Little Jackfish Hydroelectric Development

Project Description Pursuant to the *Canadian Environmental Assessment Act*

Submitted By:

Ontario Power Generation and SENES Consultants Limited

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ONTARIO POWER GENERATION

LITTLE JACKFISH RIVER
HYDROELECTRIC DEVELOPMENT

PROJECT DESCRIPTION

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1.0 INTRODUCTION

This document is the revised Project Description for the proposed Little Jackfish (LJF) River Hydroelectric Development (LJF Project or Project). Ontario Power Generation Inc. (OPG) is the proponent. Figure 1.1 is a map of the general Project location. A full description of the revised proposed Project is set out in Section 3.2. The Project Description was revised to describe three fundamental changes to the Project as follows:

1. Development of only one of the two previously proposed hydroelectric generating stations proposed on the Little Jackfish (LJF) River. The generating station (GS), is a 75 megawatt (MW) hydroelectric development that OPG has previously referred to as the "Lower Site" which is to be located about 16 km upstream of the mouth of the river at Ombabika Bay at the north end of Lake Nipigon (Lower Site). For economic reasons, OPG has deferred a decision on the development of the "Upper Site" which was proposed to be located between Zigzag and Moule Lakes at Seven Veil Falls. Development of the Lower Site does not preclude future Upper Site development. In the event that market conditions improve and OPG decides that it has become viable, additional EA approvals would be required.

2. Automation of the existing Summit Control Dam which is located approximately 28 kilometres (km) north of the Lower Site and at the north end of the LJF River.

3. Development of a 230 kilovolt (kV) transmission line that would connect the GS to the provincial electricity grid. OPG is proposing that the transmission line be sited on the east side of Lake Nipigon and connect to an existing Hydro One Networks Inc. (Hydro One) 230 kV transmission line located near Kama Bay east of the Town of Nipigon. OPG is proposing to construct this transmission line as Hydro One is no longer pursuing its proposed Northwest Transmission Expansion Project.

This Project Description is consistent with the Canadian Environmental Assessment Agency (CEA Agency, 2007) Operational Policy Statement for preparing Project Descriptions under the *Canadian Environmental Assessment Act (CEAA)* and the "Federal Requirements for Waterpower Development Environmental Assessment Processes in Ontario – Practitioner's Guide" Version 2.0 (DFO and OWA, 2010).

OPG will be carrying out a coordinated provincial-federal environmental assessment (EA) process for the proposed Project.

1.1 Project Purpose and Background

As part of its mandate to develop additional hydroelectric capacity, OPG is considering development of the LJF River. In support of this mandate and previous efforts by Ontario Hydro, OPG's predecessor company, the Ministry of Natural Resources (MNR) has granted OPG the "first rights" to develop the hydroelectric potential of the LJF River.

The LJF River flows south from the Ogoki Reservoir and Mojikit Lake into Ombabika Bay at Lake Nipigon. The river is located approximately 250 km north-northeast of Thunder Bay and has a length of 50 km (31 miles). The LJF River can be structurally divided into two components. The north part of the LJF River, from Summit Dam to the south end of Zigzag Lake, is a series of small lakes (South Summit, Stork, Moule and Zigzag), interconnected by

rapids and one waterfall between Moule and Zigzag Lakes known as “Seven Veil Falls”. From the south end of Zigzag Lake to the mouth of Lake Nipigon, the system is a river comprised of both fast and slow moving sections.

By virtue of the 57 metres (m) of elevation differential (head) between the Mojikit Lake and Lake Nipigon and an average flow of 122 cubic metres per second (m^3/s), there is a significant hydroelectric power potential on the LJF River. Although there is no existing hydroelectric development on the LJF River, it has been subject to a formalized water management regime through the Nipigon River System Water Management Plan (WMP), which was approved by MNR in 2005.

There are two existing water control dams in the river system. The first dam is Summit Control Dam (Photographs A-6 and A-7) which is located at the north end of South Summit Lake and discharges water to the south, down the LJF River. The other is Waboose Control Dam (Photograph A-8) which is located at the eastern end of the Ogoki Reservoir and discharges water north down the Ogoki River. As per the WMP, Summit Control Dam is currently operated to emulate natural flows by maintaining a constant sill level with all logs removed throughout the year (OPG, 2005).

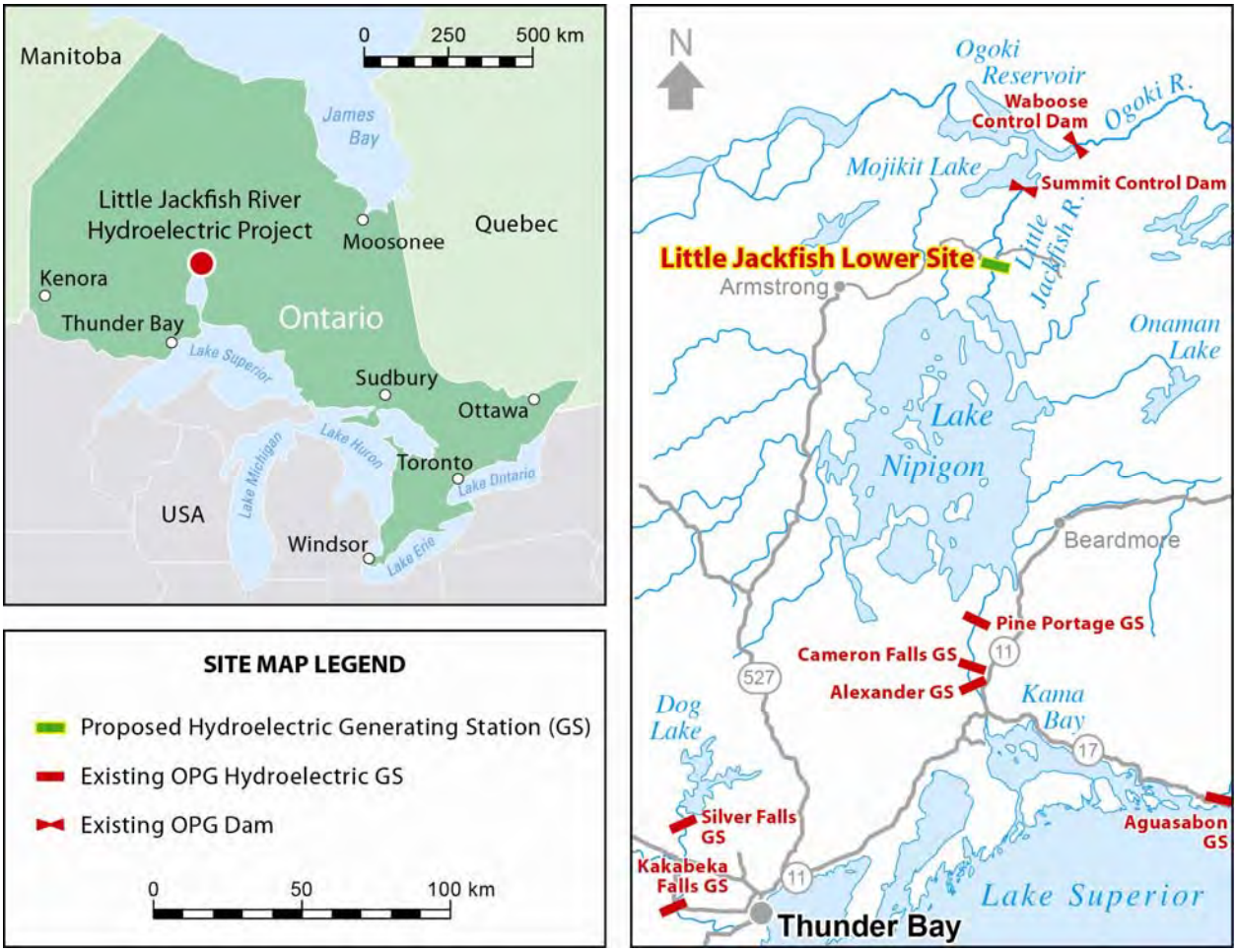

Figure 1.1 Map of Project Location

1.2 Relevant History to the Current Proposal

The two existing control dams were constructed as part of the Ogoki Diversion Project (AWRA, 1982). The Ogoki Diversion was completed in 1943 to divert flow from the Ogoki River, which discharges in Hudson's Bay, south to the LJF River and the Great Lakes system to increase water availability for downstream hydroelectric power generation.

The Ogoki Diversion converted what was then known as Jackfish Creek with a flow of 4 m^3/s into the LJF River with an average flow of 122 m^3/s. Jackfish Creek, prior to the Ogoki Diversion, is shown in Photograph 1. Major works were undertaken in what is now known as the LJF River. These works included the following:

- Construction of a new railway bridge and channel where the Canadian National Railway (CNR) line crosses the LJF River (Photograph 2);
- Major channel expansions in the area south of Zigzag Lake (Appendix A: Photographs A-1 and A-2); and,
- Construction of Waboose and Summit Control Dams and channel improvements associated with these facilities.

Photograph 1 Jackfish Creek Prior to the Ogoki Diversion (circa 1936)

Photograph 2 Construction of the Railway Channel (circa 1943)

Since 1943, the Long Term Average (LTA) flow in the LJF River has been approximately 122 m^3/s. The diversion works (Summit Control Dam and various channel improvements to the LJF River) were designed for a maximum flow of 283 m^3/s.

Since the Ogoki Diversion, several studies have been conducted on developing the hydroelectric potential on the LJF River. Studies were carried out by Ontario Hydro in the mid-1980's and were based on a proposed development, comprising a single station with an installed capacity of about 132 MW (2x66 MW units, 283 m^3/s rated plant flow) located 12.7 km (7.9 miles) upstream of Lake Nipigon. In 1988, Ontario Hydro submitted an EA for this proposal to the Ontario Ministry of the Environment (MOE). In 1993, prior to the MOE giving notice of the completion of the review of the EA by the MOE's Environmental Review Branch, Ontario Hydro withdrew the proposal from the EA review due to a combination of factors that included a drop in energy demand.

Several corporate, environmental and social changes have occurred since 1992 which have influenced the decision process for reconsideration of the proposed undertaking. These changes include but are not limited to:

- Demerger of Ontario Hydro in 1999 and the creation of OPG as a private corporation (with the government of Ontario as its sole shareholder) with a mandate to generate and sell electricity;
- Completion of a WMP for the Nipigon River System (OPG, 2005);
- Establishment of the CEA Agency in 1994 and introduction of the *CEAA* in 1995;
- Court decisions articulating the "Duty to Consult" with First Nations;
- First Right to Develop LJF River hydroelectric potential provided to OPG by MNR in 2003, with the First Right secured in 2009 through the issuance of a Notice of Commencement of an EA;
- Interest from two remote First Nations (Whitesand and Kiashke Zaaging Anishinaabek) to achieve grid connection in order to stop their current reliance on diesel generation; and,
- Potential for the LJF Project to be the catalyst for development of wind and other hydroelectric generation.

The purpose of this document is to:

- Provide the scope of the currently proposed Project for provincial and federal agencies, as well as other interested parties;
- Provide an overview of the existing physical, natural and socio-economic environments;
- Provide additional details on key aspects of the proposed GS including flows, water levels and inundation; and
- Identify areas of interest and possible triggers under *CEAA*.

1.3 Project Study Area Location

The proposed GS location is approximately 250 km northeast of Thunder Bay, Ontario. The LJF River can be accessed by Highway 527 to the unorganized community of Armstrong. From Armstrong, forest access roads lead to a bridge which crosses the LJF River. There are no other roads that lead directly to other places on the LJF River. Water flows south from Ogoki Reservoir and Mojikit Lake into Ombabika Bay at the northern end of Lake Nipigon. The length of the LJF River is about 50 km. There is no existing hydroelectric development on the LJF River.

The general study area for the generation portion of the Project spans from the Ogoki Reservoir south to the mouth of the LJF River at Ombabika Bay and is largely within the LJF River watershed, as shown in Figure 1.2. However, the study areas for each of the different disciplines involved with the Project vary with the extent of effects. Figure 1.2 shows the locations of existing structures in the vicinity of the proposed GS.

The general study area for the transmission portion of the project involves two distinct components. A proposed 230 kV transmission line is required from the proposed GS to the existing 230 kV transmission line north of the Trans-Canada Highway near Kama Bay. A 44 kV transmission line is needed from the GS to Summit Control Dam. The proposed study areas for the transmission corridors are shown in Figure 3.4.

