditure will result in the following economic impacts within Timmins and Northeastern Ontario: total sales[6] volume of $19M - $26M (which includes the initial expenditure);total income of $11M - $14.M; for every dollar of expenditure associated with the project a total of $1.50 in sales will occur in Timmins (sales multiplier of 1.50); total wages and salaries[7] of $8M to $10M; wages and salaries will account for 73% of the gross provincial income associated with the project; 142 (86.0) – 187 (113.7) person years ("PYs") of permanent full-time job equivalents; 11 person years of employment per one million dollars of expenditure; and, for every one job associated with the initial expenditure 0.65 jobs are supported in the economy at large. The project will also result in the following economic impacts within Ontario: total sales of $33M to $43M; total wages and salaries of $12M to $15M; sales multiplier of 2.4; and, 225 (92 direct) to 297 (121 direct) person years of employment. As a result of the project's expenditure, the following tax benefits are predicted to occur: $11M to $14M in taxes will accrue to all levels of government; roughly 50% of the tax revenue will to the federal government, 39% to the provincial government and 11% to local government.

For Sandy Falls GS it is estimated that expenditure in the range of $7M to $9M will be made in the Timmins and Northeastern Ontario economy. This initial expenditure will primarily occur in the non-residential construction sector but also in other business services. The expenditure will result in the following economic impacts within Timmins and Northeastern Ontario: total sale volume of $14M - $19M (which includes the initial expenditure); total income of $8M - $10M; total wages and salaries of $ 6M to $8M; wages and salaries will account for 73.3% of the gross provincial income associated with the project; for every dollar of expenditure associated with the project a total of $1.50 in sales will occur in Timmins (sales multiplier of 1.50); 102 (62 direct) - 136 (82 direct) years of permanent full-time job equivalents; 11 PYs per one million dollars of expenditure; and for every one job associated with the initial expenditure 0.65 jobs are supported in the economy at large. Beyond the impact with Timmins and Northeastern Ontario these projects are anticipated to result in an expected expenditure of $7M to $10M[8] in other parts of Ontario. The expenditure will result in the following economic impacts within Ontario: total sales of $18M to $23M; total wages and salaries of $6M to $8M; sales multiplier of 2.42; and, 121 (50 direct) to 160 (66 direct) person years of employment. As a result of the project's expenditure, the following tax benefits are predicted to occur: $6M to $9M in taxes will accrue to

[6] Sales is the total value of goods and services associated with the project that would be purchased in Northeastern Ontario.

[7] Wages and salaries paid to staff and employees in Northeastern Ontario.

[8] The provincial expenditure is an additional expenditure anticipated on top of the Timmins/Northeastern Ontario expenditure.

all levels of government; roughly 50% of the tax revenue accrues to the federal government, 39% to the provincial government and 11% to local government.

For Lower Sturgeon it is estimated that expenditure in the range of $9M to $12M will be made in the Timmins and Northeastern Ontario economy. The expenditure will result in the following economic impacts within Timmins and Northeastern Ontario: total sale volume of $18M - $23M; total income of $10M - $13M; total wages and salaries of $7M to $9M; wages and salaries will account for 73.3% of the gross provincial income associated with the project; for every dollar of expenditure associated with the project a total of $1.50 in sales will occur in Timmins (sales multiplier of 1.50); 129 (78 direct) – 170 (103 direct) years of permanent full-time job equivalents; 11 Person years (PYs) per one million dollars of expenditure; and, for every one job associated with the initial expenditure 0.65 jobs are supported in the economy at large. Beyond the impact with Timmins and Northeastern Ontario these projects are anticipated to result in an expenditure of $8M to $10M[9] in other parts of Ontario. The expenditure will result in the following economic impacts within Ontario: total sales of $31M to $4M; total wages and salaries of $11M to $14M; sales multiplier of 2.42; and, 214 (88 direct) to 282 (115 direct) PYs of employment. As a result of the project's expenditure, the following tax benefits are predicted to occur: $10M to $13M in taxes will accrue to all levels of government; and roughly 50% of the tax revenue accrues to the federal government, 39% to the provincial government and 11% to local government.

While the projects will be conducted by a Design-Build Contractor, labour will be unionized. It is expected that the individuals, businesses and sectors in the Timmins economy that will directly benefit the most will include most aspects of construction along with business services (e.g., gas stations, material providers) the accommodation and restaurant sectors. Indirectly, the entire Timmins economy will benefit from the construction projects.

The overall operational employment and expenditures associated with the facilities will be maintained at present day levels. As such there is no expected economic and social change in the community as a result of the projects over the long-term. The redevelopment does provide more certainty around the maintenance of those jobs in the community and region.

6.4.2 Land-Use Planning and Transportation

As the Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS are existing facilities, there will be no incremental affect on land use and development in the areas. Wawaitin and Sandy Falls are located in the City of Timmins and their existence predates the Official Plan for the City. As such, they are legal (permitted) non-conforming uses.

[9] The provincial expenditure is an additional expenditure anticipated on top of the Timmins/Northeastern Ontario expenditure.

At Wawaitin GS, OPG does not propose to alter any of the access roads adjacent to the site. There are likely minor changes in alignments to roads internal to the OPG site in order to accommodate the new powerhouse and slight re-alignment of penstocks. The Design-Build Contractor will use existing parking lots and access roads. As these roads are internal to the OPG site, no public use is affected. It is estimated that the daily traffic associated with the construction phase of the project will be 20 to 30 vehicles, of which the majority will be large construction vehicles and some of which will be personal vehicles of the contractors. This is a small incremental addition to the existing volume of traffic. Two road alternatives (Highway 101 west via Tembec and from Timmins via the Dalton Road) exist for emergency service use, should access be blocked on one of the roads. All roads will have a half load restriction mid-April to the 1st of June.

At Sandy Falls GS, OPG does not propose to alter any of the access roads adjacent to the site. There are likely to be minor changes in alignments to roads internal to the OPG site in order to accommodate the new powerhouse and slight re-alignment of penstocks. These will not affect public use. The Design-Build Contractor will use existing parking lots and access roads. It is estimated that the daily traffic associated with the construction phase of the project will be 20-30 vehicles, most of which will be large construction vehicles and some of which will be personal vehicles of the contractors. Two road alternatives (one from Highway 101 west to the Mahoney Road and one from Shirley Street via the Sandy Falls Road) exist for emergency service use, should access be blocked on one of the roads. All roads will have a half load restriction mid-April to the 1st of June.

At Lower Sturgeon GS, OPG does not propose to alter any of the access roads adjacent to the site. There are likely to be minor changes in alignments to roads internal to the OPG site in order to accommodate the new powerhouse and slight re-alignment of penstocks. The Design-Build Contractor will use existing parking lots and access roads. It is estimated that the daily traffic associated with the construction phase of the project will be 15-20 vehicles, some of which will be large construction vehicles and some of which will be personal vehicles of the contractors. All roads will have a half load restriction mid-April to the 1st of June.

6.4.3 Local Resource Use

For the proposed Wawaitin GS redevelopment the construction and operation phases of the project will not impact local recreational, social and economic uses. All construction activities will occur within the existing OPG fenced area. The one exception to this may be improvements to the flow of water at the entrance of the intake canal. There is a cleared area immediately to the east of the intake canal which may need to be used. The project will not impact public recreation use on Kenogamissi Lake and portaging of canoes along the Dalton Road will not be impacted by the proposed construction.

For the proposed Sandy Falls GS, the proposed undertaking during either the construction or operation phases of the project will not impact local recreational, social and economic uses. All construction activities will occur within the existing OPG fenced area or in a temporary fenced area. The main public use at the site is the boat launch located downstream of this site. OPG has committed to leaving public access open to the launch during and after construction. OPG's parking lot may be full during construction, requiring anglers and boaters wishing to leave their vehicle at this location to park further up on the road.

For the Lower Sturgeon GS, the proposed undertaking during either the construction or operation phases of the project will not impact local recreational, social and economic uses. All construction activities will occur within the existing OPG fenced area or in a temporary fenced area. The only public use in the area is either along the road leading to the site or along the river. Use is very light along both and will not be affected by the proposed development.

Because of the importance of all three areas as fishing, wilderness and recreation areas, it is important that workers associated with the project not degrade the experience of these other users. Therefore, it is recommended that contractors and employees of the Design-Build Contractor be restricted from fishing at the site during the duration of the construction period. As well, overnight trailers and stays by workers will not be permitted.

6.5 CULTURAL HERITAGE AND ARCHAEOLOGICAL RESOURCES EFFECTS

6.5.1 Cultural Heritage

At Sandy Falls GS, the Proposed Undertaking will require the removal of the 1911 powerhouse, equipment, surge tanks and penstocks. The intake structure and weir dam will remain and be refurbished. The proposed replacement to the Sandy Falls GS will result in very little modification to the access road. Modifications to the dam may affect the former log chutes. The overall layout and cultural landscape of the site will remain the same. The former hydro colony south of the generating station is to be avoided during construction.

At Wawaitin GS, the new powerhouse will be located to the north of the existing powerhouse. The existing dams and spillway will remain with only some minor refurbishment. The proposed undertaking will require the removal of the existing 1912 powerhouse (and 1916 addition), penstocks and surge tanks. The redevelopment will result in little modification to the access road. The overall layout and cultural landscape of the site will remain the same.

At Lower Sturgeon GS, the Proposed Undertaking will remove the existing 1923 powerhouse. The dam, weir and spillway will be retained and undergo refurbishment. Any repairs to the dam may affect the former log chute. The landing and remains of the former hydro colony to the south of the existing powerhouse are to be avoided during construction. The overall layout and cultural landscape of the site will remain the same.

Along with maintaining these facilities as hydroelectric generating stations and maintaining the same overall site layouts three other mitigation measures are recommended. First a full documentation of all three generating stations is to be prepared including a visual record. Second, some equipment is to be offered to the Timmins Museum. Third, consideration will be given to incorporating typical architectural elements of the existing powerhouse, such as, rectangular floor plan, flat roof, masonry/concrete structure and window openings with operable sash into the design of the new powerhouse. As part of this approach, elements of the cultural heritage landscape such as the access road and transmission line would be retained in the same location. The full cultural heritage assessment appears as a separate Technical Support Document.

6.5.2 Archaeological Resources

Archaeological sites are a non-renewable resource requiring proper planning, development, management and protection. The purpose of the assessments was to assess the proposed redevelopment plans. Due to the extensive prior disturbances, no significant archaeological features or sites of interest were recorded that will be impacted by the proposed redevelopments at Wawaitin GS, Sandy Falls GS or Lower Sturgeon GS.

