PROPOSED NEW POST CREEK HYDROELECTRIC PROJECT ENVIRONMENTAL REPORT

Submitted To:

**Coral Rapids Power Inc.
and Ontario Power Generation Inc.**

Prepared By:

SENES Consultants

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ENVIRONMENTAL REPORT
PROPOSED NEW POST CREEK HYDROELECTRIC PROJECT

Submitted to:

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EXECUTIVE SUMMARY

Ontario Power Generation Inc. (OPG) and its partner Coral Rapids Power Inc. (CRP), a wholly owned corporation of the Taykwa Tagamou Nation (TTN), are proposing the development of the New Post Creek Hydroelectric Project (New Post Creek Project or Project). The proposed Project is located in the District of Cochrane within the Geographic Township of Pinard, approximately 75 km north of the Town of Smooth Rock Falls and 15 km north of the former small community of Fraserdale.

The proposed New Post Creek Project was identified by the Ontario Ministry of Energy (2010) as being under consideration as a clean, renewable, cost-effective hydroelectric generation project in “Ontario’s Long-Term Energy Plan”.

In 1963, Ontario Hydro constructed the New Post Creek Diversion Dam on the Little Abitibi River in order to supply additional generating capacity at its Otter Rapids Generating Station (GS). The Otter Rapids GS is now owned and operated by OPG under the authority of a Water Power Lease. The dam allows flows to be diverted along the constructed New Post Creek Diversion Channel and New Post Creek to the Abitibi River upstream of Otter Rapids GS. The New Post Creek Project would take advantage of a portion of this diverted flow descending approximately 66 m between New Post Creek and the Abitibi River, all within TTN Traditional Territory to generate approximately 25 MW of electricity.

The proposed New Post Creek Project is subject to the “Class Environmental Assessment for Waterpower Projects” (OWA, 2012a) under the Ontario *Environmental Assessment Act*. This Environmental Report (ER) was prepared as part of this Class Environmental Assessment process. The ER provides a description of the proposed Project, summarizes the overall baseline environmental setting and anticipated environmental effects, recommends appropriate mitigation measures to minimize or obviate these effects, and describes agency, public, and First Nation and Métis consultation. A number of Technical Support Documents have also been prepared that address the aquatic environment, terrestrial environment, socio-economics and land use, cultural resources, public and agency consultation, and First Nation and Métis interests and consultation.

Aquatic Environment

During proposed Project construction, potential effects on the aquatic environment may occur due to soil erosion causing turbidity and sedimentation in surface waters, waste generation, incidental spills, hazardous materials usage, blasting, in-water construction activities and fish habitat enhancement/creation. Based on assessment of the available baseline information and potential effects, as well as the implementation of the recommended mitigation measures, it is concluded that effects during construction will be minimal, localized and short-term with no adverse residual effects. Fish habitat enhancement/creation will be greater than fish habitat loss, resulting in habitat gain.

During operations, potential effects on the aquatic environment may occur due to incidental spills, reservoir creation, water level and flow fluctuations due to pulsing, fish habitat loss/gain, fish entrainment, increased fish mercury body burden and water use experience diminution. Based on assessment of the baseline information and potential effects, it is concluded that the operation of the proposed Project will have negligible effects on the aquatic environment, with no adverse residual effect.

The proposed New Post Creek Project will not have a negative effect upon the fish communities of New Post Creek or the Abitibi River, although local shifts in community structure are expected due to physical habitat and water temperature changes. Upstream of the proposed intake weir, the headpond will create an additional 131.9 ha of aquatic habitat, and alter an existing 37.5 ha of riverine habitat to be slower flowing and deeper (with a total inundation area of approximately 170 ha). This will provide a greater area and diversity of habitats that could potentially result in a more productive and diverse fish community. Downstream of the proposed intake weir a set of seasonally appropriate minimum flows will ensure that the habitat components and functions in New Post Creek are maintained, including the Walleye spawning habitat below the waterfalls. The downstream area altered is approximately 32.8 ha. Reductions in downstream habitat area under minimum flows cannot be quantified with the available information, but are considered to be minor. The tailrace discharging to the Abitibi River will not result in the loss of habitat, but will increase habitat diversity in the vicinity of the tailrace.