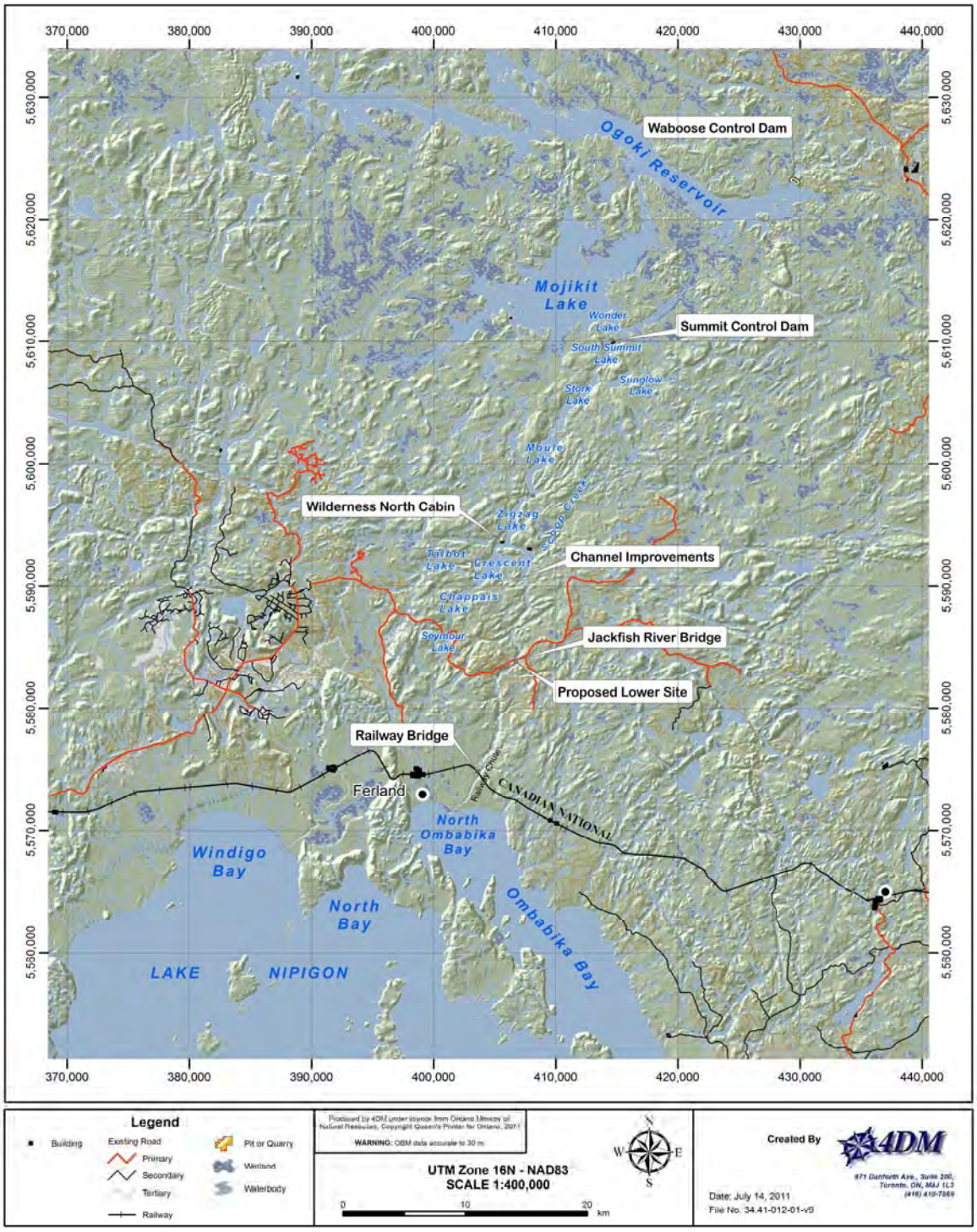

Figure 1.2 Reference Map of Little Jackfish River Watershed

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2.0 EXISTING ENVIRONMENT

2.1 Natural Environment

2.1.1 Terrestrial Environment

The proposed GS and northern portion of the transmission line are located in the Superior Province of the Precambrian Shield and the bedrock is principally granite gneiss, with lesser amount of hornblende gneiss, pegmatite, metavolcanics and periodite. Where the bedrock is exposed, it is sound and mostly of good quality. Bedrock exposures are limited in the lower portions of the LJF River but increase in frequency upstream (Hatch Energy, 2007). The southern portion of the transmission line also lies within the Precambrian Shield but proterozoic bedrock underlies much of the area in the southern part of the Forest, between Lake Nipigon and Lake Superior (Ontario Geologic Survey, 1991).

Glaciation has had a profound impact on the area in which the proposed project is located. It has shaped and sculptured the bedrock surface and infilled the irregularities of the surface with various glacial materials. The retreat of the glacial ice sheets from the Lake Nipigon area from 18,000 years before present (BP) to 8,000 years BP led to a rebound of the earth's crust of about 175 m (Hatch Energy, 2007). Movements and melting of the ice sheets deposited various sequences of glacial and glacio-fluvial materials which in turn were inundated by meltwater, flooding vast low-lying areas previously occupied by the receding glacier. The meltwater created a postglacial lake, called Lake Kelvin, and glaciolacustrine lake deposits were laid down in this more static environment. The glaciolacustrine deposits are fine grained soils comprising fine sand, silty sand, layered silt, and inter-layered silt and clay (varved clay) In general, the fine sand/silty sand deposits have been found both above and below the varved clay (Hatch Energy, 2007). Occasionally, the fine sands are trapped within the varved clay.

As a result of glaciation, the topography in the vicinity of the project area characteristically is comprised of domed or elongated hills separated by poorly drained, broad but sometimes narrow valleys, resulting in gently to moderately rapid changes in elevation over short distances.

As crustal rebound continued and the water of Lake Kelvin drained away to become Lake Nipigon, down-cutting and erosion took place along the course of the LJF River to the extent seen prior to the Ogoki Diversion, with the deposition of the eroded materials in Lake Nipigon. In the northern portion of the river, the glacial tills and bedrock resisted further erosion while the fine grained materials were transported to Lake Nipigon. Since the Ogoki Diversion, the fine grained materials including the fine sands, varved clays and aeolian deposits from the lower river reaches have been moved by water and ice erosion.

Surface topography, in general, is a reflection of the underlying geology and project area is a good example of this phenomenon. The following three features stand out:

- the topography is bedrock controlled and is reflected in the general alignment of bodies of water, hilltops and valley trends. These physical features trend northeast-southwest and are defined by the foliation in the bedrock (foliation is a structural fabric or banding caused by metamorphism);
- the higher elevations of the hills are generally underlain by thinly covered or exposed bedrock; and

- the gentler slopes and flat areas are invariably infilled with soils of glaciolacustrine and glaciofluvial origin that can be up to tens of metres thick.

The soils throughout the project area are principally glacial deposits. In some areas, wind blown aeolian deposits are also found. The glacial deposits are generally overlain by a layer of peat or muskeg, especially in the low areas of valleys.

The top to bottom sequence of soils, as can be judged from the glacial history described above, can be: peat in the lower reaches of valley, up to 1 to 3 m thick; glaciolacustrine soils consisting in part of whole of fine sands and silt, varved clay and silt; glaciofluvial sand and gravel; glacial till; and bedrock.

All of these soil elements may not be present in any one location and it will depend on the local configuration of the bedrock surface and its elevation, the local history of glacial and lacustrine deposition and subsequent erosion. When glacial till is encountered, bedrock will generally be the underlying layer. Occasionally, a thin layer of sand and gravel can be present between the till and bedrock. The thickness of these soils will vary within the footprint of any individual structure and vary from 2 to 20 m for glacial till and 2 to 40 m for lacustrine deposits. The depths stated vary for any particular structure location.

The LJF Project is located in Hill's Ecoregion 3W, which is cold and moist (wetter than surrounding Ecoregions 2S and 3S) with a mean annual length of growing season of approximately 175 days and approximately 2,225 mean annual growing degree-days (Hatch Energy, 2007). Ecoregion 3W is dominated by shallow ground moraine over granitic bedrock with considerable glaciolacustrine deposits and moraines.

The vegetation of the area is primarily boreal, with black spruce, jack pine, trembling aspen, balsam fir, white birch and tamarack. The LJF study area is primarily within the Central Plateau (B.8) section of the Boreal Forest Region (Rowe, 1972) while the Superior Section (B.9) occupies the area around Lake Superior and the Lake Nipigon Basin (B.10) occupies the area around Lake Nipigon. The Forest is situated within the Northwest Region sub-regional ecosystem areas NW-3 and NW-4 (Norampac, 2006).

This area is a relatively level bedrock plateau with shallow soils and some extensive sand and gravel deposits. Jack pine and black spruce are the prevalent trees species. Jack pine dominates on sand flats and black spruce dominates on shallow soils and organics. Mixed forests with trembling aspen, white spruce, balsam fir and white birch are largely restricted to riverbanks, lakeshores and rich, well-drained glacial deposits. In low-lying areas, glaciolacustrine soils are covered by organic peat. Extensive black spruce swamps with tamarack and less frequently, white cedar, cover areas of low relief and poor drainage. Rock barrens occur on shallow soils throughout the area, where their persistence is related to frequent fires. Red and white pine reach their northern limits in this section, typically occurring as scattered individuals or isolated clumps on lakeshores and islands (Rowe, 1972).

Woodland caribou are reported to be found in most of the area, but have a patchy distribution, associated with suitable winter habitat (open, mature conifer forest) and calving areas (islands and peatlands). Some caribou move from Lake Nipigon calving areas to winter north of Lake Nipigon, notably near Armstrong. No woodland caribou have been directly observed in the environmental field work for the GS. A few caribou were observed during 2011 mid-winter

caribou surveys for the transmission aspect of the project. The Province of Ontario has recently completed a Caribou Conservation Plan (MNR, 2009). OPG will be working with MNR and other interested parties during the EA process to ensure that new and emerging requirements under the provincial *Endangered Species Act* for assessing potential impacts to woodland caribou are understood and so that OPG can properly address this topic in the EA documentation.

Moose are present throughout the area, but are more common on richer soils supporting mixed wood forest, especially in association with burns and logging. White-tailed Deer are not common.

2.1.2 Aquatic Environment

2.1.2.1 Water Management

The LJF Project is located at the divide of the James Bay and Lake Superior watersheds and is included in the geography covered by the Nipigon River System WMP (OPG, 2005). The WMP identifies water flow and level compliance requirements for waterpower facilities and control structures (dams) in operational plans, and the process used to develop them.

This particular WMP includes two regions: one is the Ogoki Reservoir/Mojikit Lake/LJF River, and the other is the Lake Nipigon area, including the Nipigon River. For the purposes of water management planning, OPG operates Mojikit Lake and the Ogoki Reservoir as a single waterbody, which is often referred to as "Ogoki/Mojikit", and also two small waterbodies immediately north of Summit Dam (sometimes referred to as North Summit and Wonder Lakes). The Ogoki//Mojikit waterbody was created in 1943 due to the Ogoki Diversion Project. which involved the construction of the Summit and Waboose Control Dams to divert water that originally flowed north down the Ogoki River (towards James Bay), south down the LJF River into Lake Nipigon. The reason for the Ogoki Diversion Project was to provide water for three OPG generating facilities on the Nipigon River and at generating stations further downstream in the Great Lakes and St. Lawrence River systems.

As a result of the Ogoki Diversion Project, there are now significantly increased long-term flows on the LJF River (approximately 30 fold increase). Prior to 1943, the long-term average (LTA) flow in the river was about 4 m^3/s. Based on historic water gauge data (1950 to 2010) for Summit Control Dam outflow, an average of 113 m^3/s is diverted through Summit Control Dam down the LJF River. This discharge is equivalent to 3,563,568,000 m^3 per annum.

The purpose and function of Summit and Waboose Control Dams are described in the WMP and are summarized as follows:

- Summit Control Dam regulates diversion of water from the Ogoki Reservoir to Lake Nipigon via the LJF River. Under normal conditions, flow south to Lake Nipigon is controlled through operation of the Summit Control Dam.
- Waboose Control Dam functions to divert water from the Ogoki River to Lake Nipigon and the Nipigon River. The diversion created the Ogoki Reservoir and the Mojikit and North Summit Lakes.

Under normal conditions, the WMP requires that Summit Control Dam remain "all logs out" to allow the Ogoki Reservoir to rise and fall naturally. Log operations may be performed at Summit Control Dam when OPG and the MNR agree to allow manipulation to occur. Adjustments are typically made when conditions on the watershed are "out of normal" with respect to the planned operations of the WMP, or to accommodate maintenance or other stakeholder interests on the system.

The WMP also sets out the normal operating practice for Waboose Control Dam, which is to remain closed (except for leakage between stoplogs that flows north). High water level conditions may require water to be re-directed through the Waboose Dam and down the Ogoki River.

Table 2.1 presents the minimum and maximum operating and absolute water levels for the Ogoki Reservoir as contained in the WMP. The total catchment area of the Ogoki River upstream of the Waboose Dam is approximately 13,600 km^2.

The WMP allows that OPG can operate the Ogoki Reservoir at any elevation within the operating range at any time of the year as long as Summit Dam remains wide open (the specified dam opening is the compliance requirement, not detailed water flows or levels). Prior to the 2005 WMP, a review of historical data confirms that OPG typically lowered the water level in advance of the spring freshet. Water levels fluctuate and rise throughout the remainder of the year. The current operational Plan component of the WMP for the Nipigon River System appears in Appendix B.