Both archaeological and cultural heritage impact assessment reports recommended that the projects be approved by the Ministry of Culture, specifically:

> "It is recommended that approval be given by the Ministry of Culture to allow the redevelopment of the Wawaitin GS to proceed without any additional archaeological heritage concerns. One condition would be that should a change in construction plans result in the disturbance of previously undisturbed areas or if foundations or significant artefacts are uncovered, Stage 2 construction monitoring by a licensed archaeologist will be immediately undertaken."
>
> and
>
> "It is recommended that approval be given by the Ministry of Culture to allow the redevelopment of the Sandy Falls and Lower Sturgeon Generating Stations to proceed without any additional archaeological heritage concerns. One condition would be that should a change in construction plans result in the disturbance of previously undisturbed areas or if foundations or significant artefacts are uncovered, Stage 2 construction monitoring by a licensed archaeologist will be immediately undertaken."

It is also noted that should human remains be identified during operations, all work in the vicinity or the discovery will be suspended immediately. Notification will be made to the Ontario Provincial Police, or local 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, Ministry of Government Services.

The full reports assessing archaeological resources appear as separate Technical Support Documents titled: "Archaeological and Cultural Heritage Impact Assessment of the Sandy Falls and Lower Sturgeon Generating Stations Redevelopment Projects Located on the Upper Mattagami River" and "Archaeological and Cultural Heritage Impact Assessment of the Wawaitin Generating Station Redevelopment Project Located on the Upper Mattagami River".

6.6 EFFECTS ON FIRST NATIONS

Based on research, consultation and taking into consideration that the sites are existing uses, there are no identified impacts to any traditional First Nation use activities. Research conducted by a member of Mattagami FN identified that no Mattagami FN values will be affected by the development. No other First Nations values have been identified through consultations, the Mattagami River System Water Management Plan or research associated with the archaeological assessments.

7.0 PUBLIC, FIRST NATIONS AND GOVERNMENT CONSULTATION

7.1 CONSULTATION WITH PUBLIC

7.1.1 Objectives and Approach

The objective of the public consultation program for the Upper Mattagami project was "to provide the public with an opportunity to have meaningful input on the project and address public concerns where possible and feasible." The key components of the public consultation program included: two open houses/public meetings; two project newsletters; a project website; ongoing public inquiries; and an issue tracking system. All of these components have been implemented as planned. An Upper Mattagami Public and Agency Consultation Technical Support Document has been prepared and provides in more detail a summary of the overall public consultation program.

7.1.2 Summary of Activities

A database of stakeholders who were to be notified about the project and the key consultation opportunities was developed. This was based on OPG consultation and agency knowledge, a review of property owners within 200 m of the river and public submissions made throughout the course of the project. A total of 835 stakeholders were on the list at the time of the mailing for the second open house.

The first public open house with respect to the Proposed Undertaking was held on Wednesday April 19th from 3:00 pm to 8:00 pm at the Days Inn (formerly known as The Senator) in Timmins. The agenda included an 'open house' followed by a, formal presentation, and a questions and answers period. This open house focused on providing a description and rationale for the undertaking, a discussion of alternatives, the EA process and proposed technical studies. Members of the public were asked to identify any issues of concern or interest and identify any values of significance near the sites that could be affected.

A total of 38 individuals attended the public open house, of which 26 attended the presentation. The attendees represented a combination of general public, cottagers and homeowners located near the facilities, government agency representatives (MNR) and representatives of local organizations such as the: Standing Advisory Committee to the Water Management Plan; Timmins Economic Development Corporation; Timmins Trappers Association; and, the Timmins Field Naturalists,.. Local media in attendance included the local French CBC radio station.

The second public open house with respect to the Proposed Undertaking was held on Wednesday October 18th from 3:00 pm to 8:00 pm at the McIntyre Arena-MAC Auditorium. The agenda included an 'open house' followed by a formal presentation and questions and answers period. The second open house provided a description of the undertaking, the results of the various technical assessments (e.g., fisheries, socio-economic), an overview of the EA process and the key benefits of the project.

A total of 44 individuals attended the open house of these approximately a dozen attended the presentation. The attendees represented a combination of general public, cottagers and homeowners located near the facilities, government agency representatives (MNR), individuals and businesses interested in economic opportunities associated with the project and some representatives of local organizations.

A web site about the project was set up and can be found at www.upppermattagami-ea.com. The website provided a project description, some frequently asked questions, a description of the EA process, notifications about public meetings and contact information. This website was active by early April 2006. Phone numbers and e-mail addresses to the OPG Project Manager and the SENES environmental co-ordinator have been available throughout the course of the project on the internet site, albeit these have only been very lightly used by the public.

7.1.3 Public Issues and Concerns

The public and agency consultation process for the redevelopment of the Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS has been comprehensive and inclusive of all interested individuals and government representatives. Throughout the course of the project there has not been a single individual indicating opposition to the redevelopment of any of the stations. Most individuals indicated their support for the projects recognizing that the stations were very old; this represented new power for the Province and would be a positive impetus to the economy of Northeastern Ontario. Two letters of support have been received from the City of Timmins Council and from the City of Timmins Economic Development Corporation. A number of individuals commented that these redevelopments should have already occurred.

While no individual indicated any opposition to the projects a number of individuals did raise issues or questions around specific topics associated with the redevelopments and the management of impacts. The full list of issues raised by the public and responses by OPG are contained in Section 7 of the Public and Agency Consultation Technical Support Document. These issues and concerns included:

- OPG not optimizing enough power at the stations;
- How the site was to be left after redevelopment;
- Length of time cofferdams are to be in place; desire for recreation use in spillways;
- Retention of structures; and,
- Flooding in Timmins.

Most of these concerns were raised by one or at the most a few individuals. OPG is currently working with individuals with mining claim interests at Wawaitin GS. OPG recognizes the overlapping claims that these individuals have with respect to OPG's legitimate Water Power Lease, and is working towards a solution that recognizes the rights of both parties while at the same time ensuring public safety.

7.2 CONSULTATION WITH FIRST NATIONS

7.2.1 Objectives and Approach

A First Nations Consultation Plan was prepared for the purpose of the EA with the overall objective "to provide First Nations (FN) with an opportunity to have meaningful input on the project and address pertinent First Nations concerns wherever feasible through a process that is fair and reasonable with respect to the Upper Mattagami Project." The First Nations Consultation Plan identified the First Nations to be contacted and key contact persons along with possible communication vehicles.

The approach for the First Nations consultation was based on an understanding of Supreme Court of Canada Decisions with respect to the Crown's obligation to meaningfully consult and accommodate, and on current First Nations consultation practices employed in Northern Ontario with respect to resource management and development. As well it was recognized that a number of First Nations participated in the Mattagami River System Water Management Planning exercise. Based on OPG's and SENES' experience in the region, previous correspondence with First Nations and direction provided by the Ontario Ministry of Natural Resources, inquiries were placed with four First Nations to see if they were interested in being consulted on the project. The First Nations targeted for consultation were: Mattagami First Nation; Flying Post First Nation; Matachewan FN; and, Taykwa Tagamou Nation (TTN).

In the case of the Haida decision the Supreme Court identified that while the Crown may delegate procedural aspects of consultation to industry proponents of projects, the ultimate legal responsibility for consultation and accommodation remains with the Crown. As OPG is the proponent of the Project, the Ministry of Natural Resources and Ministry of the Environment were advised of OPG's First Nations Consultation program. MNR was copied on all correspondence to First Nations and invited to attend all First Nation meetings. OPG has had considerable discussions and interactions with the District and Regional MNR staff with respect to OPG's First Nation consultation initiatives. Both Ministries have advised OPG that they their duty to consult is defined by the specific approval decisions associated with the project. For instance, MNR's duty to consult will be focused on approval decisions related to the Lakes and Rivers Improvement Act and the Public Lands Act.

A full description of the First Nations consultation process appears in the First Nations Consultation Technical Support Document.

7.2.2 Summary of Activities

An offer to consult was made to all four First Nations identified in the First Nations Consultation Plan. Outlined below is a summary of consultation activities undertaken with First Nations.

7.2.2.1 Mattagami First Nation

A registered letter followed up by subsequent phone calls led to an initial conversation with Chief Willis McKay indicating that he had received the letter and was interested in Mattagami First Nation being consulted on the project. Subsequently, a meeting was held on April 18th, 2006 with Chief McKay and two other Council members. This meeting involved a presentation and general questions and answers. While no concerns were raised at this meeting it was suggested that OPG return to meet with the broader Mattagami FN community.

A community meeting was arranged for June 27, 2006 in the community centre adjacent to the Band office on the Mattagami First Nation. Eight community members participated in the opening prayer and smudge, which was led by a community elder. The presentation boards were available for the community members to peruse and SENES and OPG staff were available to answer any question which may have arisen. The presentation and discussion commenced at 11 am with a power point slide show. Following the presentation and discussion, the children from the Mattagami FN primary school joined the presentation and watched a DVD created for OPG “Stay Clear Stay Safe” while enjoying lunch. At this meeting, participants indicated that they would be interested in touring a small hydro facility.

On October 20th, a tour of the Wawaitin and Sandy Falls GS was held for interested Mattagami First Nation members. Approximately 15 individuals attended. The main purpose of this session was to provide an opportunity for community members to better understand the components of and how a small hydro-electric generating station works. There were no questions of the proposed projects but were a number of questions about how the facilities operate at various times of year.

Prior to the field tour, another registered letter was sent to Chief McKay in October inquiring if he had any other comments or concerns about the Proposed Undertaking. The second letter summarized the consultation undertaken to date and the response at the community level to the consultation sessions. There was no response to the second letter.

7.2.2.2 Matachewan First Nation

A letter was sent in March 2006 from OPG to Chief Fabian Batise of Matachewan First Nation, informing him of the project and making an offer to consult on the project. A total of four phone calls were placed in March and April to determine if Matachewan had an interest. In the second call to Matachewan SENES was able to speak to Chief Batise. He indicated that Matachewan might have an interest in being consulted on the project, subsequently two more phone messages were left with him asking him if there was a desire to be consulted. There was no response to either of these last two phone messages. Prior to the October public open house a second letter was sent to Chief Batise asking him again if there was an interest on the part of Matachewan being consulted, with an offer to meet. The letter was copied to the Forestry Liaison Officer for the FN. Following that three follow-up phone calls were placed to Matachewan. There was no response to these calls.

7.2.2.3 Flying Post First Nation

A letter was sent in March 2006 from OPG to Chief Ray Murray of Flying Post First Nation, informing him of the Proposed Undertaking and making an offer to consult. . A total of two phone calls were placed in March and April to determine if Flying Post had an interest. Chief Murray had a few questions at that time but he did not see the need for Flying Post to be consulted on the project. An offer was made to follow-up with Chief Murray in the fall to see if he had any questions at that time. Prior to the October public open house a second letter was sent to Chief Murray summarizing the work that had been done to date and asking him again if there was an interest on the part of Flying Post being consulted. Following that two follow-up phone calls were placed to Flying Post. There was no response to these calls.