With respect to fish mercury body burden, it is anticipated that mercury concentrations in Walleye in New Post Creek below the waterfalls will be comparable to the pre-development mercury concentrations in Walleye. This will be confirmed by post-inundation fish mercury body burden monitoring programs.

Terrestrial Environment

During proposed Project construction, potential effects on the terrestrial environment may occur due to combustion emissions/fugitive dust, noise, blasting, soil erosion, incidental spills, waste generation, vegetation clearing and wildlife disruption. Based on assessment of the available baseline information and potential effects, as well as the implementation of recommended mitigation measures, it is concluded that effects during construction will be minimal, localized and short-term.

During proposed Project operation, potential effects on the terrestrial environment may occur due to noise, incidental spills, decreased flows downstream of the proposed intake weir location, upstream inundation and water level fluctuations. Flow reduction and inundation will result in the diminution of some significant habitat (considered to be underrepresented in Ecoregion 3E-1), i.e., Active Cliff and Hardwood Swamp, but also an increase in area of Intolerant Hardwood Marsh. Based on assessment of the baseline information and potential effects, it is concluded that the operation of the proposed Project will have minimal effects on the terrestrial environment.

Socio-economics and Land Use

The proposed Project is expected to result in the creation of 150 to 200 person years of work over an approximately two year construction period. This employment will be distributed across a wide variety of professions and trades typically associated with a remote heavy construction project. Recent OPG project experience indicates that approximately 60% of the total labour requirement for the on-site work would be met by the labour market in northern Ontario, including those from northeastern Ontario communities that are qualified, local and have direct relevant project experience.

Economic and business activity effects are associated with sub-contracting opportunities to the Design Build Contractor (DBC). It also includes the indirect and induced economic effects associated with the proposed Project on existing local businesses and the regional economy. These opportunities will develop via contracting work, as well as local project purchasing and expenditures by workers in the local and regional economy.

The proposed Project will also have a positive economic benefit for TTN through partnership/ownership, employment and contracting opportunities. Employment and contracting opportunities will also be available for other First Nation and Métis Communities, including Moose Cree First Nation (MCFN).

The proposed Project is consistent with the existing Crown Land Use Direction for the area but required the deregulation of a small area of Little Abitibi Provincial Park (LAPP). However, regulated Replacement Lands, identified by TTN, Ontario Ministry of Natural Resources and Ontario Parks, will result in an overall increase in Park area and improvement in ecological integrity.

Two traplines utilized by TTN members will be affected by the proposed Project, with the intake, penstocks, powerhouse, a portion of the headpond and most of the transmission line located in one trapline, whereas a portion of the headpond and the Replacement Lands are located within the other trapline. A third trapline utilized by a MCFN citizen also overlaps the proposed transmission line. Discussions with the three Trappers are ongoing with respect to mitigation.

For the most part the proposed Project will have minimal effect on other land and resource uses with the exception of two small outfitting businesses which visit the New Post Creek waterfalls with clients. Minimum flows of 7.5 and 5 m^3/s in New Post Creek have been proposed for July/August and September, respectively, that will be less than current flows (mean summer flow of ~34 m^3/s). Reduction of flows over the waterfalls may possibly diminish visitor experience appreciation value, particularly with respect to mist generation. However, this reduction would result in flows more typical of natural conditions as recalled by TTN Elders prior to the diversion of the Little Abitibi River (estimated mean historic summer flow of 3.6 m^3/s). It is anticipated that the minimum flows of 7.5 and 5 m^3/s over the New Post Creek waterfalls will continue to generate appreciable mist and provide a rewarding experience for visitors. Maintaining the current summer flows would make this proposed Project not viable and therefore should the Project not be constructed, the positive benefits noted above, including those potentially accruing to TTN and the local, regional and provincial economy, would not materialize.

Cultural Resources

No archaeological or cultural heritage resources or sites were located that would be directly affected by the proposed Project. The historic portage from the New Post site to New Post Creek located approximately 1 km north of the proposed Project has been identified. With the exception of approximately 1 km section, all evidence of an old portage from the former Hudson's Bay Company New Post site to south of Abitibi Canyon has been eliminated through logging activities over the last 50 years. Therefore, the proposed Project will not affect this former trail and no mitigation was recommended. The diversion of the Little Abitibi River caused the potential destruction of almost all former evidence of human habitation along New Post Creek with the exception of the remnant portages that were located.