Table 2.1 Ogoki/Mojikit Operating Water Levels (per Nipigon River System Water Management Plan, 2005)

Description	Water Level[1]
Absolute Maximum Water Level*	327.66 m
Normal Operating Maximum Water Level	327.10 m
Normal Operating Minimum Water Level	324.70 m
Absolute Minimum Water Level	None specified

Based on the License of Occupation (LO) for Ogoki reservoir

Existing Structures in the Generation Station Portion of the Study Area

From the Ogoki Reservoir south to the mouth of the LJF River at Ombabika Bay, Lake Nipigon, the following key existing structures and man-made features are adjacent to or cross the LJF River:

- Waboose Control Dam (and earth bank);
- Summit Control Dam;
- Wilderness North Cabin at Zigzag Lake;
- Trapper cabin at Zigzag Lake (member of Whitesand First Nation);
- Channel improvements at south end of Zigzag Lake;
- Jackfish Road Bridge;

[1] All water levels are referred to in this Report as "Above Sea Level".

- CNR Railway Bridge; and
- Channel improvements at the CNR Railway Bridge ("Railway Chute").

Refer to Figure 1.2 for the relative locations of these structures. Photos of these structures appear in Appendix A.

For the LJF Project, the only proposed change to the above listed structures is the automation of Summit Control Dam. These modifications are discussed in more detail in Section 3.

2.1.2.2 Erosion and Sedimentation

The EA process will be used to examine the issue of erosion and sedimentation on the LJF River, with the aim of assessing how the proposed project will change the current situation.

To date, it is widely accepted that there has been extensive bed and bank erosion in the LJF valley as a result of the Ogoki Diversion in 1943. Erosion mechanisms in the LJF River include bed and bank erosion below the water level as a result of flow conditions in the river, as well as erosion from natural bank instabilities above the water level.

As an initial part of the EA process, OPG has conducted an erosion assessment that suggests that most of this erosion occurred during the first 40 years of operation of the Ogoki Diversion (from 1943 into the 1980's) and that erosion rates have since diminished by 95% since the diversion was placed in service.

As the EA continues, OPG will further be consulting on and assessing the validity of the following preliminary OPG perspectives on erosion and sedimentation issues:

- Given that the total volume of flow discharged into the river is not proposed to change as a result of the Project, it is unlikely that there will be a significantly increase in current erosion rates;
- Erosion will continue after construction, but it is anticipated that erosion rates will gradually diminish with time;
- The dam and reservoir will act as a physical barrier that will reduce the quantity of sediment from being transported into the lower reaches of the river;
- Natural erosion from bank slides above the water level will continue but this is unrelated to changes in flow conditions;
- Whether the benefits of new physical remedial measures for slope stabilization are greater than the potential negative environmental impact associated with construction;
- Operating regime options and their potential effect on erosion and sedimentation; and,
- Constraints on flows, levels and operating methodologies to reduce or mitigate against potential effects.

Studies to support OPG's findings and positions will be provided as early as possible in the EA process for review and discussion by all interested parties.

2.1.2.3 Water and Sediment Quality

Water quality was assessed in the LJF River in 1981 and 1982, and again in 1986 and 1987. As well it has been part of the current assessment in 2009. Parameters assessed included pH, temperature, dissolved oxygen, biochemical oxygen demand (BOD), turbidity, total phosphorus, suspended solids and conductivity (Ontario Hydro, 1988). In addition to the above water quality tests, a mercury assessment program is being undertaken to predict the potential impact of the undertaking on mercury bioaccumulation.

The objective of the mercury assessment program for the EA is to provide mercury baseline levels in different aquatic components (as noted below) and predict peak mercury concentrations in fish after construction. A mercury sampling program was implemented in 2009 and 2010. The following components of the aquatic environment were sampled for mercury analysis: water, plankton, sediments, fish (walleye, northern pike, smelt and lake whitefish at different sizes); and, soils. A sampling program occurred at the following locations: Zigzag Lake, Moule Lake, Mojikit Lake (fish only), Lake Nipigon (fish only) and Ombabika Bay (mouth of LJF River).

Abiotic factors such as temperature and oxygen (depth profiles) will be measured since they are relevant in affecting mercury concentrations in fish (Bodaly *et al*., 1993). Fish species selected are assumed to be dietary pathways leading to methyl mercury exposure to humans. Sampling was conducted in August 2009 because earlier studies presented in Ramial *et al*. (1993) showed that measured concentrations of methyl mercury (methylation rates) in surface waters peak during mid-summer in Canadian Shield Lakes.

2.1.2.4 Fisheries and Fisheries Habitat

Fish species in the LJF River include walleye, northern pike, white and longnose suckers, shorthead redhorse, lake whitefish, cisco, lake sturgeon, brook trout and small forage fish which are characteristic of other fish assemblages in lakes and rivers in Northwestern Ontario (Maher and Parker, 1988). Walleye are known to spawn at the upstream end of Zigzag Lake, and there are several other potential spawning locations where suitable bottom substrates and velocities occur. Walleye tagged in Ombabika Bay by the Rocky Bay First Nation were captured in Zigzag Lake in 1997 (Stephenson, 1998). Field studies including a large acoustic telemetry program carried out in 2009 – 2011 demonstrated some movement of walleye between Zigzag Lake and Lake Nipigon. However, movement of fish from Lake Nipigon into the LJF River is heavily constrained by the man made channel constructed below the CNR bridge approximately 3 km north of the mouth of the river. OPG has been able to demonstrate that most spring freshets flow volumes and velocities in this channel impede upstream passage for fish. Fish movement is likely not possible during this time of year until the flows drop to below 120 m^3/s.

Less is known about the abundance and movements of lake sturgeon in the LJF River system. It is considered unlikely that the Jackfish Creek supported lake sturgeon in significant numbers prior to the diversion in 1943, as it was a much smaller stream. While lake sturgeon have been found in the LJF River and Zigzag Lake, no sexually mature sturgeon have been found above the Lower Site powerhouse after two years of extensive field studies. Brook trout have been captured in the LJF River in the vicinity of the Lower Site (south of the dam) and are associated with a large creek (Major Creek) that flows into the LJF River south of the proposed dam site.

Along with walleye OPG has implanted some brook trout and sturgeon with acoustic telemetry tags.

It is not known if lake whitefish (which are important to the Lake Nipigon commercial fishery) use the river for spawning (the presence of a run has not been found in studies to date), but a cisco migration into the lower river during the fall spawning period was documented during studies in the 1980's.

The following questions are guiding the fisheries studies to support the EA:

- What are the existing habitat conditions in the LJF River system?
- What fish are using the LJF River system, and how?
- How might fish and other living creatures and aquatic resources be impacted by the Project?
- Can fish habitat be protected, created and/or re-created?
- What are potential mitigation systems for both upstream and downstream migrants, with emphasis on both walleye and lake sturgeon?
- What is the estimated predicted increase in mercury levels in fish resulting from the Project?

2.2 Land and Resource Use and Socio-economic Environment

2.2.1 Land and Resource Use

The proposed GS portion of the LJF Project is located on Crown land in the land use area known as: G2619: Armstrong/Kagianigami. This large (773,292 ha) general use area of Crown land is situated north of Lake Nipigon. The primary use of this area is resource extraction (forestry, mining and trapping) and commercial power generation is already a permitted activity (MNR, 2007). The GS portion of the LJF Project is located in the Armstrong Forest. Forest management activities have been the dominant resource uses in the area and forest access roads are prevalent throughout most of the area. There are no parks, heritage sites or protected areas within the immediate vicinity of the proposed GS location, although there is a provincial Conservation Reserve around the shoreline of Lake Nipigon.

Other Crown land use activities in the area include: mineral exploration, trapping, hunting and fishing. A remote tourism cabin (fly-in) is located on Zigzag Lake and provides high-quality fishing opportunities, primarily to American tourists. These anglers primarily fish on Zigzag Lake, however, they may also occasionally fish on Moule Lake as the outfitter leaves a cached boat at this lake and there is rough portage around Seven Veil Falls (between Moule and Zigzag Lakes). Fishing also occurs in the area where the road bridge crosses the LJF River. Due to the distance, fishing is primarily undertaken by residents of Armstrong and Whitesand First Nation.

There is no commercial fishery on the LJF River system or in Ombabika Bay. There is a commercial fishery on the remaining area of Lake Nipigon that is primarily focused on lake whitefish and small quantities of northern pike, sauger and lake trout.

Recreational boating (i.e., canoeing and kayaking) rarely occurs on the river owing to the remoteness, lack of access to the river (flying in is the only way to access the upper part of the system and the Ogoki Reservoir/Mojikit Lake) and technical and safety challenges associated with navigating the river at anything but low flows. Through 2008 and 2009, all field personnel

associated with the project were asked to record any observations of recreational boating anywhere on the system. Throughout a period of 39 days, there were no observations of canoes or kayaks on the system (and no evidence of recent campsites). There have been observations of anglers from the Zigzag Lake Cabin boating/fishing on Zigzag Lake. OPG will continue to document any evidence of recreational activities associated with outfitter operations.

As indicated in Section 1.1, the upper part of the LJF River system is a series of small lakes interconnected with falls and rapids. There are rough/unmaintained portages around all the rapids and falls in the upper part of the system. These portages may have been created at the time of the Ogoki Diversion. Use of these portages is primarily by recreational guests staying at the Zigzag Lake Cabin, or by guests to outfitters located on Mojikit Lake, as cached boats have been observed in several locations in the area. These portages have occasionally been used by canoeists (Cotton, 2010) but as indicated above canoeing occurs very infrequently on the system. OPG maintains a signed and cleared portage around Summit Control Dam. No portages were observed in the lower part of the river system, although there is a trail from the existing Jackfish Road to a fishing spot below the bridge. There is likely no boating here as there are no egress points from the river. There are powerboats that travel up the river from Lake Nipigon to the first major set of rapids, but this is significantly downstream of the proposed LJF Project.

The general study area for the transmission line from the Lower Site to the proposed interconnection point along the existing 230 kV transmission line at Kama Bay can be characterized as Crown land. The study area for the transmission line has been selected to stay outside of parks and other protected areas and is located on general crown land where transmission lines are acceptable land uses.

Most of the general study area is forested but has been subject to resource activities such as forest harvesting, road building and mineral exploration for much of the twentieth century. Other resource uses include trapping, hunting and fishing. As the area is generally very well accessed there are no remote tourism operations in the general vicinity of the study area for the transmission line. Most of the transmission line is located in the Nipigon Forest which is licenced to Lake Nipigon Forest Management Inc. Harvesting activity on the Nipigon Forest has significantly declined in the last ten years owing to the closure of many of the mills throughout Northwestern Ontario.

The transmission line study area was chosen to facilitate paralleling of existing linear severances on the landscape wherever possible. These severances are generally existing primary permanent forest access roads. However, other severances to potentially parallel include highways, a pipeline and the CNR rail line.

The transmission line study area does cross some mining claims north of Beardmore. This area has been subject to extensive mineral claims and it is impossible to completely avoid claim areas.

2.2.2 Communities

The nearest community to the GS portion of the LJF Project Area is the unincorporated community of Armstrong, which is about 60 km west by forest access road. Armstrong was the site of a former military installation and is a CNR stop. The economic base in Armstrong was

dependent on the CNR, remote tourism industry, the Whitesand First Nation and logging. However, in 2009, Buchanan Forest Products, which at one point maintained a large logging operation in the area, ceased all logging on the Armstrong Forest. Numerous outfitters use Armstrong as a launching point for fishing, hunting and canoeing trips to more remote areas. The City of Thunder Bay is located by road about 300 km southwest of the LJF Project area, and is the regional economic centre for Northwestern Ontario.

The proposed transmission line would be routed on the east side of Lake Nipigon connecting to the existing 230 kV transmission line near Kama Bay and east of the Town of Nipigon. The transmission line would cross the Municipality of Greenstone near the community of Beardmore. However, the transmission line would be located outside of the urban area boundary.

Greenstone is a recently amalgamated municipality that comprises the communities of Geraldton, Longlac, Beardmore and Nakina. It also includes the hamlets of Jellicoe and MacDiarmid. The 2006 Census reported a population of 4,906 (Statistics Canada, 2011). The Municipality covers a wide geographic area from the shores of Lake Nipigon to Longlac.

Economically, the region has been challenged over the last ten years with the decline in the forest products industry and closure of forest products mills in Longlac and Nakina. However, while there are no operational mines within the boundaries of the municipality there has been extensive mineral exploration. Tourism, transportation and government services are also important local employers.

2.2.3 Aboriginal Communities

OPG is of the opinion that the EA process is the logical point in which the impacts of the undertaking on Aboriginal and Treaty rights can be identified and mitigated where necessary and while a proponent can carry out “procedural” aspects of the consultation, the ultimate duty/responsibility is owed by the Crown.