7.2.2.4 Taykwa Tagamou Nation

A letter was sent in March 2006 from OPG to Chief Dwight Sutherland of the Taykwa Tagamou Nation (TTN), informing him of the project and making an offer to consult on the project. Three phone calls were placed to Chief Sutherland in April 2006 and voice mail messages on each occasion were left but no response occurred at that time.

Prior to the second open house, a second registered letter was sent to Chief Sutherland on October 4th. In early November Chief Sutherland contacted the project team indicating that he understood that OPG was not moving forward on projects in TTN's traditional territory until their past grievances with OPG were settled.[10] Subsequently, OPG sent another letter to Chief Sutherland asking him if TTN was interested in being consulted on the project. Three follow-up phone calls were also placed.

OPG representatives held a meeting on February 20, 2006 with Taykwa Tagamou Nation to discuss the Lower Sturgeon Generating Station project. While the Chief and a Councilor of TTN had originally planned on being at the meeting, OPG representatives did speak with Mr. Wayne Ross, a representative of TTN. Mr. Ross was provided with a presentation about the project, its rationale and need and impacts expected. TTN did not raise any questions at the meeting except for where Yellow Falls was in relation to Lower Sturgeon, as the community has some

[10] OPG has been involved in a Past Grievance Process with TTN and is currently working with them on a possible other project in Northeastern Ontario closer to their Reserve.

interests in Yellow Falls. No issues were raised about the Lower Sturgeon project or the EA results. OPG has also made an offer to go to the TTN Reserve to explain the project, should the community wish it. TTN did not have an interest in either Sandy Falls or Wawaitin Generating Stations.

7.2.3 First Nations Issues and Concerns

7.2.3.1 Mattagami First Nation

It is the opinion of OPG that Mattagami FN does not have any outstanding issues and concerns associated with the project. It should be noted that a member of the Mattagami First Nation was part of the environmental assessment team from the start of the process. He helped to both co-ordinate the consultation on the Reserve as well as undertake an examination to see whether any First Nations values would be affected by the project. The results of the values exercise revealed that no Mattagami First Nation values would be affected by the development.

There were some initial questions about whether the Proposed Undertaking would change levels and flows in the rivers. OPG assured Mattagami FN members that there would be no such changes and that the Water Management Plan that the First Nation participated in would be adhered to. Most of the other questions and comments were of general interest. Overall, there were positive comments that environmental aspects of the redevelopment were being examined and that a member of the First Nation was retained to determine whether any values were impacted. There was also a general interest expressed to learn more about hydro-electric facilities, which culminated in the tour of the Wawaitin and Sandy Falls GS for members.[11]

7.2.3.2 Matachewan First Nation

As indicated in the summary of activities, a total of two letters and seven phone calls have been placed to the Matachewan First Nation. As there has been no response to date, OPG has assumed the Matachewan First Nation does not have any issues or concerns.

7.2.3.3 Flying Post First Nation

As indicated in the summary of activities a total of two letters and four phone calls have been placed to the Flying Post First Nation. The only concern that was expressed early in the project was around new flows and levels. The concern was addressed by responding that there would be no change to overall flows and levels and that the Water Management Plan would be

[11] OPG is currently working with Mattagami First Nation on the possible development of a small hydroelectric generating station at the Mattagami Lake Dam and it is possible that this arrangement has led to the increased interest in these small hydro-electric generating stations.

adhered to. As there has been no further response from the Flying Post First Nation, OPG has assumed there are no issues or concerns.

7.2.3.4 Taykwa Tagamou Nation

As indicated in the summary of activities a total of three letters and six phone calls have occurred with the Tatkwa Tagamou Nation. The only concern that was expressed by TTN was with respect to their past grievance process. OPG is engaged with TTN in this past-grievance process. The final follow-up letter with TTN had asked them if they have any specific concerns associated with the project and whether they want to be consulted on it. No response has been received.

7.3 CONSULTATION WITH GOVERNMENT AND AGENCIES

7.3.1 Objectives and Approach

The overall objective of the agency consultation was to keep the various federal, provincial and municipal authorities informed of the project and offer to meet with them whenever necessary.

7.3.2 Summary of Activities

OPG has consulted with various municipal, provincial and federal government agencies throughout the environmental assessment process. Outlined below are the key consultation events.

- Meeting with the Canadian Environmental Assessment Agency (CEAA), July 2005.
- Teleconference with MOE, Environmental Assessment Officer – Discussion on environmental assessment process, December 13, 2005.
- Meeting with Federal and Provincial Authorities – Discussion of Project Scoping and federal environmental triggers – February 9, 2006. Agencies represented in person or on phone included the CEAA, DFO, Transport Canada, Environment Canada and MNR.
- Meeting with MNR – Discussion of environmental assessment process and key issues – February 20, 2006.
- Meeting with Ministry of Municipal Affairs and Housing (MMAH) and Ministry of Culture – Discussion on an overview of the project and any Ministry of Culture or MMAH issues, February 23, 2006.
- Meeting with City of Timmins Department Heads – Overview of the projects and discussion of any issues of interest, April 19, 2006.
- Meeting with City of Timmins City Council – Overview of the projects and Council resolution in support of the projects, June 26, 2006.
- Meeting with DFO – Overview of project and possible Fisheries Act implications, August 18, 2006.

- Teleconference with MOE and MNR – Status update on environmental assessment – September 27, 2006.
- Teleconference with MNR –- Discussion of First Nation and Aboriginal Issues – September 29, 2006.
- Teleconference with MNR –- Discussion of First Nation and Aboriginal Issues – December 4, 2006 and December 20, 2006.
- Ongoing communications with MOE file coordinator.
- Letters of Advice from DFO, January 2, 2007.

7.3.3 Issues and Concerns

In the various meetings held with federal, provincial and municipal representatives, agency representatives spoke to their mandates and responsibilities and what studies or work they might want to see. These varied from agency to agency but in general OPG and SENES do not think there are any outstanding issues or concerns that have not been addressed in the EA.

8.0 SUMMARY EVALUATION OF THE UNDERTAKING

8.1 Evaluation of Alternatives to the Undertaking

8.1.1 Null Alternative

The null alternative is to continue operating the stations with no action other than regular maintenance. In its present state, however, significant civil and mechanical repairs are required to enable the facilities to operate safely. This alternative also provides no opportunity to improve station efficiencies, and is therefore considered unacceptable from a safety, reliability and economic points of view.

8.1.2 Retirement

Retirement involves the decommissioning or permanent removal of the facilities, with the resultant loss of the site as a renewable source of electricity generation. Retirement foregoes the economic contribution made to the Ontario Power Generation electrical system by the stations and offers no substantial environmental or technical benefits

8.1.3 30 Year Facility Life Extension at 25 Cycles

Life Extension at 25 cycles (25 Hz) involves restoring the existing powerhouses to a condition suitable for a further 30 years of operation. The station capacity and energy production would be approximately equal to historical values. Water to Wire equipment and auxiliaries would be rehabilitated and the powerhouse civil structures would be rehabilitated (excluding dam repairs). Hydro One would still be required to maintain the 25 cycle transmission infrastructure.

The costs for upgrades to extend the life of the facility at 25 Hz are somewhat comparable to those for upgrades to extend the life of the facility with a frequency conversion to 60 cycles (60 Hz).

From a technical point of view, this alternative returns old, inefficient generating units to service for an extended period. Some uncertainty would exist regarding the expected life of some of the components in the turbines and generators. This alternative would also not address the rehabilitation of the dams.

Environmental effects of this alternative are predicted to be minimal, with short-term effects associated with construction activities. Upon consideration of the economic, technical and environmental aspects of this alternative, the life extension option is not preferred.

8.1.4 Frequency Conversion to 60 Cycles

Frequency Conversion involves converting the facilities from 25 cycles (25Hz) to 60 cycles (60 Hz). Although the generators and transformers will be replaced in this alternative, the risk of problems with the older Francis turbines remains. Under this option, the connection to the Hydro One system would be local thereby relieving Hydro One the obligation to maintain the 25 cycle infrastructure.

Overall, this alternative represents considerable capital investment with a small increase in capacity from the three facilities. The conversion to 60 cycles is a more favourable option than the other life-extension alternatives without conversion as it decreases annual OM&A costs, increases the capacity and energy output of the stations, and more significantly decreases line losses.

Environmental effects of this alternative are predicted to be minimal, with short-term effects associated with construction activities. Upon consideration of the economic, technical and environmental aspects of this alternative, the life extension option is not preferred.

8.1.5 90 Year Facility Redevelopment (the Preferred Alternative)

Redevelopment involves the construction of new powerhouses. Redevelopment will result in the demolition of the existing powerhouse and some associated facilities and the installation of new, safe and efficient generating units which will provide power and energy benefits to Ontario consumers for the next 90 years. This project also involved dam rehabilitation work.

Technical advantages of this alternative include the much greater capacity to make more efficient use of the available water resource at the sites optimizing the operation of the hydroelectric facilities and producing badly needed additional power for the Province. This alternative of changing the generating stations from 25 to 60 Hz will also allow direct connection to the local distribution system in Timmins and eliminate the energy losses due to the transmission of energy from Timmins to Sudbury.

Environmental effects of redevelopment will be somewhat greater than that of a life extension alternative but short-term in nature, minor, temporary and mitigable (these effects are described in detail throughout the EA). Long-term environmental effects are predicted to be minimal because the existing total discharge pattern flows and associated range of water level fluctuations, are not predicted to change. The redeveloped generating station will adhere to the approved Water Management Plan for the Mattagami River System. The redevelopment of these facilities will provide a temporary but significant benefit in the local economy as well as guarantee the perpetuation of existing employment and other economic benefits associated with the operations of these facilities.

Redevelopment was determined to be technically and environmentally sound, and to have substantial economic benefits over the other alternatives.

8.2 Evaluation of Alternative Methods of Carrying Out the Undertaking

Alternative ways of carrying out the undertaking which were examined included the number of units, the type of unit, the capacity for the unit(s) and station locations. All options largely leave the overall site layouts in their historic condition. In all cases, Kaplan turbines were chosen based on technical and economic criteria

8.2.1 Wawaitin Generating Station

Five redevelopment options were considered at Wawaitin GS. In all options considered, the new powerhouse would be located adjacent to the old facility. The preferred option would involve the decommissioning and demolition of the existing powerhouse, penstocks and surge tanks. The existing dams, intake canal, access roads, parking lots and other facilities would remain with refurbishments made to the dams and canal. The existing four Francis turbine-generator units would be replaced with two 7.5 MW vertical Francis turbine-generator units with a single new penstock from intake to powerhouse.