The only cultural resources (pre-diversion) located along New Post Creek approximately 3 km east of the proposed intake location were associated with a remnant of a former portage used before the diversion to by-pass a formerly un-navigable section of New Post Creek. The occurrence of food containers and Culturally Modified Trees indicated the presence of an historic campsite dating to the early 1900s. Although the proposed inundated (headpond) area will extend beyond 3 km upstream of the intake location, this historic archaeological site (DlHi-1 – Borden number pending) will apparently not be affected. However, it was recommended that further Stage 3 mitigation assessments be undertaken if this site is within the final headpond inundation limits.

First Nation and Métis Interests and Consultation

The proposed Project lies within the heart of the Traditional Territory of TTN occurring almost exclusively within traplines held by TTN members. This land is of high importance to TTN. TTN has been trying to pursue the development of a hydroelectric project for New Post Creek for many years; and therefore, has made a decision to partner with OPG in order to bring this to fruition. The proposed Project has tremendous support within the community and has been endorsed by membership and the Chief and Council. Consultation with TTN members has been on-going for many years. Most of the members are anticipating the economic opportunities associated with the proposed Project.

Extensive efforts have been made to work with the MCFN through the Environmental Assessment (EA) phase of the proposed Project. MCFN has had a staff person dedicated to the proposed Project and consultation sessions have occurred with the Community. The MCFN has made a Homeland Declaration as far as the western shore of the Abitibi River and therefore the proposed transmission line for the proposed Project occurs within this area. As indicated above, a MCFN citizen has a trapline on the proposed transmission line and he does hunt, trap and fish in the area. It is possible a few other MCFN citizens have also hunted and fished in this area. CRP/OPG and the MCFN Coordinator are working closely with the MCFN Trapper to mitigate any effects on his trapline.

In addition to TTN and MCFN, the MoCreebec Council of the Cree Nation (MoCreebec) based in Moose Factory has been included as part of the co-planning policy for the Moose River Basin. Based on CRP/OPG knowledge of the area and discussions with MoCreebec, it is opined that there are no MoCreebec interests that occur in or near the proposed Project. A letter has been provided by the MoCreebec in support of the proposed Project.

Out of courtesy, CRP/OPG have consulted with Wahgoshig First Nation (Wahgoshig) and are of the opinion that the Wahgoshig Traditional Territory does not encompass any area associated with the proposed Project. Chief Babin has indicated that Wahgoshig has no concerns about the proposed Project.

The Métis Nation of Ontario (MNO) has also been consulted on the proposed Project and CRP/OPG have been supportive of any issues raised. Based on CRP/OPG knowledge of the area and discussions with MNO, it is opined that there are no Métis interests affected by the proposed Project.

In summary, CRP/OPG are of the opinion that all First Nation and Métis interests have been adequately consulted on the proposed Project; however, an “open door” policy will be maintained beyond the EA phase to deal with any issues or concerns as they may arise. TTN would re-iterate that making the proposed New Post Creek Hydroelectric Project a reality would be a very positive move for the Community.

Public and Agency Consultation

The consultation program included two sets of public open houses held in Smooth Rock Falls and Cochrane (2011 and 2012), public notices and newsletters, a Project website, and the provision of opportunities for on-going consultation. Generally, public interest has been modest with approximately 30 people attending each round of open house.

The two open houses demonstrated that the vast majority of individuals that attended indicated their support for the proposed Project. Two outfitters have expressed concerns about the proposed operating regime. They have submitted their concerns in writing and the CRP/OPG team has provided a response. At least one other individual indicated a concern about the proposed Project but was less concerned following the answers provided. This individual did not submit a Comment Sheet.

Government agency consultation was initiated in 2006, becoming more formal once the EA commenced in 2011. Consultation has been on-going throughout the proposed Project and has focused particularly around issues associated with deregulation of a small area of LAPP and the proposed GS operating regime.

The public and agency consultation process for the proposed New Post Creek Project has been comprehensive and inclusive of all interested individuals and government representatives. In general, the public has been very supportive of the proposed Project recognizing its energy and economic benefits, as well as its importance to TTN.

No individual has indicated an outright opposition to the proposed Project. A few individuals have expressed some questions and concerns and efforts have been made to address these questions and concerns.