There are six First Nations situated around Lake Nipigon that consider the Lake and its surrounding lands their traditional territory. All six First Nations are Ojibway, located within the Robinson-Superior Treaty area. These First Nations include:

- Animbiigoo Zaagi’igan Anishinaabek (AZA), or Lake Nipigon Ojibway;
- Bingwi Neyaashi Anishinaabek (BNA) or Sand Point;
- Biinjitiwaabik Zaaging Anishinaabek (BZA) or Rocky Bay;
- Kiashke Zaaging Anishinaabek (KZA) or Gull Bay;
- Red Rock Indian Band (RRIB); and
- Whitesand (WSFN).

OPG is pursuing the LJF Project with the hopes of entering into a commercial partnership with six Lake Nipigon First Nations. On November 3, 2008, OPG and the Chiefs of the six Lake Nipigon First Nations signed a Protocol Agreement related to the proposed LJF Project. This Agreement commits OPG and the Lake Nipigon First Nations to work cooperatively over the next few years to define and assess the environmental, social, cultural, economic and long-term sustainability of the proposed development prior to either party making any decisions about formally proceeding with the LJF Project.

OPG and Waaskiinaysay Ziibi Inc., a development corporation formed by the Lake Nipigon Nations, have signed a non-binding Memorandum of Understanding that represents an important step in developing a partnership between the parties with respect to Little Jackfish River Hydroelectric Project.

Members of Waaskiinaysay Ziibi Inc. currently include: Animbiigoo Zaagi'igan Anishinaabek, Biinjitiwaabik Zaaging Anishinaabek, Red Rock Indian Band, Whitesand First Nation and Bingwi Neyaashi Anishinaabek (collectively known as the Lake Nipigon Nations).

OPG and the Lake Nipigon Nations continue to work cooperatively to complete an environmental assessment of the Project.

Each of these five First Nations is described below.

Animbiigoo Zaagi'igan Anishinaabek (Lake Nipigon Ojibway First Nation)

The AZA reserve is located near Jellicoe and Geraldton on Partridge Lake, off Highway 11. In 2008, AZA achieved their goal of having Partridge Lake transferred into the Lake Nipigon reserve. Community members reside principally in Ontario between Sault Ste. Marie and Kenora with the majority presently living in the Thunder Bay District. The community's homeland and traditional land use area is north and northeast of Lake Nipigon. AZA has an office in Beardmore and a total population of 395 (INAC, 2010).

Biinjitiwaabik Zaaging Anishinaabek (Rocky Bay First Nation)

The BZA reserve is nestled between mountains on the southeast shore of Lake Nipigon, adjacent to the community of MacDiarmid and accessible off Highway 11. The reserve acreage is currently under review and BZA has been in negotiations for additional reserve lands since 1991 and is in litigation for a comprehensive land claim since 1984. There are also community members who live in MacDiarmid. The community has a total population of 680, of which 327 are on reserve (INAC, 2010).

Red Rock Indian Band

The Red Rock Indian Band (RRIB) is located in Nipigon. RRIB has an on-reserve population of 300 (Band Office) and a total band membership of 1,494 (INAC, 2010). The main reserve of the RRIB is located approximately 400 meters from the junction of TransCanada Highways 11 and 17 and is situated on Lake Helen. RRIB has two parcels of land that comprise its reserve lands: Parmacheene Reserve No. 53 and Lake Helen Reserve No. 53A. The total area covered by these two reserves is approximately 385 ha. Community members are employed in a wide variety of band related occupations and have had a long and sustainable forestry operation.

Whitesand First Nation

Whitesand First Nation (WFN) has two reserves, with the main reserve No. 190 is located adjacent to the community of Armstrong, about 260 km northeast of the City of Thunder Bay and is accessed off Highway 527. The other reserve, referred to as Old Whitesand No. 81, is located on the northern shores of Windigo Bay, Lake Nipigon. The WFN has a total population of 1,200 of which 430 are on the main reserve and 100 in Armstrong (INAC, 2010). WFN

members are employed in a wide variety of band related occupations and in forestry, heavy equipment and tourism activities.

Bingwi Neyaashi Anishinaabek (Sand Point First Nation)

In April 2010, following negotiations with the Governments of Canada and Ontario, Bingwi Neyaashi Anishinaabek (BNA) received its land base. The agreement included nearly 1,000 hectares of land in what was the former Black Sands Provincial Park. BNA's reserve land is located on the eastern shore of Pijitiwabik Bay, which is in the southeast corner of Lake Nipigon, approximately 50 km north of Highway 11/17. While some BNA members live on-reserve seasonally, community members can be found in the neighbouring First Nation communities of Rocky Bay, Lake Helen, and Pays Plat, as well as in Beardmore, Thunder Bay, and in large and small municipalities across the country. BNA has a total membership of approximately 210 individuals, and currently maintains a satellite office in Thunder Bay.

A sixth First Nation situated around Lake Nipigon is Kiashke Zaaging Anishinaabek (KZA).

Kiashke Zaaging Anishinaabek (Gull Bay First Nation)

The KZA community is located on the west side of Lake Nipigon on Highway 527. The main reserve (No. 55) and Jackfish Island Reserve (No. 57) cover a total area of approximately 3,940 ha. KZA has 1,138 citizens (INAC, 2010) with approximately 350 citizens living on the reserve at any one time. The balance of community members reside in the Thunder Bay region, on other reserves or Crown land. KZA is an original signatory to the Robinson-Superior Treaty of 1850.

Other Aboriginal and Métis Interests

Five provincial and federal government departments were contacted to assist in identifying First Nations to be consulted on the project (INAC – Specific and Comprehensive Claims Branches, INAC Litigation Branch, Ontario Ministry of Attorney General and Ontario Ministry of Aboriginal Affairs).

In addition to the First Nations around Lake Nipigon, there are a number of other Aboriginal and Métis interests that have been identified. OPG has been in contact with each of the following communities to either initiate dialogue, or to respond to interests in the LJF Project.

- Eabametoong (Fort Hope) First Nation;
- Marten Falls First Nation;
- Aboriginal community of Namaygoosisagagun (Collins);
- Aboriginal community of Whitewater Lake;
- Métis Nation of Ontario (Lakehead/Nipigon/Michipicoten Consultation Protocol);
- Red Sky Métis Independent Nation; and
- Jackfish Métis Association/Ontario Coalition of Aboriginal People.

OPG has held introductory and information sharing meetings with these potentially interested Aboriginal communities and Métis people, and will continue to take a lead role in supporting and/or carrying out engagement activities to ensure that adequate consultation occurs with respect to the LJF Project. Provincial and Crown agencies will be kept informed of OPG activities to engage First Nations, Métis and other Aboriginal people throughout the EA process.

3.0 PROJECT DESCRIPTION

3.1 Alternatives Analysis

In 1987, Ontario Hydro (OPG's predecessor company) proposed a hydroelectric development, which consisted of the following components:

- A single GS at kilometre 12.7 (kilometre designation is the approximate distance upstream from Ombabika Bay);
- An installed capacity of about 132 MW (2x66 MW units);
- A rated plant flow of about 283 m^3/s (equivalent to the original Ogoki Diversion design maximum flow);
- A gross head of about 58 m;
- An intermediate peaking mode to produce about 452 GWh/y; and
- Inundation of 3,620 ha with a reservoir size of about 4,000 ha.

In 2007, the 1987 project was used as the Base Case for a study of various alternatives that would lessen the amount of inundation required and still provide heads that were potentially affordable to develop (Hatch Energy, 2007). The gross head of the Base Case is about 84% of the total head available between Ogoki/Mojikit Reservoir and Ombabika Bay at Lake Nipigon. Development alternatives included:

- High-head single-stage developments; and
- Multiple developments to utilize all of the available head and ranging from a series of 12 run-of-river small hydro developments (i.e., based on the "List of Waterpower Sites in Ontario") to developments comprising of just 2 or 3 sites.

Two preferable development alternatives emerged from the 2007 screening exercise which consisted of cost estimates and economic analyses:

- A single-stage development with an installed capacity of 132 MW, a rated flow of 283 m^3/s and average annual energy production of 452 GWh. This alternative is a modification of OPG's Base Case with a modest reduction in reservoir inundation. The primary modification is the proposed use of a tunnel connecting Chappais Lake to the kilometre 12.7 powerhouse in lieu of a forebay and a power canal.
- A two-step development with a combined installed capacity of 64 MW, with a rated flow of 141 m^3/s at each GS and an average annual energy production of 405 GWh and estimated inundation of about 1,130 ha.

Additional work on refining the two-step development was conducted in 2008 and 2009. This work resulted in an optimization of the installed capacity for the two-step development. The refined two-step development scheme included an optimum installed capacity of approximately 100 MW.

In early 2011 OPG reviewed the economics of the project in light of more challenging technical conditions at the Upper Site. This review resulted in the removal of the Upper Site from the current Project scope.

3.2 Description of the Preferred Development (Revised)

OPG is now proposing to develop a 75 MW hydroelectric development at the Lower Site, in conjunction with the automation of the existing Summit Control Dam. The Lower Site is approximately 60 km east of Armstrong where the Jackfish Road crosses the LJF River. Summit Control Dam is approximately 28 km north of the proposed hydroelectric site. This alternative is capable of producing an estimated average annual energy of approximately 360 GW-h, to be further refined through computer modeling.

Construction of this scheme will take approximately 36 months, with a projected in-service date in the 2016.

Lower Site Details

The general arrangement for the Lower Site is shown below in Figure 3.1. The main dam would be at kilometre 15.6 from the mouth of the river, upstream of what is known as the Jackfish Road Bridge. The dam would be a 20-m tall, 600-m long earth embankment. It would impound water up to elevation 312.0 m, which is the current high water mark on Zigzag Lake. The dam would redirect flow into a 2-km long canal cut into the overburden and underlying bedrock above the west bank of the river.

A concrete intake, at the south-west end of the canal, would control flows into two 5.5-m diameter, 160-m long penstocks leading to a powerhouse. Flow would be released back into the river along a tailrace channel.

A by-pass structure would be incorporated into the western portion of the main dam. This structure would be used to pass flows down the river when the generators are not available and to pass excess water from the Ogoki Reservoir in accordance with the approved Water Management Plan. A concrete spillwall will also be installed.

Safety devices, such as booms, buoys, will be placed in the water upstream of the intake canal and downstream of the tailrace. Signage will be posted around the site.

Figure 3.1 Proposed Arrangement of Lower Site

The location of the main dam would be just upstream of the bridge shown in Photograph 3. The stretch of the river between the main dam and the powerhouse consists of a series of rapids and pools, some of which are shown in Photograph 4. The tailrace area is shown in Photograph 5.

Photograph 3 Upper Portion of the Lower Site (Looking Upstream or North)

Photograph 4 Middle Portion of the Lower Site (Looking Upstream or North)

Photograph 5 Tailrace Area (Looking Downstream or South)

The general arrangement will be subject to design optimization and, therefore, minor modifications to this arrangement are likely. OPG will notify federal and provincial agencies as early as possible to discuss the implications of any significant design changes on the EA process.

The technical details of the Lower Site are summarized in Tables 3.1 and 3.2.

Table 3.1 Proposed Lower Site Generating Facility – Hydraulic Characteristics

Gross Head	42 m
Average Flow	122 m^3/s
Rated Flow	215 m^3/s
Installed Capacity	75 MW
Average Annual Energy	360 GW-h
Inundation	483 Ha

Table 3.2 Proposed Lower Site Generating Facility – Components

Main Dam	
Type	Earthfill
Height	20 m
Crest length	600 m
Bypass Structure	
Type	Concrete orifice spillway
Number of Bypass Gates	2
Spillwall	Concrete
Intake Canal	
Type	Cut and fill in overburden and bedrock
Length	2000 m
Intake	
Number of Intakes	Dual
Type	Concrete
Gates/Intake	1
Penstock	
Number of Penstocks	2
Type	Steel
Diameter	5.5 m
Length of each penstock	160 m
Powerhouse	
Type	Surface
Turbine-Generator Units	2x37 MW
Tailrace	
Type	Cut in overburden/rock
Length	200 m

Automation of Summit Control Dam

Since completion of the Ogoki Diversion in the early 1940's, the Summit Control Dam has been used to control the release of water from Ogoki Reservoir into the Great Lakes watershed. This water is dedicated to the generation of electricity by OPG at DeCew Falls GS in St. Catharines, Ontario, in accordance with an addendum to the *Boundary Water Act*, which is administered by the International Joint Commission. Summit Control Dam is not meant to handle flood flows. Waboose Dam, at the northeast corner of the Ogoki Reservoir, is used for that purpose. Photographs of Summit Control Dam are presented in Photographs 6, 7 and 8. An aerial view of Waboose Dam is presented in Photograph 9.

Automation of the existing structure would consist of the installation of vertical lift gates, complete with hoists and hoist towers, in place of the existing stop logs in four of eight bays.

This automation will also require the construction of a road and a 44 kV transmission line from the Lower Site. The road would be expected to utilize the existing primary road system that traverses the landscape to about 10 km from Summit Dam. At that point new road construction would be required to connect to the site. It would be expected that the 44 kV transmission line would primarily twin this road with possible deviations. The possible routing of this transmission line is described in Section 3.2.7 and shown on Figure 3.4.