8.2.2 Sandy Falls Generating Station

Four redevelopment options were considered for the location of a new powerhouse at Sandy Falls GS. Three design alternatives were also considered for channelling water to the powerhouse including one or two new penstocks or an intake canal.

The preferred option would involve the decommissioning and demolition of the existing powerhouse, penstocks and surge tanks. A new powerhouse would be located on the east side of the existing facility and an intake canal constructed. The existing spillways and dams would remain with refurbishments made as necessary. The three existing Francis turbine-generator units would be replaced with a single 5.5 MW vertical Kaplan turbine coupled with a synchronous generator with a canal linking the intake to the powerhouse.

8.2.3 Lower Sturgeon Generating Station

Four redevelopment options were considered for the location of a new powerhouse at Lower Sturgeon GS. Threes options involved relocation of the powerhouse and the fourth, a powerhouse built on the existing site.

The preferred option would involve the decommissioning and demolition of the existing powerhouse. A new powerhouse with a single unit intake would be located on the existing footprint. The existing dams would remain with refurbishments made as necessary. The two existing Francis turbine-generator units would be replaced with a two 7.0 MW vertical Kaplan turbines coupled to synchronous generators.

8.3 Advantages of the Proposed Undertaking

Construction

Effects of construction are expected to be localized. The sites are owned by OPG and are fairly remote from communities.
Depending on the availability of a regional workforce, the relatively short overall duration of the three projects, and the fact that not all workers would be employed over the project construction period, it is anticipated that there would be some in-migration of construction workers. However, there will be a benefit of the project on communities in the area with regards to local hiring and spending.

Two of the sites (Wawaitin and Sandy Falls) will produce electrical power and provide flows through the existing powerhouses until the final year of construction, maintaining fish habitat in the tailrace areas.

Operation

The redevelopment option will enable the sites to continue to produce electrical power and add additional power using a renewable resource for another 90 years, with associated benefits to the community and the electrical consumers of Ontario.

The redeveloped stations will give OPG greater ability to manage water flows at the sites. It will also make the sites more compatible with the operating patterns of upstream and downstream hydroelectric stations.

The overall existing flow and water level fluctuation patterns are not expected to be changed during operation of the redeveloped stations. The three redeveloped generating stations will operate in accordance with the approved Water Management Plan for the Mattagami River System. No adverse effects are expected to occur to associated wetlands, aquatic or terrestrial communities. Resource use and socio-economic patterns in the vicinity are not expected to be affected by operations of the new facilities.

The stations will continue to operate as run-of-river facilities, but will make more efficient use of the available flows for power generation. The need for routine maintenance will be much reduced.

8.4 Disadvantages of the Proposed Undertaking

Construction

Minor and short-term disruption of air quality, vegetation, and fish and wildlife will occur in the vicinity of the redevelopment sites during construction due to activities such as dewatering, excavation, drilling, blasting, rock movement, cofferdam and access ramp construction and removal, equipment use and fuelling.

Although the sites are generally remote there is a potential for occasional disruption of traffic due to movement of heavy vehicles in the region.

Dewatering and reconfiguration of the forebay and tailrace areas during construction may affect some fish and aquatic vegetation habitat, however these effects are mitigable.

Demolition of the existing powerhouses may result in the loss of a structure with some heritage value. A number of measures are proposed to minimize this effect (see Section 6).

Operation

For the most part, no adverse effects on the bio-physical and socio-economic environments or resource use in the area are predicted during operation of the redeveloped stations. Although the need to open the sluiceways or spillways may be reduced, this does not mean that total flows equivalent to those occurring historically, will not occur. As a result, no significant effects on local aquatic communities downstream of the facilities are predicted to occur. The sites will continue to operate as per the existing Water Management Plans with no changes to water levels or river flows.

8.5 Proposed Mitigation Measures

The following is a summary of key mitigation measures which have been identified for consideration at the Upper Mattagami redevelopment project. It is not intended to be a comprehensive or final list.

Construction

During construction, the following mitigation measures are proposed.

- The stations and equipment will be photographically recorded prior to stations' demolition. If feasible and economical, some equipment from the existing stations may be made available to the local communities for historical display.

- All construction equipment will adhere to relevant guidelines for emission and noise control.

- Clearing of vegetation for construction activities will be minimized. Disturbed areas will be re-vegetated after construction to prevent erosion and dust.

- Sediment control devices such as settling/filtering facilities, silt curtains and silt fences will be installed where required to prevent transport of sediments into the river.

- Where applicable, flows through the existing powerhouses will continue until the final year of construction, to maintain fish habitat in the existing tailrace.

- In-water construction activities will be timed to avoid the spring spawning incubation period of fish.

- Fish stranded or trapped during dewatering of the coffer-dammed areas will be captured and relocated to the river. Pending discussions with DFO and MNR, rock or selected underwater structure will be placed in the new tailrace areas during construction to enhance existing or create new fish habitat.

- Environmental protection during proposed generating stations construction and operation will be ensured by adherence to the site-specific Environmental Management Plans, as well as compliance with regulatory standards and guidelines.

- The Environmental Management Plan for each redevelopment project ensures that environmental protection will be achieved by describing government agency requirements, OPG policy, project commitments and recommended mitigation measures to be undertaken. The Environmental Management Plan will include the Erosion and Sediment Control Plan, Spills Emergency Preparedness and Response Plan, Hazardous Materials Management Plan, Waste Management Plan and Site Rehabilitation Plan.

Operation

For operation, the power generating equipment has been selected to reduce the risk of spills to the environment. Power transformers and high voltage breakers do not utilize insulating oils. The transformers are of a dry type and the breakers are of vacuum type.

As indicated above, mitigation measures to be used to minimize or obviate potential adverse environmental effects associated with the three redevelopment projects will continue to be developed based on regulatory agency and other stakeholder consultation. For example, DFO in its Letters of Advice dated January 2, 2007, requested that the following mitigation measures be incorporated into the Environmental Management Plans for the three redevelopment projects.

- To protect local fish populations during their spawning and nursery periods, no in-water work or activity should occur during the timing restrictions indicated on the MNR work permit.

- Any natural woody material or boulders located within the footprint of the project should not be removed from the water, but instead relocated to an area of similar depth adjacent to the work site.

- Do not take materials (i.e., rocks, logs) from the shoreline, from below the ordinary high water mark or from the lake or river bottom.

- Install effective sediment and erosion control measures before starting work to prevent sediment from entering the water body. Inspect them regularly during the course of construction to ensure that they are functioning properly. Make all necessary repairs if any damage is discovered.

- All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance (e.g. petroleum products, silt, etc.) from entering the water.

- Stabilize any waste materials removed from the work site, above the ordinary high water level to prevent them from entering the water body. Spoil piles could be maintained with silt fence, flattened, covered with biodegradable mats or tarps, and/or planted with preferably native grass or shrubs.

- Vegetate any disturbed areas by planting and seeding preferably native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time in the growing season remaining for the seeds to germinate, stabilize the site (e.g., cover exposed areas with erosion control blankets to keep soil in place and prevent erosion) and then vegetated the following spring.

- Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.

- Existing stream flows should be maintained downstream of the dewatered work area without interruption, during all stages of the work. There should be no increase in water levels upstream of the dewatered work area.

- Fish should be removed from the work area prior to dewatering and released alive immediately downstream.

- Flow dissipaters and/or filter bags, or equivalent, should be placed at water discharge points to prevent erosion and sediment release.

- Silt or debris that has accumulated around the coffer dams should be removed prior to their withdrawal.

- Sediment laden dewatering discharge should be pumped to a settling basin or filtering system well away from the watercourse and allowed to settle and/or filter through riparian vegetation before re-entering the watercourse downstream of the construction area.

- Concrete leachate is alkaline and highly toxic to fish and aquatic life and measures must be taken to prevent any incidence of concrete or concrete leachate from entering the watercourse. All cast-in-place concrete, grout, mortars, etc. should be totally isolated from precipitation and all water bodies for a minimum 48 hour period or until significantly cured to allow the pH to reach neutral levels. The wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment required must not be allowed to enter any waterbody and should be contained in a suitable manner and location.

- Only clean material, free of fine particulate matter, should be placed in the water.
- Disturbed areas should be stabilized as soon as possible after the work is completed.
- Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
- Wash, refuel and service machinery and store fuel and other material for the machinery away from the water to prevent deleterious substances from entering the water.
- Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

8.6 Proposed Environmental Effects Monitoring

8.6.1 Pre-Operational Monitoring

Construction Monitoring

Pre-operational monitoring will be conducted during the construction period (construction monitoring) to monitor the potential effects of construction activities, including:

- periodic surveillance of construction activities, construction sites and constructed work to determine that environmental protection requirements are being met; and
- regular monitoring of suspended solid concentrations in water discharged from settling cells.

Post-Operational Monitoring

Post-operational monitoring will be conducted once the stations are commissioned, and begin operations. It is done to monitor specific areas of potential environmental effect, to verify predictions and to determine the effectiveness of mitigation measures. OPG will provide daily flows and levels for the facility as described in the Water Management Plan; and may monitor the use of the tailrace areas by fish and aquatic species under the new operating conditions.

8.7 Post-EA Act Approvals

Approval under the provincial EA Act is the first Provincial government approval in a series of permits, licences and approvals required for the Proposed. Other legislation such as the Ontario Environmental Protection Act, the Ontario Water Resources Act, the Lakes and Rivers Improvement Act, the Federal Fisheries Act, and the Federal Navigable Waters Protection Act grant authority to designated provincial and federal agencies to review and approve components of the proposed works at later stages of design definition, and therefore at a greater level of detail than is typically available at the EA stage. The EA Act specifically prohibits the granting of other approvals prior to EA Act approval. A list of the environmental permits, licences, clearings and approvals for the hydroelectric generating stations is provided in Table 8-1. While the permits and approvals required for the Proposed Undertaking is dependent on the final designs by OPG's Design Build Contractor, a non-exhaustive list of permits and approvals is provided. Depending on the Design Build Contractor's design, many of these approvals may or may not be required; however, the list is provided for illustrative purposes and serves as a generic list.

Other EA Act approvals and communications will be initiated with all relevant government agencies to ensure an up-to-date and complete list of information. This list will be incorporated into a Project Environmental Requirements document, which will be prepared as an approvals guide for project engineering and construction staff.