It is our opinion that all public comments raised have been addressed and that comprehensive consultation has taken place with relevant agency and government regulators.

<u>Summary</u>

Environmental protection during proposed New Post Creek Project construction and operation will be ensured by adherence to the site-specific Environmental Management Plan to be developed by the DBC, as well as compliance with regulatory standards and guidelines.

The Environmental Management Plan ensures that environmental protection will be achieved during construction by describing government agency requirements, proposed Project commitments and recommended mitigation measures to be undertaken. The Environmental Management Plan will include the Erosion and Sediment Control Plan, Spills Emergency Preparedness and Response Plan, Hazardous Materials Management Plan and Waste Management Plan.

During operation, environmental protection will be achieved by adherence to the Spills Emergency Preparedness and Response Plan and the amended Abitibi River Water Management Plan (WMP), deployment of public safety measures and environmental monitoring. The requirements of the Abitibi River WMP administrative amendment process are being met and documented by the EA process.

The proposed New Post Creek Hydroelectric Project offers significant advantages to northeastern Ontario communities and TTN. The construction economic benefits would come at a time when the northern Ontario economy has downsized owing to the substantial reduction of the region’s forest products industry.

TTN would re-iterate that making the proposed New Post Creek Project a reality would be a very positive move for the Community.

The proposed Project will also benefit Ontario in terms of the gross revenue charges that would be paid to the Province, and by providing a long-term, renewable and reliable energy source that supports provincial green energy, climate change and Aboriginal policies, and aligns well with the needs (e.g., storage) of the provincial electrical system. The Province would also benefit by the related taxes and charges that result from all aspects of the proposed Project.

Any negative environmental effects associated with the proposed Project are minor and/or temporary and most if not all can be addressed through appropriate mitigation and monitoring measures. Lower flows over New Post Creek waterfalls may result in a negative effect on the aesthetic values and tourism, but this effect is considered to be minor.

Finally, this ER presents the view that developing a 25 MW hydroelectric GS on a human-made river system is preferable to developing multiple greenfield sites on natural river systems. This proposed Project will have a positive net benefit for the people of Ontario.

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1.0 INTRODUCTION

In April 2006, a Memorandum of Understanding (MoU) was signed between Ontario Power Generation Inc. (OPG) and the Taykwa Tagamou Nation (TTN) to jointly explore hydroelectric development opportunities within the Abitibi River drainage basin, north of Highway 11. As a result of this initiative, a potential waterpower generation location was identified on New Post Creek, a tributary of the Abitibi River.

In 1963, Ontario Hydro constructed the New Post Creek Diversion Dam on the Little Abitibi River in order to supply additional generating capacity at its Otter Rapids Generating Station (GS). The Otter Rapids GS is now owned and operated by OPG under the authority of a Water Power Lease. The dam allows flows to be diverted from the Little Abitibi River along the constructed New Post Creek Diversion Channel and New Post Creek to the Abitibi River upstream of Otter Rapids GS. With a drainage area increase of approximately 9.5 times (from 319 to 3,025 km^2), mean flow in New Post Creek has increased from approximately 4.4 to 42 m^3/s (based on 1975-2012 data), with a 1:100 year flood event flow of 296 m^3/s. The New Post Creek Hydroelectric Project (New Post Creek Project or Project), proposed by OPG with its partner Coral Rapids Power Inc. (CRP), a corporation wholly owned by the TTN, would take advantage of a portion of this diverted flow descending approximately 66 m between New Post Creek and the Abitibi River, all within TTN Traditional Territory, to generate approximately 25 MW of electricity, or about 125 GWh annually.

The proposed New Post Creek Project was identified by the Ontario Ministry of Energy (2010) as being under consideration as a clean, renewable, cost-effective hydroelectric generation project in “Ontario’s Long-Term Energy Plan”.

The proposed New Post Creek Project provides some unique opportunities for economic and social development for TTN and its members. TTN’s equity share in the proposed Project will provide a steady flow of revenue to use as a source on which to build future development within TTN Traditional Territory. There will also be opportunities for employment during the Construction Phase of the proposed Project.

The utilization of water resources and the establishment of a GS in an area already manipulated by human influence represent a preferred option over a project proposed on an unaffected watercourse.