During the most recent dam safety inspections and analyses the structure has been assessed as adequate to accommodate the proposed automation. An update of this assessment is in progress. If the future findings agree with previous reports, it will be possible to automate the existing structure to suit the proposed development. If the existing structure cannot be automated because it has exceeded its useful service life, a new control structure will be required. Various alternative locations for a new control structure will be evaluated. Again, OPG will notify federal and provincial agencies as early as possible to discuss the EA process implications of any significant design changes to Summit Control Dam from that which has been described in this section.

Photograph 6 Summit Control Dam – Looking North

Photograph 7 Summit Control Dam – Upstream (North) Side

Photograph 8 Summit Control Dam – Downstream (South) Side

Photograph 9 Waboose Control Dam

The technical details of the existing Summit Control Dam are summarized in Tables 3.3 and 3.4.

Table 3.3 Summit Control Dam – Hydraulic Characteristics

Headwater Levels (HWL)	
Normal Maximum	327.05 m
Normal Minimum	324.00 m
Tailwater Level	
@ 220 m^3/s	325.27 m
Corresponding HWL	326.38 m
Additional Inundation	0 ha

Table 3.4 Summit Control Dam – Existing Components

Left Abutment (looking downstream)	
Type	Concrete Gravity
Crest Elevation	328.56 m
Maximum Height	6.1 m
Crest Length	39.9 m
Sluiceways	
Number	8
Width of Each Sluice	4.88 m
Sill Elevations	
Bays 1, 2, 7 & 8	323.00 m
Bays 3 through 6	321.78 m
Deck Elevation	328.85 m
Right Abutment	
Type	Concrete Gravity
Crest Elevation	328.56 m
Maximum Height	7.0 m
Crest Length	30.6 m
Core Wall (extension of Left Abutment)	
Type	Concrete
Crest Elevation	327.57 m
Maximum Height	3.7 m
Crest Length	38.6 m

Modifications to Existing Structures other than Summit Control Dam

OPG does not propose to alter any of the existing structures on the LJF River that are not currently owned by OPG. This includes the Wilderness North cabin on Zigzag Lake, a trapper cabin on Zigzag Lake, Jackfish Road Bridge and the CNR Railway Bridge/chute. In addition, OPG does not propose to alter Waboose Control Dam.

Additional physical works in and around the LJF River in the vicinity of the Lower Site may be proposed by OPG as the EA process unfolds, and the need for mitigation and compensation measures is better understood by all interested parties.

3.2.1 Operation of Lower Site Generating Station

It is expected that the operating regime for the proposed GS will require a change to the current WMP which does not reflect any generation on the LJF River. The final Operating Plan will be developed in consideration of the needs of the downstream aquatic environment in the LJF River, and input from other stakeholders involved with the WMP to ensure that there is no significant impact to Lake Nipigon levels. The EA process will be used to develop the operating regime using consultation activities that are consistent with MNR's water management planning process. This will ensure the necessary MNR and affected stakeholder input is received in an efficient manner and as early as possible in the planning process. OPG will include the proposed Operating Plan in the coordinated body of EA documentation for the LJF Project. Once the EA has been approved, it is expected that this Operating Plan will be incorporated into the Nipigon WMP as an administrative amendment once the new facilities are operational.

OPG proposes to operate the GS to allow for the time shifting of generation. This type of operation provides for flows in the river that minimize the amount of new flooding required and allows for some additional storage of water in Ogoki/Mojikit Reservoir during periods of natural high inflows. The releases of these flows may be time shifted from a low electricity demand period to a high demand period to better match variability in electrical load and supply in Northwestern Ontario. OPG will also be evaluating the seasonal time shifting of water through the EA process. Based on preliminary results of studies that have been conducted, it is expected that this may lead to opportunities for improvements to current fish movement upstream through the railway by-pass channel below the Lower Site.

Summit Control Dam would regulate water levels in the Ogoki/Mojikit Reservoir and control the release of flow down the LJF River. The by-pass structure at the Lower Site will be capable of passing flows in excess of the discharge capacity of the GS. This design will make it possible to by-pass flows when one or both of the units in the GS is off-line or when it is deemed necessary to increase the total discharge to satisfy any requirements for additional inflow into Lake Nipigon and to control levels on Ogoki/Mojikit Reservoir.

3.2.2 Water Levels

Based on Ontario Base Mapping (OBM) data, the water surface areas of Mojikit Lake and the Ogoki Reservoir are 83.6 km^2 and 138.8 km^2, respectively. It should be noted that there is a minor existing mean annual elevation difference between the Ogoki Reservoir and Mojikit Lake. This difference is a result of the headloss through the narrow channel that joins the two water bodies. As stated earlier, these two waterbodies are operated as a single waterbody. OPG does not propose any physical works in the narrow channel.

The water level of the Ogoki Reservoir is measured at three locations: Waboose Dam headwater, Mojikit Lake and Summit Control Dam headwater. The level of the reservoir is currently measured by the following devices:

- Under normal conditions (all flow through Summit Control Dam and leakage flow through Waboose Control Dam), the Ogoki Reservoir water level is best represented by the average of the Waboose head water gauge and the Mojikit Lake gauge.
- When significant flow is being released through both Waboose and Summit Control

Dams, the water level of the reservoir is best represented by the level measured at Mojikit Lake gauge.

- When Summit Control Dam is closed and significant flow is being released from Waboose Control Dam, the water level of the reservoir is best represented by the level measured by the Summit head water gauge and Mojikit Lake gauge.

The proposed LJF Project will be consistent with the WMP in that the normal maximum and minimum operating levels in the Ogoki/Mojikit Reservoir will be maintained under normal conditions. Water levels above the normal operating maximum of 327.10 m will be consistent with the past and may only occur during wet periods where inflows are high. Similarly water levels below the normal operating minimum of 324.7 m will be consistent with the current WMP and may only occur during dry periods when inflows are low.

The absolute maximum water level of 327.66 m will not be exceeded under normal circumstances. The range between 327.10 to 327.66 m has historically been the flood allowance range. As is consistent with past operations, this limit will continue to act as the flood allowance range and may be required during abnormally wet conditions.

Further detailed information regarding water levels will be proposed and presented through the EA process.

3.2.3 Flows

OPG does not propose to divert more water to the LJF River. It is expected that that the flow split between the two watersheds (James Bay and Lake Superior) will be similar to the historic conditions, however, the actual amount is variable from year to year depending on the amount and location of precipitation that occurs. Therefore, the proposed LJF Project will not result in an increase in additional water diversion from the Ogoki River to the LJF River.

The intent of the proposed mode of operation is to optimize the utilization of the available hydraulic resource on the LJF River for power production, while meeting environmental and regulatory obligations. Therefore, under normal operations, all water from the Ogoki Reservoir will continue to flow down the LJF River. This proposed mode of operation is consistent with the intent of the existing WMP, which requires that Summit Control Dam pass all flow to the LJF River under normal conditions.

3.2.4 Inundation and Total Cleared Areas

As indicated above, the proposed development significantly reduces the area of inundation associated with the 1987 Single-Step development. The 1987 proposal would have resulted in inundation of 3,620 ha, whereas the presently proposed project is projected to result in an estimated inundated area of 500 ha, or 5 km^2. The inundation is limited to the portion of the watershed between Summit Control Dam and the proposed Lower Site and is shown in dark blue in Figure 3.2 below.

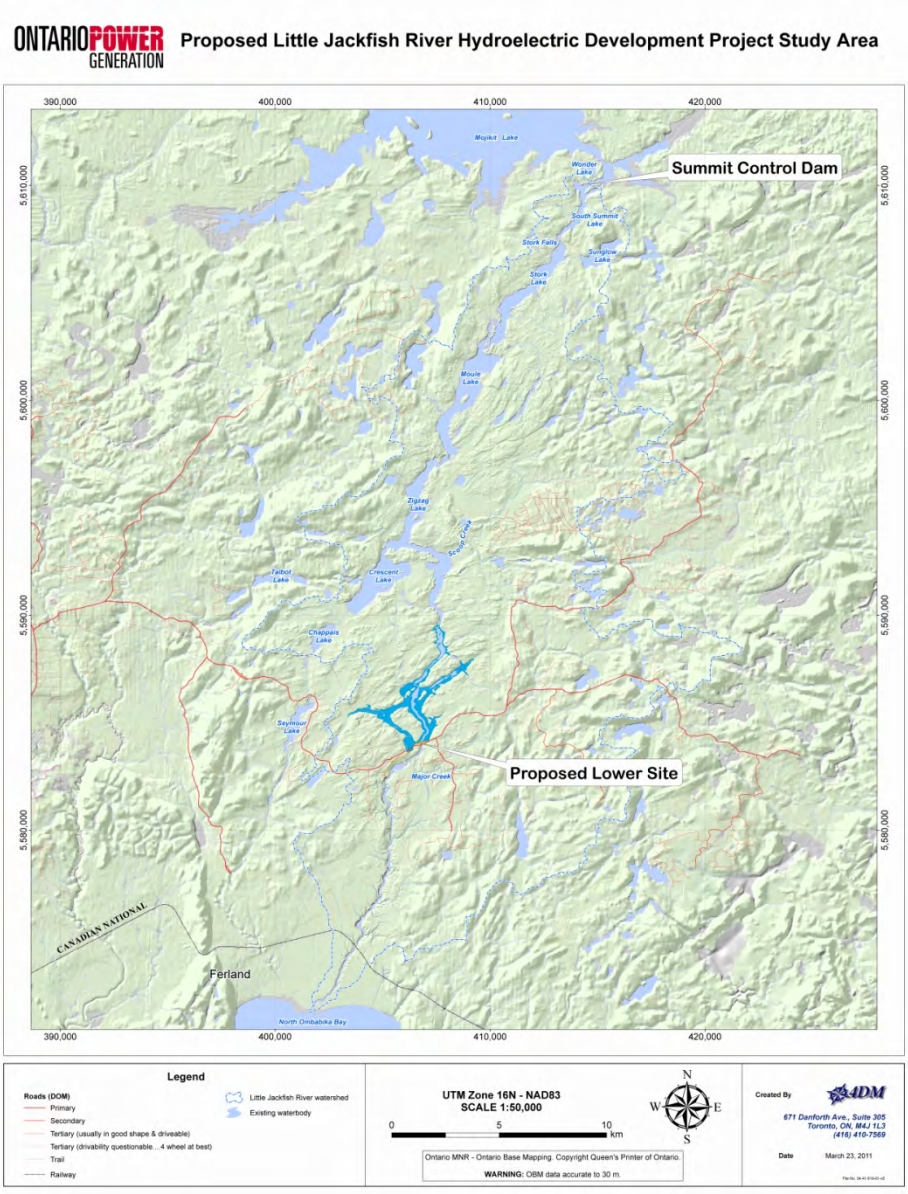

Figure 3.2 Inundation Associated with the Lower Site

The additional inundated areas associated with the Project are a combination of shoreline, wetland and lower forest covered areas.

Approximations of all of the areas to be cleared as a result of the entire Project are as follows:

- Lower Site:
  - Additional inundated area to elevation 312 m: 500 Ha
  - Additional clearing around inundated area: 50 Ha
- Lower Site structures: 200 Ha
- Roads and 44 kV transmission line from Lower Site to Summit Control Dam: 100 Ha
- Borrow areas: 50 Ha

- Transmission line from Kama Bay to LJF Project: 833 Ha

The final total area to be cleared will be refined as the Project progresses, and a Reservoir Clearing Plan will be included in the EA documentation.

3.2.5 Requirements for Off-Site Land Use and Other Ancillary Features

A number of ancillary facilities will be required for the LJF Project. These include roads, camps for construction workers, lay-down/construction areas and borrow areas for construction materials.

The Lower Site is currently accessed by the Jackfish Road, a primary road that is permanent and all-season. This road has been primarily used by logging and mineral exploration companies, and to a lesser extent, Crown land recreationalists (the EA will seek to understand how First Nations, Métis and other Aboriginal people also use this road). The road is considered of adequate quality for the LJF Project, although improvements for some of the water crossings may be required, depending on the size and weight of equipment that would be required for construction. Further details for these will be provided as early as possible during the construction process regarding potential impacts associated with road upgrades and repairs.

Summit Control Dam is currently not accessible by road; however, existing primary and secondary roads come within approximately 10 km of the site. OPG expects to access this site utilizing existing primary roads and recently decommissioned secondary and tertiary roads where feasible. Some permanent water crossings will be required. OPG will provide further updates during the EA process as route planning is refined through consultation and the access proposal is more accurately developed.

For the Lower Site GS, a large construction camp will be required to accommodate up to 400 workers. The location of this construction camp has not been finalized, but it is anticipated that this would be constructed in an area that has recently been disturbed through forestry activities and harvesting. Alternative locations include the area north of the proposed power canal at the Lower Site and along the east side of the LJF River. For the automation of Summit Control Dam, a satellite camp might be constructed within the immediate vicinity.