8.8 Conclusions

It is the conclusion of this EA that the redevelopment of the generating stations at Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS is the preferred alternative to renew and enhance the hydroelectric generating potential of the existing sites. This Environmental Report (ER) provides an evaluation of project alternatives, public and government concerns and suggestions, environmental effects and mitigation and monitoring options. Opportunities have been given for input from government reviewers in the scoping of field studies, the identification of effects, selection of potential mitigation measures, and the content of the ER document and review of Technical Support Documents. Through meetings, discussions and information centres/open houses and web site, substantial efforts have been made to inform and involve the public in the project, and to develop a clear understanding of their concerns. Ontario Power Generation continues to participate in community liaison committees and working groups with government agencies and the public, to address issues associated with Mattagami River Water Management and hydroelectric operations. Public and government involvement has, and will continue to be, a major influence on decisions related to the implementation of this project.

The Proposed Undertaking will provide a benefit to the electricity consumers of Ontario. The existing stations have served a long (over 75 year) and useful purpose, but are approaching the end of their useful service life. The opportunity now arises to extend and enhance the power output of these sites. The construction of the projects may provide some employment opportunities to workers in the Region. It is believed that the redeveloped stations will not adversely affect the attractiveness of the local areas for tourism and recreation, nor will they adversely affect resource uses by local people.

Ontario Power Generation is fully committed to monitoring project effects and developing appropriate mitigation to eliminate or reduce impacts of the projects, or to provide offsetting benefits. Preliminary monitoring recommendations have been provided in this document. There will be several opportunities to address new or outstanding public or government concerns.

It is OPG's intent to submit this Assessment to the MOE pursuant to OPG's *Class EA for Modifications to Hydroelectric Facilities* (Ontario Hydro, 1993). A key objective of this assessment was to identify and resolve all project issues, in advance of the 30 day review period stipulated within the Class EA. It is OPG's understanding that this objective has been achieved. If outstanding concerns remain after submission of this ER, a bump-up procedure is available for consideration of those concerns. The final result may be resolution of the issues, agreement to deal with the issues through another process, possible amendments to the document, or, if necessary, formal submission of the EA for review and approval as an individual EA under the terms and conditions of the EA Act.

Ontario Power Generation respectfully requests acceptance of the Proposed Undertaking as described herein, under the terms of the Class EA approval process. This document also provides information on the projects in order for the Department of Transport (Canadian Coast Guard), Department of Fisheries and Oceans Canada and other relevant federal authorities to provide the necessary clearances under the federal Environmental Assessment and Review Process.

TABLE 8-1: LIST OF PERMITS, LICENSES AND APPROVALS REQUIRED FOR HYDROELECTRIC REDEVELOPMENT

Agency	Statute	Pertinent Permits Licences or Approvals	Comments
Department of Fisheries and Oceans	The Fisheries Act	Letter of Advice (or Authorization required if HADD of fish habitat under Section 35 of the *Act)*. Letter of Advice if no fish destruction conclusion (or authorization for the destruction of fish by means other than fishing under Section 32 of the *Act)*.	Letters of Advice provided to OPG dated January 2, 2007 for Wawaitin, Sandy Falls and Lower Sturgeon.
Department of Transport	Navigable Waters Protection Act	Navigable Waters Protection Act Clearance can be required.	6 copies of final plans to be sent to Transport Canada.
Department of Transport	Transportation of Dangerous Goods Act	Explosives Transportation Permit	Required if transporting up to 2000 kg of explosives – unlikely to be required.
Ministry of the Environment	Environmental Protection Act	C of A (air/noise) Approval for the emissions or discharge of any contaminants into any part of the natural environment other than water (Part II, Section 8 and Regulations).	According to MOE C of A's are needed for any portable generation equipment. This will be a DBC responsibility.
Ministry of the Environment	Certificate of Approval - Waste	Waste generator registration.	Registration for hazardous waste generated during construction and which will be removed from the site.
Ministry of the Environment	Ontario Water Resources Act	Section 34 of the OWRA requires anyone taking more than a total of 50,000 L of water in a day from a lake, stream, river or groundwater source, with some exceptions, to obtain a permit to take water. Permits to take water for construction and dewatering depending on volume anticipated. MOE regional office.	Permit likely required during construction phase. MOE has indicated that there are discussions on the need for Permits to Take Water for the operation of hydroelectric facilities. OPG staff indicated that this is a corporate level issue for OPG.
Ministry of the Environment	Ontario Water Resources Act	C of A (Industrial Sewage)	Separate approvals would be required for temporary settling ponds and cofferdams requiring pump outs (if required). This is not anticipated but would be dependent on the cofferdam design submitted by DBCs.

TABLE 8-1 (CONT'D)
LIST OF PERMITS, LICENSES AND APPROVALS REQUIRED FOR HYDROELECTRIC REDEVELOPMENT

Agency	Statute	Pertinent Permits Licences or Approvals	Comments
Ontario Ministry of Natural Resources	Lakes and Rivers Improvement Act	Consolidated Work Permit Under section 16 of the LRIA: "No person shall alter, improve or repair any part of a dam in the circumstances prescribed by the regulations unless the plans and specifications for whatever is to be done have been approved by the Minister. 1998, c. 18, Sched. I, s. 31"	Consolidated Work Permit under the *Act* must be acquired from the MNR to undertake work on shore lands or works within a water body; Lakes and Rivers Improvement Act - O. Reg. 454/96.
Ontario Ministry of Natural Resources	Lakes and Rivers Improvement Act	Location Approval for new powerhouses Plans and Specification Approval for works to dams/powerhouses, temporary cofferdams	All part of LRIA
Ontario Ministry of Natural Resources	Public Lands Act	Amendment to Water Power Lease Agreements	
Ontario Ministry of Natural Resources	Public Lands Act	Amendment to Licence of Occupation if head pond area changed	No amendment to Licence of Occupation needed.
Ontario Ministry of Natural Resources	Fish and Wildlife Act	Fish Collection Permit	Required from MNR in order to capture and transfer fish following the construction of the cofferdams and the de-watering of the area behind them.
Ontario Ministry of Natural Resources	Crown Forest Sustainability Act	Forest Resource Licence – Clearance to Harvest	Clearance required to cut timber on crown land (all OPG sites are on crown land). OPG will send pictures to OPG of brush to be cleared – to determine if this is necessary.

TABLE 8-1 (CONT'D)
LIST OF PERMITS, LICENCES AND APPROVALS REQUIRED FOR HYDROELECTRIC REDEVELOPMENT

Agency	Statute	Pertinent Permits Licences or Approvals	Comments
Ministry of Transportation	Dangerous Goods Transportation Act	Waste Manifest	If materials are contaminated, will need to ensure manifests etc are in place if waste is to be transported off site
City of Timmins (for Wawaitin and Sandy Falls) and Ministry of Municipal Affairs and Housing (for Lower Sturgeon)	Planning Act	Official Plan and Zoning By-Law Designation	Use is in conformity.
City of Timmins (for Wawaitin and Sandy Falls) and Ministry of Municipal Affairs and Housing (for Lower Sturgeon)	Planning Act (Building Code)	Building permit approval required from the City. No permit from the Province, but the building must be compliant with the Ontario Building Code.	Building Permit approval will be required for "structural" aspect of the powerhouse, where in municipal boundaries.
City of Timmins (for Wawaitin and Sandy Falls) and Ministry of Municipal Affairs and Housing (for Lower Sturgeon)	Planning Act (Building Code)	Demolition permit approval required from the City	Demolition permits approval required by municipality.
South Porcupine Health Unit	Planning Act (Building Code)	Sewage System Permit Sewage System Demolition Permit and Sewage System Renovation Permit	(Ontario Regulation 22/98 stipulates the minimum requirements for a septic system) Permit will be required for septic systems removals, installations and/or renovations. To be discussed with Health Unit(s).

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ACKNOWLEDGEMENTS

The Upper Mattagami Environmental Assessment is the product of the efforts and contributions of a great many individuals and groups whose efforts are greatly acknowledged: Ed Dobrowolski, Gillian MacLeod, Mario Durepos, Joe Heil, Bill McKinlay, Chirasthi Mendis, Bruce McIvor (Ontario Power Generation); Don Gorber, Phil Shantz, Don Chubbuck, Amir Iravani, Bernard LeBeau and Cara Sanders (SENES); John Hilton (DCS); Jerry Fitchko (Environment & Energy Limited); Cam Portt and George Coker (C.M. Portt and Associates), John Pollock (Woodland Heritage); Richard Untermann and Jean Hilton (Unterman McPhail Associates); Francois Vitez and Bernard Munger (Gestion Conseil S.C.P. inc); David Judge (Hatch Energy) Chris McKay (C.M. McKay and Associates); and Mark Fleming (Fleming Professional Forestry Services).

LIST OF ABBREVIATIONS, ACRONYMS AND UNITS OF MEASUREMENT

&	And
~	Approximately
CLI	Canada Land Inventory
Cheminfo	Cheminfo Services Inc.
CEAA	Canadian Environmental Assessment Agency
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CWS	Canadian Wildlife Service
DBC	Design-Build-Contractor
DFO	Department of Fisheries and Oceans
$	Dollar
e.g.	For example
EA	Environmental Assessment
Eds.	Editors
EEL	Environment & Energy Limited
ER	Environmental Report
ERDE	Environmental and Resource Development Engineering nc.
ESA	Environmental Site Assessment
et al.	And others
Etc.	And so on
FOM	Mixed Forest
#	Number
FN	First Nation
Gartner Lee	Gartner Lee Limited
GS	Generating Station
>	Greater than
Hatch Acres	Hatch Acres Incorporated
Hydro One	Hydro One Networks Inc.
INAC	Indian and Northern Affairs Canada
Inc.	Incorporated
i.e.	That is
KGS Group	Kontzamanis, Graumaun, Smith, MacMillan Inc.
LRIA	*Lakes and Rivers Improvement Act*
<	Less than
ML/ARD	Metal Leaching and Acid Rock Drainage
MNR	Ministry of Natural Resources
MOE	Ontario Ministry of the Environment
N	North
NEPG	Northeast Plant Group (Ontario Power Generation)
NHIC	Natural Heritage Information Centre
No.	Number
OM&A	Operations, Maintenance and Administration
OMMAH	Ontario Ministry of Municipal Affairs and Housing
OPG	Ontario Power Generation Inc.
OWRA	Ontario Water Resources Act
pers. comm.	Personal communication

S1	Extremely rare in Ontario; usually fewer than 5 occurrences (in a 10-km by 10-km Mercator square grid)
S3	Rare to uncommon in Ontario; usually between 20 to 100 occurrences (in a 10-km by 10-km Mercator square grid)
S3S4	Rare to common in Ontario
S4	Common in Ontario; apparently secure, usually more than 100 occurrences (in a 10-km by 10-km Mercator square grid)
S4S5	Common to very common in Ontario
S5	Very common in Ontario, demonstrably secure
SE	Exotic; not believed to be a native component of Ontario's fauna
SENES	SENES Consultants Limited
sp.	One species
spp.	A number of species
SZN	Not of practical conservation concern as there are no clearly defined occurrences
TS	Transformer Station
TTN	Taykwa Tagamou Nation
W	West
WMP	Water Management Plan

Measurement Units

°	degree
°C	degree Celsius
°F	degree Fahrenheit
GWh	gigawatt-hour
ha	hectare
HADD	Harmful alteration, disruption or destruction (of fish habitat)
Hz	hertz
kg	kilogram
km	kilometre
Km^2	square kilometre
km/h	kilometre per hour
kV	kilovolt
Litre	litre
L/s	litre per second
m	metre
m^2	square metre
m/km	Meter per kilometer
mm	millimetre
m/s	meter per second
m^3/s	cubic meter per second

M	million
MW	megawatt
OIP	Ontario Institute of Pedology
PY	person year
SU	Status Uncertain
YOY	Young-of-the-year
’	minute
%	percent
$/m^2$	per square meter
$\leq$	Less than or equal to
”	second

GLOSSARY

Amphibole	A group of double chained inosilicate minerals whose basic chemical unit is the tetrahedron (SiO_4); they are common rock forming minerals and are found in most igneous and metamorphic rocks.
Arkose	A coarse-grained sandstone containing at least 25% feldspar and derived from the partial disintegration of feldspar-rich rocks such as granite and gneiss.
Avifauna	Birds.
Boreal	Of the north.
Canal	A channel dug or built to carry water.
Capacity	The greatest load which a unit, station or system can supply (usually measured in kilowatts, megawatts, etc.).
Capacity Factor	Ratio of the actual energy produced to the maximum energy which could be delivered under continuous operation at maximum rating.
Chute	A steeply-inclined natural passageway or constructed pipe or channel which conveys water from a higher to a lower level.
Clast	Rock typically composed of broken rock fragments, e.g., conglomerate and sandstone.
Cofferdam	A temporary dam made of concrete, rockfill, sheet-steel piling, timber/timber-crib or other non-erodible material and commonly utilized during construction to exclude water from an area in which work is being executed.
Conglomerate	A clastic sedimentary rock consisting of more or less rounded rock particles at least 2 mm in diameter, embedded in a fine-grained matrix of sand or silt.
Coniferous Forest	The largest terrestrial biome on earth (also known as the Taiga or boreal forest) extending in a broad band across North America, Europe and Asia to the southern border of the arctic tundra and usually dominated by one or two species of evergreen trees,
Dam	A concrete or earthen barrier constructed across a river and designed to control water flow or create a reservoir.
Deciduous Forest	In the Northern Hemisphere, this forest type occurs to the south of the coniferous forest and is dominated by broadleaved deciduous hardwood trees typically with a five- to six-month growing period.
Diabase	A fine-grained, dark coloured igneous rock composed of lath-shaped plagioclase (feldspar) crystals surrounded by smaller grains of pyroxene and olivine; it commonly occurs as tabular bodies (dikes and sills) intruded into surrounding rocks.

Dike	The vertical veins of igneous rock that form when magma enters and cools in fractures found within the crust.
Eukaryotes	Organisms whose cells have a membrane-bound nucleus and many specialized structures located within their cell boundary; in these organisms, genetic material is organized into chromosomes that reside in the nucleus.
Feldspar	A group of common aluminum silicate minerals that contains potassium, sodium or calcium; the most important group of rock-forming minerals, making up about 60% of the rocks of the earth's crust.
Flash board	A wood plank, steel member or inflatable rubber membrane placed at the top of a spillway to increase the storage capacity of a reservoir.
Forage	Any food suitable for livestock.
Forebay	The part of a dam's reservoir that is immediately upstream from the powerhouse.
Freshet	High flows in a stream or river, usually occurring in the spring, caused by snow melt, runoff, heavy rains and/or high inflows.
Geotechnical	Concerned with the physical properties of soil, rock and groundwater usually in relation to the design, construction and operation of engineered works.
Glaciofluvial	Of glacial watercourses.
Gleysolic	An order of soils developed under wet conditions and permanent or periodic reduction.
Gneiss	A metamorphed coarse grained igneous rock with the recrystallization of quartz, feldspar, micas and amphiboles into bands.
Granite	Medium to coarse grained igneous rock that is rich in quartz and potassium feldspar.
Grey Wooded	Well to imperfectly drained soils that have developed under coniferous and mixed-forest vegetation, as have Podzolic soils, but differ from them in having an accumulation of clay in the B horizon, neutral to slightly acid A and B horizons, and an alkaline parent material.
Greywacke	A hard coarse-grained sandstone characterized by angular particles of quartz, feldspar and other rock fragments embedded in a matrix of clay-sized particles.
Head	The difference in elevation between the water surface at the intake and tailrace.
Headgate (Control Gate)	The gate that controls water flow into a hydroelectric dam.

Headpond	The reservoir from which water is extracted for power generation or spillage.
Herpetofauna (Herpetiles)	Amphibians and reptiles.
Igneous	Rocks formed from the solidification of molten magma either beneath (intrusive igneous rock) or at (extrusive igneous rock) the earths' surface.
Inosilicates	A silicate group in which the oxygen-silicon tetrahedra (SiO_4) are linked into chains by sharing oxygen ions.
Intake	A structure which regulates the flow of water into a water-conveying conduit.
Isostatic rebound	The upward movement of the Earth's crust following depression of the crust by the weight of ice during continental glaciation.
Lacustrine	Of lakes.
Lithification	Process by which sediments are consolidated into sedimentary rock.
Mafic magma	This type of magma solidifies to form rocks relatively rich in calcium, magnesium and iron but poor in silica.
Magma	Molten rock originating from the earth's interior.
Matrix	The small particles of sediment or rock material that occupy the spaces between the larger fragments forming the framework of the rock.
Metamorphic	A rock that forms from the recrystallization of igneous, sedimentary or other metamorphic rocks through pressure increase, temperature use, or chemical alteration.
Mica	Silicate mineral that exhibits a platy crystal structure and perfect cleavage.
Olivine	A common silicate mineral found in rocks formed from mafic magma with its chemical composition varying between magnesium silicate and iron silicate.
Organic	Soils that have developed from accumulations of organic materials such as grasses, reeds, rushes, sedges, mosses and ferns.
Palustrine	Of wetlands.
Pebbly wacke	A coarse-grained siliciclastic sedimentary rock containing less than 25 percent pebbles in a matrix of sand, silt and clay.
Peneplain	A low almost featureless surface reflecting a base level of erosion.
Penokean Orogeny	A major early Proterozoic mountain building episode that began soon after a rifting event along the southern edge of the Superior Province 2.4 billion years ago.

Perennial	Continuing, enduring or growing through the year or through many years.
Plagioclase	A type of feldspar that is rich in sodium and calcium.
Podzolic	Well and imperfectly drained soils that have developed under coniferous and mixed-forest vegetation and usually found in cold to temperature climates on acid parent materials.
Powerhouse	A primary part of a hydroelectric facility where the turbines and generators are housed and where power is produced by falling water rotating turbine blades.
Proterozoic	Geological eon that occurred from 570 to 2,500 million years ago when the first single-celled and multi-celled eukaryotic organism evolved and developed.
Pyroxene	A group of single-chained inosilicate minerals whose basic chemical unit is the silica tetrahedron (SiO_4). They are common rock forming minerals and are found in the igneous and metamorphic rocks.
Quartz	A mineral: an oxide of silicon which is abundant and widespread occurring as an important constituent in many igneous, sedimentary and metamorphic rocks.
Quartz arenite	A medium-grained siliciclastic sedimentary rock containing less than 5% sand-sized particles of feldspar and less than 5% sand-sized particles of rock fragments.
Quaternary Period	The second and youngest period of the most recent Cenozoic Era (also called the Age of Mammals); the Quaternary Period began 2 to 3 million years ago and consists of two epochs, the Pleistocene and the Holocene (known also as Recent).
Riparian	Of or on a river bank.
Run-of-the-River	A power plant that has no upstream storage capacity and must pass all flows as they come.
Sandstone	A type of sedimentary rock that contains a large quantity of weathered quartz grains.
Sedimentary	Rock formed by the deposition, alteration and/or compression and lithification of weathered rock debris, chemical precipitates, or organic sediments.
Shale	Fine-grained sedimentary rock composed of lithified clay particles.
Siliciclastic sediment	Silica-based, noncarbonaceous sediments that are broken from pre-existing rocks, transported elsewhere and redeposited before forming another rock. Examples of common siliciclastic sedimentary rocks include conglomerate, sandstone, siltstone and shale.

Sill	Horizontal planes of igneous rock that run parallel to the grain of the original rock deposits; they form when magma enters and cools in bedding planes found within the crust.
Siltstone	Fine-grained sedimentary rock composed of lithified silt particles
Sluiceway (Sluice)	An open channel designed to divert excess water which could be within the structure of a hydroelectric dam or separate of the main dam (see spillway).
Spillway	A passageway, or channel, located near or at the top of a dam through which excess water is released or “spilled” past the dam without going through the turbine(s); as a safety valve for the dam, the spillway must be capable of discharging major floods without damaging the dam while maintaining the reservoir level below some predetermined maximum level.
Stoplog	A gate (sometimes made from squared lumber) which can be placed into an opening to shut off or regulate the flow of water.
Tailrace	A channel through which the water flows away from a hydroelectric plant following its discharge from the turbine(s).
Terrestrial	Belonging, living on or growing in the earth or land.
Turbine	A mechanism in an electrical generation facility which converts the kinetic and potential energy of water (in the case of hydroelectric turbines) into mechanical energy which is then used to drive a generator converting mechanical to electrical energy.
Weir	A dam in the river to stop and raise the water.

APPENDIX A

DISPOSITION REPORT

DISPOSITION REPORT FOR THE UPPER MATTAGAMI RIVER PROJECT COMMENTS BY AGENCIES AND RESPONSES BY OPG AND SENES

Submitted to:
Ontario Power Generation Inc.
700 University Avenue
Toronto, Ontario
M5G 1X6

By:

Mattagami River EA Consulting Team

Prepared by:	Mr. Phil Shantz, SENES EA Consulting Team	5 March 2007 Date
Reviewed by:	Dr. Donald Gorber, SENES EA Consulting Team	5 March 2007 Date
Approved by:	Dr. Donald Gorber, SENES Project Manager EA Consulting Team	5 March 2007 Date
Reviewed by:	Mrs. Gillian MacLeod Environmental Lead Ontario Power Generation Inc.	5 March 2007 Date
Accepted by:	Mr. Edward M. Dobrowolski Project Manager Ontario Power Generation Inc	5 March 2007 Date

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1.0 INTRODUCTION

Ontario Power Generation provided the main Environmental Report and the associated Technical Support Documents to various agencies prior to a Notice of Completion. The Technical Support Documents were sent to the agencies on December 23, 2006 and the Environmental Report on January 22, 2007.