Construction staging or lay-down areas will be required at both sites. It would be expected that these areas would be close to the construction sites.

Borrow areas will be required primarily for the earth fill dam and dykes. OPG anticipates that aggregate needs would be largely met by utilizing rock excavated for the LJF Project. During the EA process, OPG will aim to provide as much information as possible as to the locations of borrow areas which might be used during construction. Confirmation of the specific borrow areas may be difficult for OPG to provide at the EA stage, if it is determined that the final selection and permitting for use these areas will be the responsibility of a construction contractor, which is discussed in the next section.

Any waste generated by the LJF Project will be disposed in accordance with federal and provincial requirements.

3.2.6 Construction Strategy and Schedule

The LJF Project Schedule (Table 3.4) estimates that the construction phase of the project will take place from mid-2013 to mid-2016 lasting for approximately 36 months. A detailed schedule for construction of project components and implementation of associated activities will be provided later in the EA process. The following schedule is for illustrative purposes only.

Table 3.5 LJF Project Milestones

Key Project Milestones	Forecasted Completion Date
First Nation Protocol Agreement Signed	Mar 2009
EA Notice of Commencement Issued	Apr 2009
First Nation Partnership Memorandum of Understanding Approved	Apr 2011
DB request for proposals (RFP) issued	Dec 2011
External Review of Draft EA Documentation	May 2012
EA Notice of Completion Posted	Jun 2012
Completion of Provincial – Federal EA Process	Oct 2012
First Nation Project Agreement Signed	Oct 2012
Design Build Contractor Selected	Oct 2012
OPG Approval to Proceed with Project Execution Phase	Nov 2012
Start of Construction	2013
In-Service	2016
Water Management Plan Amendment	2016

OPG currently envisions hiring a third party construction contractor that will be responsible for the detailed design and construction of the LJF Project. This contractor would be responsible for completing detailed design and obtaining all construction-related permits and approvals (e.g. Permits to Take Water for cofferdams and construction related activities, road and water crossing approvals, aggregate permits, etc).

OPG is committed to working with federal agencies during the EA process to address federal information requirements (and potentially obtaining *Fisheries Act and Navigable Waters Protection Act* authorizations) as early as possible such that the results can be incorporated into potential construction contracts. OPG is also committed to working with provincial agencies to address information requirements related to any provincial operating approvals or authorizations.

OPG anticipates providing sufficient time for the construction contractor to carry out subsequent assessments of potential environmental effects as part of the permitting process that must be completed prior to the start of construction.

At this point, OPG does not know the specific equipment that will be required for the LJF Project, however it is likely that it will include typical construction equipment associated with large-scale civil works.

OPG anticipates that explosives will be required during construction.

3.2.7 Transmission

The transmission facilities for the LJF Project will comprise of a 230-kV feeder transmission line, approximately 600 m long, between the Lower Site switchyard and a 230/44 kV Substation, the 230/44-kV Substation and a system interconnection 230-kV transmission line approximately 180 km long to a 230-kV Switching Station at Kama Bay.

The 230/44-kV Substation will be located west and uphill from the Lower Site powerhouse, adjacent to and on the east side of the access road from Armstrong. The substation will interconnect the 230-kV generation feeder line from the Lower Site powerhouse to the 230 kV system interconnection transmission line to Kama Bay and will also contain a 230/44-kV power transformer and 44-kV distribution line exit for the power supply to the Summit Control Dam.

Both sections of 230-kV transmission line will be constructed to the same design which will feature H-frame structures consisting of two wood poles with galvanized steel crossarms and cross-bracing, one aluminum conductor for each of the three phases and composite-type insulator strings. The structures will also carry two overhead steel wires for protection against lightning and to support fibre optic cables for project communications. Guy wires and anchors will be added to the H-frame structures for small angles in the transmission line route while larger angles will be accommodated on three guyed-pole structures.

The 230-kV interconnecting transmission line between the LJF Project and Kama Bay will exit from the 230/44-kV Substation in a south-southeast direction, around Ombabika Bay, well away from the Lake Nipigon Conservation Reserve, and generally paralleling any existing access roads. In the Beardmore area, the line route turns more southerly to terminate at Kama Bay adjacent to Hydro One's 230-kV transmission line right-of-way (ROW) at a point immediately

east of the intersection of the 230-kV and 115-kV transmission lines. For all wooded areas along the transmission line route, a ROW approximately 40 m wide, or 20 m on each side of the centerline, will be cleared and selective cutting of non-compatible ('danger') trees off the ROW will be undertaken.

The 230-V Switching Station at Kama By will interconnect the 230-kV transmission line from the LJF Project to Hydro One's double-circuit 230-kV east-west transmission lines.

A general study area has been identified in which to locate the proposed transmission line. The study area is depicted in Figure 3.4 below.

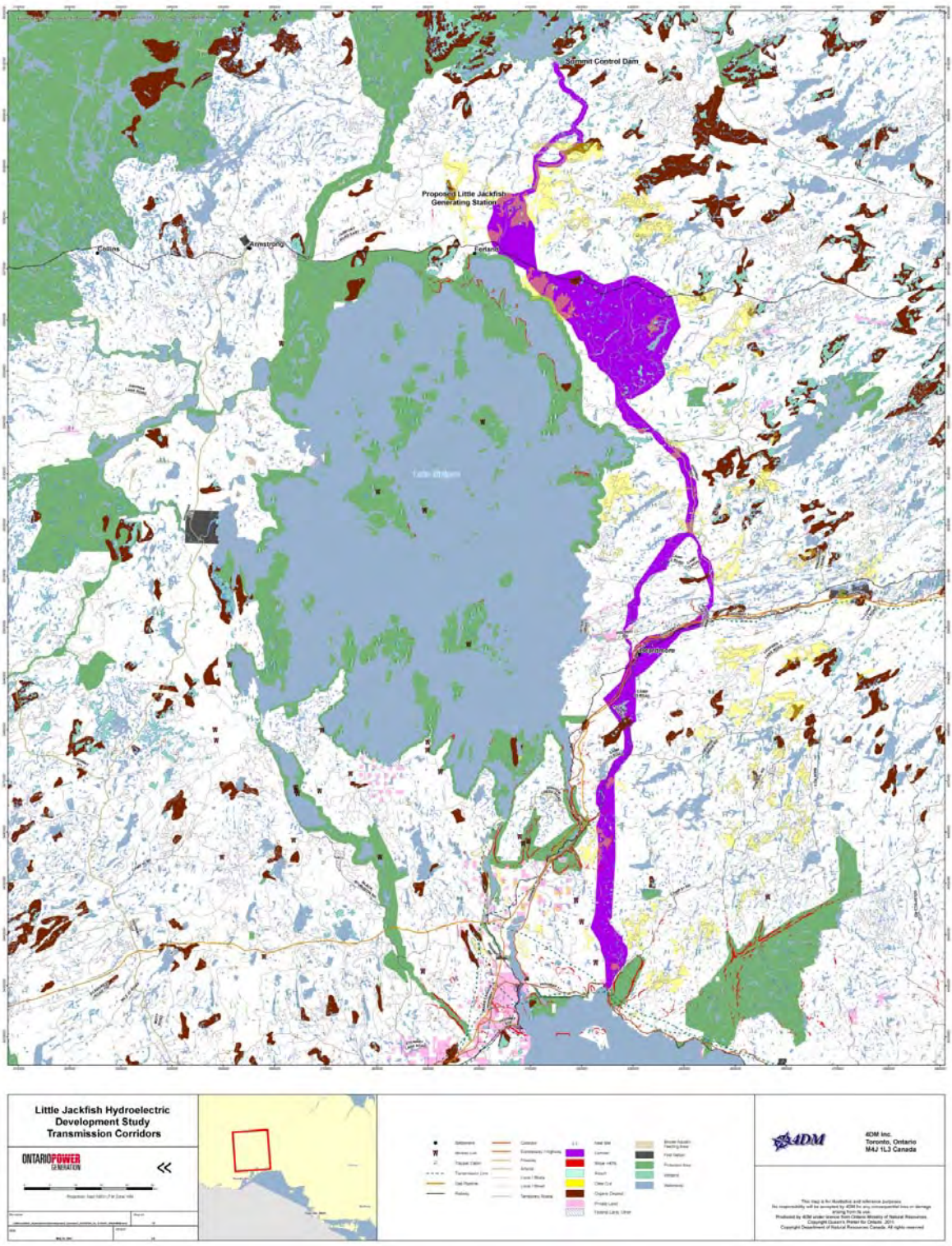

Figure 3.3 Little Jackfish Transmission Corridors Study Area

4.0 KEY ISSUES AND PROPOSED STUDIES

A number of issues have been identified for the LJF Project and the provincial-federal EA, which will need to be addressed. At present, the key issues and the corresponding work plans to investigate them are outlined below.

4.1 Aboriginal Community Benefits and Concerns

The LJF Project has the potential to result in a number of positive economic benefits (e.g., investment, revenue, employment, and other business opportunities) for the potentially affected Aboriginal communities in the Project area. At the same time, these Aboriginal communities will likely have a wide range of potential concerns including: negative impacts on the Lake Nipigon fishery; potential negative impact on the natural environment; loss of opportunities for traditional uses; impacts on cultural heritage values, etc. These concerns will be addressed in the various proposed work packages (aquatic, terrestrial, cultural heritage, etc.) for the LJF Project and through the Aboriginal community consultation process.

During the EA process, OPG will be seeking to engage First Nations, Aboriginal communities and Métis people in such a way that:

- creates conditions for meaningful participation;
- recognizes that each community and organisation may have unique histories, traditional knowledge, perspectives and interests;
- has consideration for addressing all feedback that is provided; and
- contributes to a single EA for the LJF Project.

4.2 Fish Habitat and Movement

Fish and fish habitat will be affected by the development of the Project. The Project's impact on fish spawning habitat, general habitat and movement will be studied and previous studies will be re-examined. In addition, OPG will consider whether construction activities and operations have the potential to create new opportunities for fish stranding. The consulting team initiated a large telemetry program in 2009, which has continued through 2011. Several discussions have already been held with the MNR and Department of Fisheries and Oceans (DFO) on the Project. The fish habitat and movement issue will be addressed as part of the Aquatic Work Package.

4.3 Erosion and Sedimentation

As indicated previously, erosion and the associated sediment transport to Ombabika Bay in Lake Nipigon is a legacy of the original Ogoki Diversion project. The rate of erosion has decreased significantly since the original diversion; however, there will be a need to determine whether the proposed project will increase, lessen or result in little change to the existing level of erosion. This issue will be addressed as part of the Erosion and Sedimentation Work Package undertaken by Hatch.

4.4 Mercury

The potential for the LJF Project to affect the current levels of mercury levels in fish is an important issue for the EA to address as elevated mercury levels create human health concerns. This issue is particularly sensitive to Aboriginal people, who typically consume fish on a regular basis. Concentration of mercury in fish is a function of many factors that include the available methyl mercury and time. The provincial-federal EA will consider a wide range of potential mitigation options that may be available. For instance, OPG will attempt to minimize methyl mercury production from the inundated areas using a variety of methods such as cutting and removing most of the vegetation from the flood zone (Carey, 1988; Hatch Energy, 2007). Other measures will be explored during the EA consultation process. In addition, the EA will also predict the geographic and temporal extent that potentially elevated mercury levels may occur and develop a post-construction monitoring and contingency plan. The mercury issue will be addressed as part of the Aquatic Work Package.

4.5 Species at Risk

Woodland caribou are identified as a "Threatened" species under the federal *Species at Risk Act* and Ontario's *Endangered Species Act*. As indicated Section 2.1.1, woodland caribou travel in the area from more northern environments to calving islands on Lake Nipigon. OPG is aware of Ontario's Woodland Caribou Conservation Plan (MNR, 2009*)*. Other species at risk (SAR) that may be found in the project area include: common nighthawk, wolverine, peregrine falcon, whip-poor-will, Canada warbler, olive-sided flycatcher, rusty blackbird, bald eagle, American white pelican and lake sturgeon. A late winter aerial survey for woodland caribou and bald eagle was also conducted. Surveys for SAR will also be conducted in the impacted areas, especially shorelines and wetlands. Target species will also include provincially and regionally rare vascular plants, birds, mammals, butterflies, and dragonflies. Issues relating to SAR will be addressed as part of the Terrestrial Work Package.

4.6 Cultural Heritage

Sites of cultural heritage in the upper portion of the system (e.g., Moule, Stork and Zigzag Lakes) the have already been impacted by the original Ogoki Diversion (Dalla Bona, 2011). The potential for the generation portion of the LJR Project to have an incremental impact on cultural heritage (beyond the impact of the Ogoki Diversion) will be studied and mitigation measures will be identified in accordance with the *Ontario Heritage Act*.