The agencies which were distributed the reports were as follows:

- City of Timmins;
- Ontario Ministry of the Environment;
- Ontario Ministry of Natural Resources;
- Ontario Ministry of Culture;
- Ontario Ministry of Municipal Affairs and Housing;
- Department of Fisheries and Oceans;
- Transport Canada; and,
- Environment Canada.

The table below identifies the comments from the various agencies and the response from OPG. Agency comments are provided verbatim.

2.0 TABLE OF COMMENTS AND RESPONSES

COMMENTS	RESPONSE
Ontario Ministry of Natural Resources <u>Environmental Report - Section 5.4.3 – Resource Use</u> Earlier maps provided to MNR for the additional area at Wawaitin indicated an overlap with a mining lease.	 Based on the updated property needs of the Proposed Undertaking, there is no overlap of the additional area at Wawaitin with the mining lease. The lease falls outside the additional area at Wawaitin.
Ontario Ministry of Natural Resources <u>Environmental Report - Section 5.4.2 –Land Use Planning – p. 5-28</u> They quote some aspects of the PPS (2005), specifically 1.8.2 & 1.8.3 to support their re-development in terms of improvements to increased energy supply and air quality however they fail address any aspects of PPS section 2.1- <u>Natural Heritage</u> to speak to development or site alteration impacts to natural heritage features or fish habitat. They address natural heritage issues at various points throughout the document but in this section its absence would seem to suggest minimal or negligible impacts but it may help to directly show this and link impacts to items 2.1.5 & 2.1.6 of the PPS as well. This may help clarify all PPS concerns/items tied to this re-development under this section.	 Item 2.1.5 of the PPS states that: "*Development* and *site alteration* shall not be permitted in *fish habitat* except in accordance with *provincial* and *federal requirements*." The discussion around the Proposed Undertaking and its impact on fish habitat and provincial and federal requirements occurs in three documents in the study. It is summarized in Section 6.2.2.10 of the Environmental Report and Section 3.2.7 of the Aquatic Technical Support Document (TSD) Report. Item 2.1.6 of the PPS states that: "*Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions*." The discussion around the Proposed Undertaking and its impact on natural heritage features is summarized in Section 6.2.1.3 of the Environmental Report and Section 3.3 of the Terrestrial TSD.
In a supportive note, the document and TSD's provided, specifically the FN consultation and Built Heritage and Cultural Landscapes were very thorough-nice to see for a change compared to some others reviewed in the past.	We appreciate the supportive comments.
Ontario Ministry of Natural Resources <u>Environmental Report - Section 6.2.1.4 – Wildlife</u> A colony of approximately 50 cliff swallows makes their home on the north side of the Lower Sturgeon GS. These migratory birds over-winter in South America and return in the spring to reproduce. Although these birds are not designated as a species at risk, they are locally rare likely comprising the only colony within	 OPG has amended Section 3.4 of the Terrestrial Environment TSD and Section 6.2.1.4 of the Environmental Report to address this comment.

<table>
<tr><th>COMMENTS</th><th>RESPONSE</th></tr>
<tr><td>the Timmins District and are protected under the Migratory Birds Convention Act. Efforts should be made to time the demolition of the GS outside the breeding/nesting period (I would estimate this period to be early May to mid-September) so that the eggs or flightless young are not killed. If the demolition of the GS cannot be done outside of these timeframes, then efforts should be made to deter the birds from nesting on the GS the spring prior to demolition.</td><td></td></tr>
<tr><td>Ontario Ministry of Natural Resources

<u>Environmental Report - Section 6.2.2.9 – Fish Populations – p. 6-15 (and other references)</u>

The work-in-water timing restrictions suggested in the Environmental Report are:
• Wawaitin April 1 – June 15
• Sandy Falls April 1 – June 15
• Lower Sturgeon April 1 – July 1

Each of these reaches of the Mattagami River have populations of smallmouth bass (personal observation) yielding a timing restriction of May 15 – July 15. Sturgeon are present below the Lower Sturgeon facility and have been recently transferred to the reach between Wawaitin and Sandy Falls. Some of those individuals have since moved below Sandy Falls (based upon telemetry data) and now likely reside between that structure and Lower Sturgeon. One of the original transferred sturgeon was caught this past spring by an angler between Wawaitin and Sandy Falls so it can be surmised that at least some of the original 50 individuals remain there. Although this is an introduced population, we still manage these waters as sturgeon waters (yielding a timing restriction of May 1 – June 30). Each of these reaches also has populations of whitefish which are fall spawners whose eggs over-winter in the substrate. The standard timing restriction for work in water for waterbodies with whitefish is September 15 – May 30.

Thus, the timing restrictions for work in water for the redevelopment sites should be modified to:
• Wawaitin September 15 – July 15
• Sandy Falls September 15 – July 15
• Lower Sturgeon September 15 – July 15

OPG will be required to meet with MNR Timmins District staff once construction details and schedules have been finalized in order to discuss the potential impacts of the timing restrictions and possible mitigative measures.</td><td>Lake whitefish are a fall spawner with eggs over wintering in the substrate. Spawning usually occurs in shallow water often over a hard or stoney bottom, but sometimes over sand. The eggs are deposited more or less randomly above the spawning grounds, drifting downstream to settle in areas of lesser flows. With the hydroelectric plants in operation during cofferdam installation, it is highly unlikely that whitefish eggs will settle in the areas of higher turbulent flow proximate to the tailrace. The potential for increased turbidity generation and siltation is the main concern in protecting lake whitefish eggs.

OPG has amended Section 3.2.7 of the Aquatic Environment TSD and Section 6.2.2.9 of the Environmental Report to address these comments.</td></tr>
<tr><td>Ontario Ministry of Natural Resources

<u>Environmental Report - Section 7.2.2.3 – Flying Post First Nation – p. 7-5</u>

Please correct this section as the Chief of Flying Post FN is Chief Murray Ray.</td><td>The Report has been revised to address this comment.</td></tr>
<tr><td>Ontario Ministry of Natural Resources

<u>Environmental Report - Table 8-1 – p. 8-10</u></td><td></td></tr>
</table>

COMMENTS	RESPONSE
Please revise table to reflect correct list of MNR permits as discussed at the Approvals and Permits Technical Committee meeting of February 13, 2007.	The report has been revised to address this comment.
Ontario Ministry of Natural Resources General Comment Are the proposed cofferdams totally within the boundaries of the current lease? If not, tenure will be required for the length of time they will be in place.	The proposed cofferdams are totally within the existing boundaries of the OPG water power leases for each site.
Ontario Ministry of Natural Resources First Nations Technical Support Document - p. 5 Please revise the statement ''While MOE is the lead agency in the EA review, it has been agreed as between these Ministries that the MNR has responsibility for ensuring consultation with First Nations." MNR does not assume the full duty to consult with First Nations on behalf of all Provincial Ministries. MNR's duty to consult is defined by the specific approval decisions associated with any project. In the case of the Upper Mattagami Redevelopment Project MNR's duty to consult will be focused on approval decisions related to the Lakes and Rivers Improvement Act and the Public Lands Act.	OPG has amended Section 2.0 of the First Nations Technical Support Document and Section 7.2.1 of the Environmental Report.
Ontario Ministry of Natural Resources First Nations Technical Support Document - p. 7 Re. Flying Post First Nation – please revise the text to read Chief Murray Ray; also missing word "Post" in first line	The report has been revised.
Ontario Ministry of Culture The Ministry of Culture, Thunder Bay office noted the following (MCL File #2007-56WT001): "I have had the opportunity to review the information provided in Dr Pollock's reports on the above noted project areas. In these two reports Dr Pollock has determined that there is low potential for the discovery of archaeological resources for the subject properties. This Ministry agrees with Dr Pollock's assessment of these properties as holding low potential for the discovery of cultural heritage materials. I think the built heritage component of the assessment is being commented on separately by the Ministry's Conservation Advisor in Toronto. Therefore, this Ministry is satisfied that the proper assessments and recommendations have been made with respect to the archaeological cultural heritage issues, and has no further concerns for this application. Please note that clearances and evaluations of low potential made by this Ministry do not remove the proponent's obligations under the Ontario Heritage Act (R.S.O. 1990, c. O. 18) or the Cemeteries Act (R.S.O. 1990, c. C. 4). For this reason, two standard conditions will continue to apply to the approval of this	Both of these conditions were already identified in the Archaeological and Cultural Heritage Impact Study Technical Support Document. The second condition is already described in Section 6.5.2 of the Environmental Report. The first condition with respect to human remains has also been added to the Environment Report.

COMMENTS	RESPONSE
application. 1. Should human remains be identified during operations, all work in the vicinity or the discovery will be suspended immediately. Notification will be made to the Ontario Provincial Police, or local police, who will conduct a site investigation and contact the district coroner. Notification must also be made to this office and the Registrar of Cemeteries, Ministry of Government Services. 2. Should other cultural heritage values (archaeological or historical materials or features) be identified during operations, all activity in the vicinity of the recovery will be suspended and the Ministry of Culture archaeologist contacted. This condition provides for the potential for deeply buried or enigmatic local site areas not typically identified in evaluations of potential. "	
Department of Fisheries and Oceans No formal comments were provided at this stage, but DFO had previously sent OPG three Letters of Advice (one for each generating station).	No further response required from OPG. The recommendations of these Letters of Advice had already been incorporated into the Environmental Report and Aquatic Technical Support Document.
Transport Canada Susan Homer of Transport Canada wrote the following: "Transport Canada - Ontario Region, Engineering and Environment group has received the material on the above noted project. As you know, Transport Canada does not have a CEAA trigger for this project. Therefore, we have no comments and do not require any further involvement with this proposal. However, Transport Canada - Marine Safety - Navigable Waters Protection Program will be interested in the installation of any turbidity curtains, installation of any temporary works, fluctuation of water levels, maintenance of portage routes during and after construction, installation of warning signs, deposition of blasted material and creation of any fish habitat compensation at all sites. When the plans for the alterations have been finalized the Navigable Waters Protection Program will require 6 copies of the plans for each site. Should you have any questions, please contact the Navigable Waters Protection Program Parry Sound office and speak to Rick Thomas (705-774-9095 or by fax at 705-746-4820)."	Six copies of the final plans of each generating station will be forwarded to Transport Canada.
Environment Canada <u>Environmental Report - Remediation of contaminated soils</u> On page 5-11 of the EA Report it is stated that: "although small amounts of transformer oil, arsenic and lead may be entering the Mattagami River via the groundwater, there was no detectable effect on surface water quality." It was	Acknowledged. This issue is discussed in detail in Section 2.2.1 of the Aquatic Environment TSD, Section 2.2.3 of the

COMMENTS	RESPONSE
also indicated that transformer yard soil remediation will be carried out. We assume that any contaminated soils found in the Transformer Yards have been previously identified as the source of the groundwater contamination and entry of these pollutants into the river. Do the contaminated soils that require clean-up contain PCB's (from old transformer oils) or other toxic substances designated under the *Canadian Environmental Protection Act (*including arsenic and lead)? EC recommends that the extent of contamination, contaminants found, etc. on this site, and the other sites, should be described more fully in the EA Report along with a brief description of the proposed cleanup objectives/criteria and risk management measures.	Terrestrial TSD and Section 5.2.2.4 of the Environmental Report.
Environment Canada Environment Report - Management and Disposal of Chemically Treated Lumber EC understands that existing penstocks and surge tanks will be decommissioned and removed from the project sites. Some of these structures were constructed using timber; however, it was not indicated in the EA Report whether chemically treated timber was the material originally used. Historically, creosote was the most common preservative used to treat wood stave timber used for penstocks (and surge tank?) construction. EC recommends that this should be clarified in the EA Report. The proponent is advised that PAH's found in creosote, are identified as priority substances under the *Canadian Environmental Protection Act* (CEPA). Also, pentachlorophenol (PCP) (another common wood preservative) is highly water soluble and is a popular wood preservative also identified as a toxic substance under CEPA. PCP contains traces of Track 1 substance slated for Virtual Elimination under CEPA. Therefore handling and disposal of wood waste containing toxic preservatives should be carried out to prevent contamination of the environment. For more information on CEPA toxic substances and pertinent Guidelines and Codes of Practice, please see our web site at: < http://www.ec.gc.ca/CEPARegistry/subs_list/Toxicupdate.cfm > If chemically treated timber was originally used for these or other decommissioned structure, EC recommends that removal and disposal of any treated timber take into consideration best practices for management and disposal of treated timber waste to: ▪ avoid and minimize releases of treated timber fragments and sawdust into the environment; and, ▪ maximize opportunities for re-use (e.g., landscaping, re-processing, etc.) before disposal at a landfill (licensed to accept this type of waste material). It is possible to utilize creosote treated timber waste for energy generation, and EC recommend that the feasibility of this option be evaluated by OPG as suitable facilities (co-generation facilities, cement kilns, etc.) that can properly accommodate this type of fuel are located a relatively close to the project site (i.e., Kirkland Lake).	The comment is acknowledged. The wooden penstocks were constructed from wood which was chemically treated with creosote or with coal tar which contains creosote. However, other than the wooden penstocks there was no other chemically treated wood in the original GS construction. Sections 2.2.3 and 3.2 of the Terrestrial Environment TSD and Sections 5.2.1.2 and 6.2.1.2 of the Environmental Report have been updated to address this concern. OPG appreciates the reviewer's suggestions about alternative uses for the material.
Environment Canada Environment Report - Acid Rock Drainage On of the references cited in the EA Report (p. R-4) is entitled: "Martin, J. 2006.	Section 2.2.1 of the Terrestrial Environment

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Interpretation of ML/ARD Analyses at Proposed Hydroelectric Power Plant Redevelopments. SENES Consultants Limited Memorandum, 30 July 2006. 3 p.". EC assumes that this reference pertains to the analyses of acid rock drainage (ARD) potential associated with locally occurring rocks that require excavation and disposal at the three project sites. Information on the nature of the work undertaken, and the main conclusions and recommendations described in this report were not presented in the EA Report, nor did EC receive a copy of the reference for review. Therefore, EC recommends that an appropriate level of discussion on ARD be included in the EA Report under the appropriate sections.	TSD and 5.2.1.2 of the Environmental Report have been revised to address this comment.
Environment Canada Environment Report - Migratory Birds EA Report, s. 6.2.1.2 (p. 6-5) - In areas designated for clearing where vegetation provides migratory bird habitat, timing of vegetation clearing should be carried out to avoid impacts on nesting migratory birds as indicated under s. 6.2.1.4. EC suggests that reference be also made in this section to timing constraints for clearing vegetation that provides migratory bird habitat. EA Report, s. 6.2.1.4 (p. 6-6) – it was indicated that in the event that active migratory bird nests are found that: "A buffer zone with a 50-m allowance restricting active construction activities is usually applied around a nest.". As the buffer size required to minimize disturbance to nesting birds would likely depend on the species present, work activity adjacent to the nest, and other specific site conditions, EC should first be contacted to determine whether any mitigation measures proposed are appropriate.	Acknowledged Section 3.4 of the Terrestrial Environment Technical Support Document and Section 6.2.1.4 of the Environmental Report have been revised to address the comment.
Environment Canada Species at Risk As Table 5-1 is entitled: "Wildlife Species at Risk with Ranges Overlapping the Study Area" (EA Report, p. 5-6), it is not clear to EC what "accidental" means in reference to occurrences of certain species in the table. Each species shown in the table is either ranging into the project study area or it is not. If it is not, it should be removed from the table. It is not clear whether EC's species at risk search tool < http://www.speciesatrisk.gc.ca/map/default_e.cfm> was consulted to determine if the ranges of any COSEWIC listed species at risk (including those listed in the Table 5-1) overlap with the site. Also, no reference is made to the status under SARA of the species listed in the table. For species where their known range occurs within the project study area, information on their habitat requirements should be consulted and compared to habitat descriptions for the study area. If there is a potential for species at risk to occur at a project site (i.e. previous known occurrence, species range overlap and/or known habitat preference exists), a qualified biologist should conduct a thorough biological inventory of all areas of natural habitat that may be affected by the project and have the potential to support species at risk. A strategy should be developed to protect any identified species at risk, with a primary focus on avoidance. The foregoing was part of EC's scoping comments[1] describing assessment protocols applicable to the consideration of species at risk listed under the federal *Species at Risk Act* (SARA).	Acknowledged. Sections 2.3.2 and 2.5.4 of the Terrestrial Environment TSD and Section 6.2.1.4 of the Environmental Report have been revised to address this comment.

[1] Provided by EC letter to OPG dated February 20, 2006 (Shaw/Macleod)

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In order to be consistent with objectives of the Canadian Biodiversity Strategy (i.e., to preserve the biodiversity of surrounding vegetation and ecosystems) and provide suitable habitat for migratory birds and other wildlife, we recommend the proposed re-vegetation of any disturbed or restoration areas using native plant species, however these should be indigenous to the area to the maximum extent possible, and also well adapted to the site conditions and uses. Use of invasive species should be avoided.	Acknowledged – Section 3.2 of the Terrestrial Environment TSD and Section 6.2.1.2 of the Environmental Report have been revised to address this comment.
City of Timmins No written comments received. Mark Jensen, Director of Development Services for the City indicated on February 13th at a meeting in Timmins that the City would have no comments.	Previously, the City of Timmins had provided a Council Resolution in support of the Proposed Undertaking.
Ontario Ministry of the Environment Water Quantity In order to generate more power, the redeveloped generating stations (GSs) will require greater flows. For instance, Wawaitin GS will have a rated flow of 45 cms instead of existing 40 cms, the Sandy Falls GS will have 65.4 cms instead of existing 44 cms, and the Lower Sturgeon GS will have 123 cms instead of existing 56 cms. This greater flow capacity of the generation stations will alter the distribution of flow between GSs and the spill channels, though the total flow will remain the same. The current Mattagami WMP does not specify any minimum flow requirement for the spill channels for the resident fish community in the channels. However, the consultant discussed about this minimum flow in their EA report. According to EA report, the existing minimum 1 cms flow will be maintained in the spill channels of Wawaitin GS, ≤ 1cms will be maintained in the spill channel of Sandy Falls GS, and 2 to 3 cms will be maintained in the spillway of the Lower Sturgeon GS. The proponent must resolve this minimum spill channels and spillway flow requirements with the MNR and/or DFO before applying for permit to take water (PTTW) for these facilities to the MOE. A Permit to take water will not be issued without written authorization/agreement from these agencies.	At Wawaitin leaks between the stoplogs have been eliminated in the summer of 2006. The only inflow of water into the spill channel is from natural inflows. At Sandy Falls, and at Lower Sturgeon, any existing leakage is due to the poor concrete condition, and when the civil works are rehabilitated as part of the Proposed Undertaking this source of leakage will be eliminated. All three projects will adhere to the approved Water Management Plan, and there are no minimum flow requirements at any of the 3 facilities. The Design Build Contractor will have to work with all relevant agencies for permits they are required to obtain. This issue is discussed in detail in the "During Operation" Section 3.2.7 of the Aquatic Environment TSD and Section 6.2.2.18 of the Environment Report.
Ministry of the Environment Blasting Agents After dewatering, within the cofferdams areas rock blasting will be done for redevelopment activities. What type of explosives will be used and whether they will alter nearby water quality, are not mentioned in the EA report, though it was	A more detailed explanation of how blasting is to be done is provided in the Aquatic Technical Support Document in Section 3.1.

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reported that 'the DFO guidelines for the use of explosives in or near Canadian fisheries waters' would be followed. The proponent should expand this portion of the document and clearly identify all preventative and contingency measures to ensure that blasting does not have harmful effects to water quality, aquatic biota or fish habitat. Possible mitigations, if required, must be addressed in the EA Report.	
Ministry of the Environment Sediment laden dewatering discharge According to DFO letter of advice of January 2, 2007, sediment laden dewatering discharge should be pumped to a settling basin or filtering system well away from the watercourse and allowed to settle and/or filter through riparian vegetation before re-entering the watercourse downstream of the construction area. This facility will require OWRA Section 53 (Sewage Works) approval from the MOE before its execution.	The potential effects of in-water construction activities, such as cofferdam construction on water quality in the Upper Mattagami River, will be minimized by using clean rock fill, the placement of rock fill over similar coarse substrate and judicious selection of the discharge location and water pressure during dewatering. This description is provided in the Aquatic Technical Support Document in Section 3.2.2. MNR will provide permits for cofferdam timing, design and installation proposed by OPG's Design Build Contractor. MOE will need to review this for the Permit to Take Water during construction. At this point, OPG does not think an OWRA Section 53 (Sewage Works) approval from the MOE will be required if the design addresses the regulators' concerns.