For the transmission lines a Stage 1 Archaeological Assessment will occur on the proposed transmission route. That assessment will identify areas of high archaeological potential that will require field reconnaissance. The high potential areas will be identified in the co-ordinated EA. However, a Stage 2 Archaeological Assessment will occur following the EA phase and prior to construction. The results of the Stage 2 Archaeological Assessment will be used to avoid areas of archaeological resource in the placement of poles and related ground disturbing activities (e.g., summer road building). The presence of the overhead transmission corridor in and of itself would not impact buried cultural resources.

4.7 Socio-Economic Impacts and Benefits

During the construction period (a few years), hydroelectric development projects have a substantial economic impact and require a large amount of labour. During operations (many decades) however, the direct labour and material purchase benefits during operations tend to be minor, although the value of electrical production to Ontario will be significant. The construction period impact will likely have the potential for substantial positive economic impact for communities in the region including Armstrong, Thunder Bay, Greenstone, Nipigon and Red Rock as well as for all six First Nations around the Lake Nipigon, and other Aboriginal and Métis people. Potential concerns will include: impacts on other resource uses such as tourism and trapping and economic impacts of a boom and bust effect on Armstrong. These issues will be addressed as part of the Land Use and Socio-Economic Work Package.

5.0 REGULATORY CONTEXT

5.1 Federal Approvals

The *CEAA* can be triggered with respect to a hydroelectric project, among other triggers, when a federal authority exercises a regulatory duty in relation to a project, such as issuing a permit or authorization.

Under *CEAA*, a Comprehensive Study for a hydroelectric project is triggered when the proposed project is planned to have a production capacity of 200 MW or more and/or result in an inundated area of 1,500 ha or more. Based on the LJF Project, as proposed by OPG, none of these criteria apply to the LJF Project. OPG therefore anticipates that if *CEAA* is applied it will be in the form of an Environmental Screening.

For the LJF Project, there are three other triggers under *CEAA* that may apply:

- If the project is considered to interfere with navigation, a permit under the *Navigable Waters Protection Act* (*NWPA*) may be required.
- If the project results in the harmful alteration, disruption or destruction (HADD) of fish habitat, an authorization under the *Fisheries Act* may be required.
- If federal funding is involved for a capital project.

The primary purpose of the *NWPA* is the protection of the public right of navigation. The *NWPA* prohibits any works in, upon, over, under, through or across a navigable waterway. "Work" has been defined to include the dumping of fill or excavation of materials from the bed of navigable waters. Therefore, clearance under the *NWPA* is required from Transport Canada for projects requiring new permanent in-water structures. For new construction, one of two types of processes would apply: an "approval process" under subsection 5(1) of the *NWPA* or a "determination process" under subsection 5(2).

The approval process is followed when the Navigable Waters Protection (NWP) Officer determines that the proposed works have the potential to interfere with navigation which would then trigger the *CEAA*. The determination process is followed when the NWP Officer determines that the works do not interfere with navigation. In this case, a letter is issued indicating that a subsection 5(2) determination has been made and the *CEAA* is not triggered.

The federal *Fisheries Act* gives the Minister of Fisheries and Oceans the legislative authority to protect fish and fish habitat from destructive activities. Any works that occur in or near water may require authorization under the *Fisheries Act*. Under section 35(1) of the Act, no person shall carry out any work or undertaking that results in a HADD of fish habitat, unless authorized by the Minister of Fisheries and Oceans under section 35(2). Where adverse effects to fish habitat cannot be avoided through project relocation, redesign or mitigation, a section 35(2) *Fisheries Act* authorization may be issued. An authorization under section 35(2) protects an individual from prosecution under the Act, provided the conditions of the authorization are met. Authorizations are not issued until the *CEAA* EA analysis and decision are complete. It should be noted that the DFO can refuse authorization where impacts to fish habitat are unacceptable. Under the Policy for the Management of Fish Habitat, DFO (1986) typically does not authorize HADDs unless an acceptable compensation plan is developed and implemented by the Proponent. Generally, the *Fisheries Act* authorization will set out the conditions for mitigation and compensation to be implemented.

To assess the impact of the project on fisheries, it is expected that the DFO will ask OPG to utilize the *Practitioners Guide to the Risk Management Framework for DFO Habitat Management Staff* (DFO, no date). Using the Guide, the team will categorize the risk according to the DFO Framework. A site specific review and either a Letter of Advice or more likely an authorization (under subsections 32 and 35(2) of the *Fisheries Act*) is then issued by DFO. The Guide specifically states that: "Within these authorizations, conditions concerning mitigation measures, compensation, monitoring and financial securities should be commensurate with the level of impact associated with the project."

In addition to section 35, the *Fisheries Act* sets out general habitat and pollution protection provisions in sections 20, 22, 30, and 36 which are binding on all levels of government and the public in areas such as:

- provision of sufficient water flows;
- passage of fish around migration barriers;
- screening of intake;
- restrictions on fishing near a barrier; and
- deposit of a deleterious substance into waters frequented by fish unless authorized by regulation.

If in-water blasting is required to facilitate the construction of in-water works, authorization under section 32 of the *Fisheries Act* to kill fish by means other than fishing is required from the DFO. To satisfy all of the relevant *Fisheries Act* requirements, OPG will carry out comprehensive studies of the fisheries and other aquatic life will be undertaken, as well as examining studies or research from projects of a similar nature elsewhere in Canada.

The third potential trigger is if federal funding were involved in a capital project. Federal agencies should be aware that the LNFNs may pursue federal funding or support for any number of activities that may be directly or indirectly related to the LJF Project and other resource development activities in the region (employment and training funding, capacity building funding, regional community health assessments). OPG will work with the LNFNs to ensure that there is communication to federal agencies regarding potential funding sources that may trigger CEAA.

5.2 Provincial Approvals

Provincial EA

The Provincial EA for the LJF Project will be carried out according to the approved Ontario Waterpower Association (OWA, 2011) Class EA for Waterpower Projects as a "New Project on a Managed Waterway". Provided the requirements of the Class EA planning process are met, and a Part II Order request is not made (or denied), a project is considered approved under the provincial *Environmental Assessment Act*. The Class EA planning process is comprehensive as the definition of the environment to be assessed is quite broad, and therefore will be used as the basis for coordinating consultation activities required under *CEAA* and water management planning.

Permits and Approvals

Definition Phase:

The following permits and approvals may be acquired during the Definition Phase of the LJF Project in order to enable field studies to support the EA process, detailed engineering design and activities associated with pre-construction site preparation.

- Ontario Ministry of Natural Resources
    - Work Permits for geotechnical investigations and for access roads and trails on Crown land (MNR Class EA for Resource Stewardship and Facility Development Projects);
    - Scientific Fish Collection Permit under the *Fish and Wildlife Conservation Act*;
    - Class EA for MNR Resource Stewardship and Facility Development Projects for the 44 kV transmission line requiring a disposition of rights to Crown Resources.
- Ontario Energy Board
    - Section 92 Leave to Construct for the new 230 kV transmission line.
- Ministry of Tourism and Culture
    - Letters of Clearance for archaeological and cultural heritage resources under the *Ontario Heritage Act.*

Execution Phase:

Once the Definition Phase is complete, a decision is made about whether to proceed to Execution Phase. The following permits and approvals may be acquired during Execution Phase:

- Ontario Ministry of Natural Resources
    - Authorization under the *Lakes and Rivers Improvement Act (LRIA)* for location approval of new facilities, and plans and specification approval for temporary cofferdams, dam/powerhouse works, approvals for location and design of water crossings, etc.;
    - Approval of *amendment to the Nipigon River Watershed WMP under the LRIA;*
    - Licence of Occupation and amendment to the waterpower lease agreement under the *Public Lands Act;*
    - Land Use and Work Permits under the *Public Lands Act* for site alteration and temporary occupation (construction camps) on Crown lands and infrastructure on or over Crown lands as well as water designated as Crown lands;
    - Forest Resource Licence, Forest Management Plan amendments and Authority to Haul Crown Wood and Timber Scaling Agreement (licence and clearance to harvest and remove Crown wood) under the *Crown Forest Sustainability Act* (*CFSA*);
    - Amendment of the Sustainable Forest Licence under the *CFSA;*
    - Work permit controls, at all times of the year, for clearing within 300 m of a forest under the *Forest Fires Prevention Act;*
    - Permit for SAR plant removal, or disturbance or destruction of SAR habitat under the *Endangered Species Act;*
    - Aggregate Permit under the *Aggregate Resources Act* for new aggregate sites and inactive, existing sites not under permit;

    - Memorandum of Understanding outlining ownership and maintenance of certain roads and all water crossings.
- Ontario Ministry of Environment
    - Certificate-of-Approval (C of A) (air/noise) for backup diesel generators and concrete batch plants and C of A (waste) – Waste Generator Registration under the *Environmental Protection Act;*
    - C of A (Sewage) for treatment of construction camp sanitary wastes under the *Ontario Water Resources Act* (*OWRA*);
    - Permits to Take Water for construction and dewatering if greater than 50,000 litres per day under the *OWRA.*
- Ontario Ministry of Transportation
    - Permit under the *Dangerous Goods Transportation Act.*
- Department of Fisheries and Oceans
    - *Fisheries Act* authorization for HADD of fish habitat with conditions for mitigation and compensation, which would trigger the federal *CEAA* process (if it is determined that there will be no HADD of fish habitat, permits for temporary watercourse crossings must still be obtained from the MNR with a Letter of Advice from DFO).
- Transport Canada
    - *NWPA* Letters of Exemption from Navigable Waters Protection Program Office for any works built or placed in, on, over, under, through or across navigable water (including transmission line crossing of a riverine waterway that is 15 m or wider at the crossing location) prior to construction of the works (the requirement for a formal approval due to the determination that a project poses a substantial interference with navigation would trigger the federal *CEAA* process).
- Natural Resources Canada
    - Explosives Transportation Permit under the *Explosives Act.*

Operations:

OPG will work directly with provincial and federal agencies to obtain operating permits and approvals, as required. The following is an example of a permit that may be required for the operation of the generating station:

- Ontario Ministry of the Environment
    - C of A (Sewage) for oil containment systems for stormwater management inside and outside the powerhouse under the *Ontario Water Resources Act* (*OWRA*);
    - Permit to Take Water under the *OWRA* for the operation of the GS.

Water Management Planning

In 2010, MNR announced that proponents would not be required to undertake a separate sequential water management process for greenfield facilities. The EA will, however, include a section on the proposed operating regime.

MNR has agreed to work with OPG to pursue an early renewal of the WMP to develop and include a process for incorporating the operating requirements for the proposed LJF Project. An official administrative amendment of a renewed WMP would be sought post-construction to incorporate the new requirements.

Municipal Permits

As the area is located in unorganized territory, no municipal approvals are required. There are no provincial Ministers Zoning orders in this part of the Province and compliance with the Ontario Build Code is required.

OPG was invited by the MNR (chair) to attend the Armstrong Local Citizens Committee (LCC). OPG attends the LCC to consult with Armstrong citizens regarding the LJF Project and participates by giving presentations, project updates and answering questions.

6.0 SUMMARY

As indicated, there are a number of potential *CEAA* triggers necessitating a Environmental Screening.

At this point, it appears that federal funding would not be involved in the capital cost of the project and, therefore, no trigger would be invoked. OPG does expect that an authorization is required under the *Fisheries Act* and, therefore, results in a trigger under *CEAA*. With respect to the *NWPA*, OPG will be asking Transport Canada for an early determination as to whether the presence of the new structures will result in a trigger under *CEAA*.

In the event that CEAA is triggered by any of the above, OPG will be pursuing a coordinated EA process to address both provincial and federal EA requirements in a single coordinated process. It is hoped that a single body of EA documentation can be prepared to satisfy both processes. Consultation (Aboriginal, public and agency) for all three processes will be combined and coordinated as much as possible for efficiency and to reduce the likelihood of confusion surrounding the proposed LJF Project.

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APPENDIX A

Photographs

Photograph A-1 Channel Improvements S End of Zigzag

Photograph A-2 Channel Improvements S End of Zigzag

Photograph A-3 Jackfish Road Bridge Aerial

Photograph A-4 Jackfish Road Bridge Close

Photograph A-5 Railway Bridge

Photograph A-6 Summit Control Dam Aerial

Photograph A-7 Summit Control Dam from Water

Photograph A-8 Waboose Control Structure

Photograph A-9 Zigzag Lake Cabin

Photograph A-10 Zigzag Lake Trappers Cabin

Photograph A-11 Railway Chute

APPENDIX B

Current Nipigon River System Water Management Plan Chapter 10 Operational Plan

CHAPTER 10: OPERATIONAL PLAN

This operational plan contains 2 components: an operational plan for Lake Nipigon and the Nipigon River, and a separate operational plan for the Ogoki Reservoir.

10.1 LAKE NIPIGON AND NIPIGON RIVER OPERATIONAL PLAN

This operational plan identifies compliance requirements for levels on Lake Nipigon and flows on the Nipigon River, and contact information when outside of plan requirements.

The Nipigon River WMP identified adjustments to the current operating regime. This operational plan identifies compliance requirements for operation under normal conditions. These requirements are enforceable and the potential for penalties applies if flows and levels are outside of the identified compliance requirements. Absolute maximum or minimum water level limits may be identified in legal agreements including Water Power Leases, Licenses of Occupation, or other instruments.

10.1.1 Level and Flow Requirements

Flow requirements are provided on an annual and seasonal basis, and are based primarily on weekly flow tables. The weekly flow tables provide weekly Nipigon River flow targets depending on Lake Nipigon inflow and elevation. Flow requirements may differ from the weekly flow table values under some circumstances. These are identified within the operational plan, and include:

- To minimize short term flow variation
- To account for instances where inflows are outside of the range indicated on the weekly flow tables.
- When identified through work scheduling meetings (as specified in Table 36).
- When logs are pulled from Waboose Dam. At that time, discussions are to take place between OPG, OMNR and other stakeholders as necessary.

Flow requirements include weekly flow target and associated ranges, hourly flow requirements, as well as peaking considerations. These requirements will vary with the season, and whether flows are above or below critical seasonal flow values. Flow requirements are presented for Alexander GS, as it is the most downstream facility on the river, and upstream facilities must be operated to provide for appropriate flow conditions at Alexander GS.

Water levels measured at different locations on Lake Nipigon may not be the same due to wind effects. Water level requirements are presented based on the average level from gauges on 2 locations on the lake. Water levels on the lake are the result of specified flows on the Nipigon River and inflows to the lake and there are no specified compliance requirements for lake elevations identified in the operational plan. There is one level

requirement identified for the Nipigon River, and that is the water level at Cameron Falls GS forebay, as it affects the water level on Jessie Lake.

10.1.1.1 Use of Weekly Flow Tables

The Lake Nipigon water level elevation and the inflows to Lake Nipigon are used to determine the Nipigon River flows, from a flow table, for any given week of the year. A weekly flow table which consists of 52 weeks is attached as Schedule A. Week 1 will start on the first Monday of January.

From the weekly flow table in Schedule A, a table target flow for the upcoming week, will be determined on the Wednesday immediately prior to the Monday. The most current Lake Nipigon elevation, available on Wednesday, will be used. Lake Nipigon's inflow 7-day running average immediately prior to Wednesday will provide the inflow value. An example on how to use the table is provided in Schedule A.

End-of-week target flows will always be the table target flow for that week, or the previous week table target flow. In most cases when the table calls for an end-of-week target flow change, the table target flow will become the end-of-week target flow. In some instances, however, to minimize short term flow variations, the previous week table target flow may become the end-of-week target flow and the end-of-week target flow will not change. A joint decision between MNR and OPG to use the previous week table target flow will be based on inflow trends and lake levels trends. For example if the table target flow calls for a decrease in river flows, but the Whiteclay inflows are increasing, the Nipigon River flows may be kept at the previous week table target flow. Whenever the previous table target flow is chosen as an end-of-week target flow, rationale will be provided and filed with the plan.

The weekly average flow is determined from the net gross kW hours produced and the net head at Alexander GS, between Monday 00:00 to Sunday 24:00 plus spill volume.

10.1.1.2 Year Round Requirements

Only one peaking cycle allowed per day at Alexander GS. The first stage in flow reduction is 100 cms. Further flow reductions in stages of no more than 50 cms every two hours until the desired flow is reached. There are no flow increase restrictions.

10.1.1.3 Summer Operations

Summer operations are considered to start the first Monday in June and up to but not including the first Monday in October

When the weekly flow table calls for an end-of-week target flow greater than 170 cms, peaking is allowed.

When the weekly flow table calls for an end-of-week target flow at or below 170 cms there will be no peaking and the one hour average flows will be within plus or minus 10 cms of the end-of-week target flow.

Intent:
End-of-week target flows at or below 170 cms occurs during low water conditions. No peaking reflects the need to conserve water and to keep one hour average flows within plus or minus 10 cms the end-of-week target flows.

The weekly average flow, calculated at the end of the week, will be within plus or minus 10 cms of the end-of-week target flow.

Table 33. Summer operation flow requirements.

End of week target flow (cms)	Peaking	End of week flow range (cms)	Hourly Average Flows (cms)
>170	yes	Maximum, 10 above target flow Minimum, 10 below target flow	Maximum, 600 cms at Alexander GS* Minimum, 160 (10 below 170)
<= 170	no	Maximum, 10 above target flow Minimum, 10 below target flow	Maximum, 10 above target flow Minimum, 10 below target flow

* Throughout the planning process, 566 cms at Pine Portage and 623 cms @ Nipigon rail bridge were identified as considerations.

10.1.1.4 Fall Operations

Fall operations are considered to start the first Monday in October and up to, but not including the first Monday in December.

The end-of-week target range will be the end-of-week target flow plus 20 cms. At no time during the week will the one hour average flows be outside the end-of-week target range by plus or minus 5 cms.

Intent:
This allows for successful spawning to occur yet allows OPG some peaking capabilities.

The 20 cms range above will provide enough water to allow fish into areas to spawn, and if dropped to the lower level of the range will keep eggs wet. This will have little impact on the lake levels.

When the end-of-week target flow is at or below 270 cms there will be no peaking and the one hour average flows will be within plus or minus 10 cms of the end-of-week target flow. (i.e. If the end-of-week target flow is scheduled to be 270 cms then at no time during the week shall flows be greater than 280 or less than 260 cms that is the one hour average flows will be 270 plus or minus 10 cms).

Intent:
End-of-week target flows at or below 270 cms occur during low water conditions. No peaking at low flows provides some protection for the Nipigon River fish.

Table 34. Fall operation flow requirements.

End of week target flow (cms)	Peaking	End of week flow range (cms)	Hourly Average Flows (cms)
>270	yes	Maximum, 20 above target flow Minimum, 0 below target flow	Maximum, 25 above target flow Minimum, 5 below target flow
<= 270	no	Maximum, 10 above target flow Minimum, 10 below target flow	Maximum, 10 above target flow Minimum, 10 below target flow

10.1.1.5 Winter Operations

Winter operations are considered to start the first Monday in December up to but not including the first Monday in June.

When the table calls for an end-of-week target flow greater than 270 cms, then peaking is allowed.

The weekly average flow, calculated at the end of the week, must be within plus 15 cms or minus 10 cms of the end-of-week target flow.

Intent:
OPG requires an upper compliance limit of 15 cms above the end-of-week target flow when the minimum flow is 30 cms below the end-of-week target flow.

The minimum flow, for the winter operational period, will be 30 cms less than the end-of-week target flow.

Intent:
In years when there is sufficient water there is an opportunity to keep flows high enough to cover spawning areas that are not covered with a minimum flow of 270 cms.

The minimum flow (i.e. end-of-week target flow minus 30 cms) will decrease when the end-of-week target flow decreases.

The minimum flow will not increase if end-of-week target flow increases. (e.g. If an end-of-week target flow was 350 cms in December and then in January an end-of-week target flow was 400 cms the minimum flow would remain at 320 cms.)

When the table calls for an end-of-week target flow at or below 270 cms there will be no peaking and the one hour average flows will be within plus or minus 10 cms of the end-of-week target flow. (i.e. If the end-of-week target flow is scheduled to be 270 cms then at no time during the week shall flows be greater than 280 cms or less than 260 cms. (i.e. one hour average flows will be 270 cms plus or minus 10 cms))

If spawning occurred at flows below 270 cms, and the end-of-week target flows in the winter operations period are greater than 270 cms, then discussions will occur between OPG and the OMNR. If it is agreed that a lower minimum flow is sufficient for any particular year, then an amendment will be required. Discussions will be based on the following: benefits to hydro-electric production; peaking capabilities; levels at which spawning occurred on the lake and river; increasing or decreasing lake levels; lake inflows; and benefits or impacts to lake and river fish and aquatic environment.

> *Intent: There is limited benefit to fall spawning fish to increase water flows after spawning has occurred. During low water levels there may be benefit to the lake and lake fish to keep the lake from being drawn down.*

Table 35. Winter operation flow requirements.

End of week target flow (cms)	Peaking	End of week flow range (cms)	Hourly Average Flows (cms)
>270	yes	Maximum, 15 above target flow Minimum, 10 below target flow	Maximum, Maximum 600 cms at Alexander GS Minimum, 30 below target flow*
<= 270	no	Maximum, 10 above target flow Minimum, 10 below target flow	Maximum, 10 above target flow Minimum, 10 below target flow

**The minimum flow will not increase if end-of-week target flow increases through the winter.*

10.1.1.6 Cameron Falls GS Forebay Level

The minimum winter water level on Jessie Lake will be 226.95 m ASL.

10.1.2 Work Schedule Meeting (WSM)

A Work Schedule Meeting (WSM) will be held at least once per year in April and will include at minimum OPG and OMNR representatives. A DFO representative will be invited to attend. Other meetings will be held as requested by OPG or OMNR throughout the year.

The WSM will provide an opportunity to discuss operations on the Nipigon System and to schedule planned work that require flows different from the projected weekly flow table values on the Nipigon River. Work will normally be targeted for the Summer Operational Period and may require flows as low as 50 cms.

Table 36 provides the extreme conditions (minimum flows, maximum duration, frequency and time period) under which construction projects, maintenance and lampricide treatments can be allowed to occur without the need for an amendment to the plan.

Requested flows outside of conditions (minimum flows, maximum duration, frequency and time period) described in Table 36 will require an amendment.

Table 36. The minimum one hour average, maximum duration, frequency and time period when work can be scheduled without the need for an amendment.

Type of work	Minimum one hour average flow	Maximum Duration	Frequency	Time Period
Lampricide treatment/Maintenance /Upgrades	50 cms	1 week	Once per year	July 1 to August 31
Maintenance/Upgrades	113 cms	3 weeks	Once per year	July 1 to September 1
Maintenance/Upgrades	170 cms	1 month	Once per year	First Monday in June to September 1
Maintenance/Upgrades	270 cms	3 months	Once per year	First Monday in October to First Monday in June

Intent: The above flows are considered to be extremes and duration of flow reduction will be minimized. Flows will be kept as close as possible to table flows while allowing the required work to be conducted.

Any organization contemplating work which requires specific flows such as: Department of Fisheries and Oceans, Trans Canada Pipelines, Canadian National Railway, Canadian Pacific Railway, Township of Nipigon, Red Rock First Nation (Lake Helen), Bell Canada, Ministry of Environment, NWAC, Ministry of Transportation and Parks Canada must submit a requests to OPG and OMNR by April 1.

Requests will include details about work including at least:

- Project title/identification
- Project description/rationale
- Lead agency and contact information
- Required flows
- Start date, finish date and any flexibility

- Contingency date flow requirements and who should be notified
- Statement of possible issues (e.g. reliant on delivery of equipment, weather) or limitations (e.g. high water conditions where for safety concerns water must flow).

WSM content:

The type of projects or work that is anticipated to be discussed at work schedule meetings includes maintenance and upgrade work by OPG, Hydro One, DFO, OMNR, Trans Canada Pipelines, Bell Canada, the rail lines, other outside agencies and DFO lampricide treatments on the Nipigon River.

The WSM will be used to discuss the specifics of each work event such as the minimum flows required, specific timing and duration of each work event and where possible to co-ordinate projects.

- All requests for specific flows will be reviewed and evaluated.
- Requested flows which must occur for safety or maintenance of a dam will be identified as such and scheduled by OPG with direction from OMNR.
- Requested flows with critical timing requirements will be reviewed and scheduled first.
- Requested flows with general timing requirements will be reviewed and if possible incorporated into time periods with other scheduled proposals.
- Requested flows that are approved must be jointly agreed to by OPG and OMNR.
- Requested flows that are approved will be referred to as Planned Flows.
- Planned Flows will be filed with the plan including but not limited to project title/identification , project description, lead agency, contact information, required flows, start date, finish date (including contingency dates if possible), and limitations on approval .
- Requested flows that are not approved will be filed with the plan including rationale as to why they were not approved.

Reporting to the Public

When Planned Flows are scheduled, notification will be made on the OPG public website at least 2 weeks prior. First Nations and the NWAC will be directly notified by OPG and will have an opportunity to comment.

10.1.3 Implementation of Planned Flows

Any modifications to an approved Planned Flows filed with the plan, will require notification and agreement between OMNR, OPG, and DFO. This agreement will be filed with the approved Planned Flows in the plan.

If a Planned Flow is no longer required, flows will be changed to the end-of-week target flows. A written notice will be filed with the related Planned Flow in the plan and posted

on the web. First Nations and the NWAC will be informed by OPG and will have an opportunity to comment.

10.1.4 Monitoring Planned Flows

All Planned Flows must be monitored. Date and flows observed must be recorded. Project completion must be recorded and filed with plan on completion of project. If a Planned Flow is completed early, flows will be the end-of-week target flow value, but maintained on a daily target flow until the start of the weekly averaging on Monday at 00:00.

10.1.5 Contacts when Outside of Operational Plan

Should flows or levels occur outside of the operational plan requirements, the following contact should occur,

- **OPG Operations Manager** shall contact **OMNR Nipigon District Manager**