The proposed Project is located in the District of Cochrane within the Geographic Township of Pinard, approximately 75 km north of the Town of Smooth Rock Falls and 13 km northeast of Abitibi Canyon GS (Figure 1.1). The proposed New Post Creek Hydroelectric GS tailrace would be located on Abitibi River shore lands with the intake at New Post Creek approximately 3 km southwest of its outlet to the Abitibi River (Figure 1.2). The actual creek channel length between its outlet and the proposed intake location is approximately 5.7 km.

Figure 1.1 Proposed Project Location

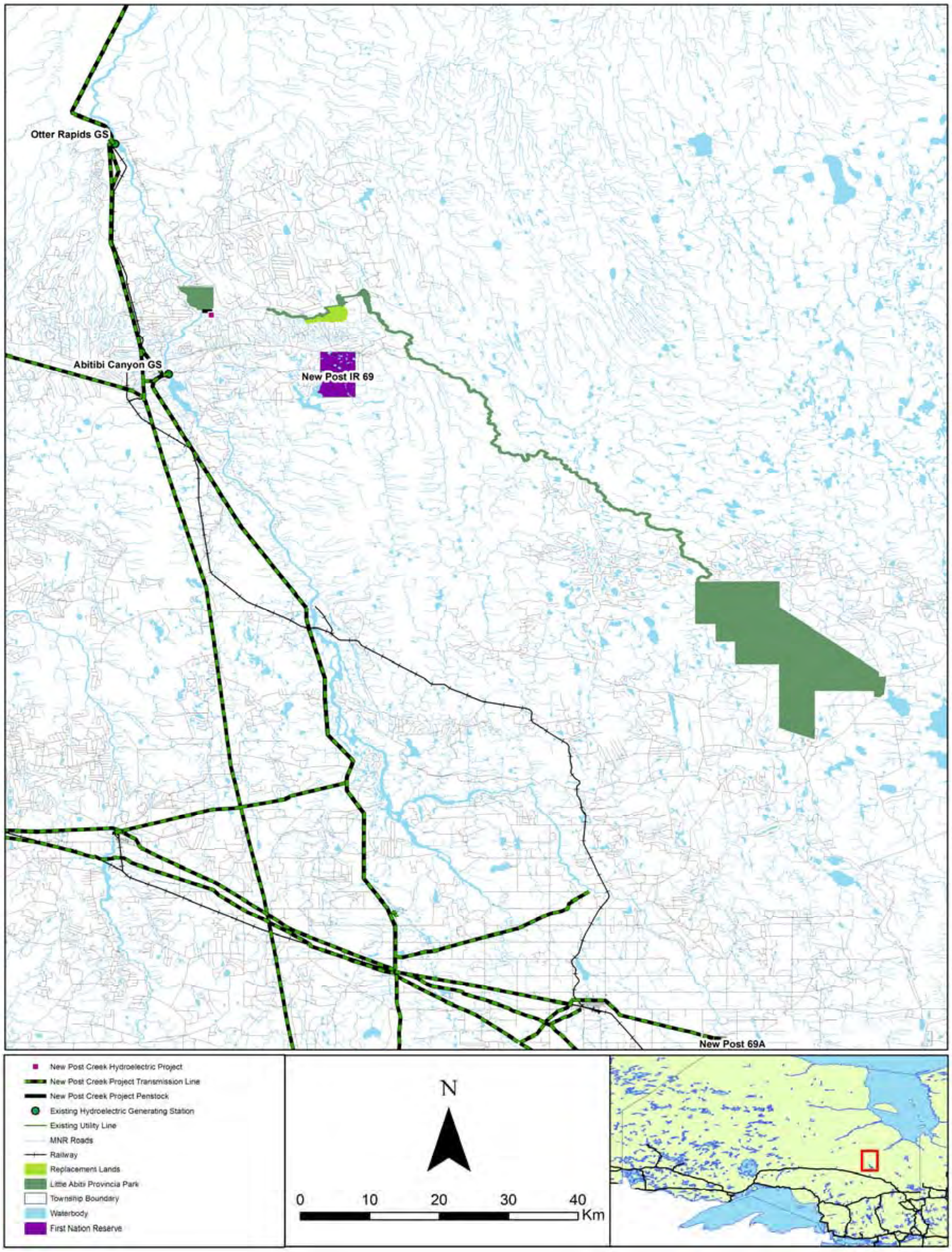
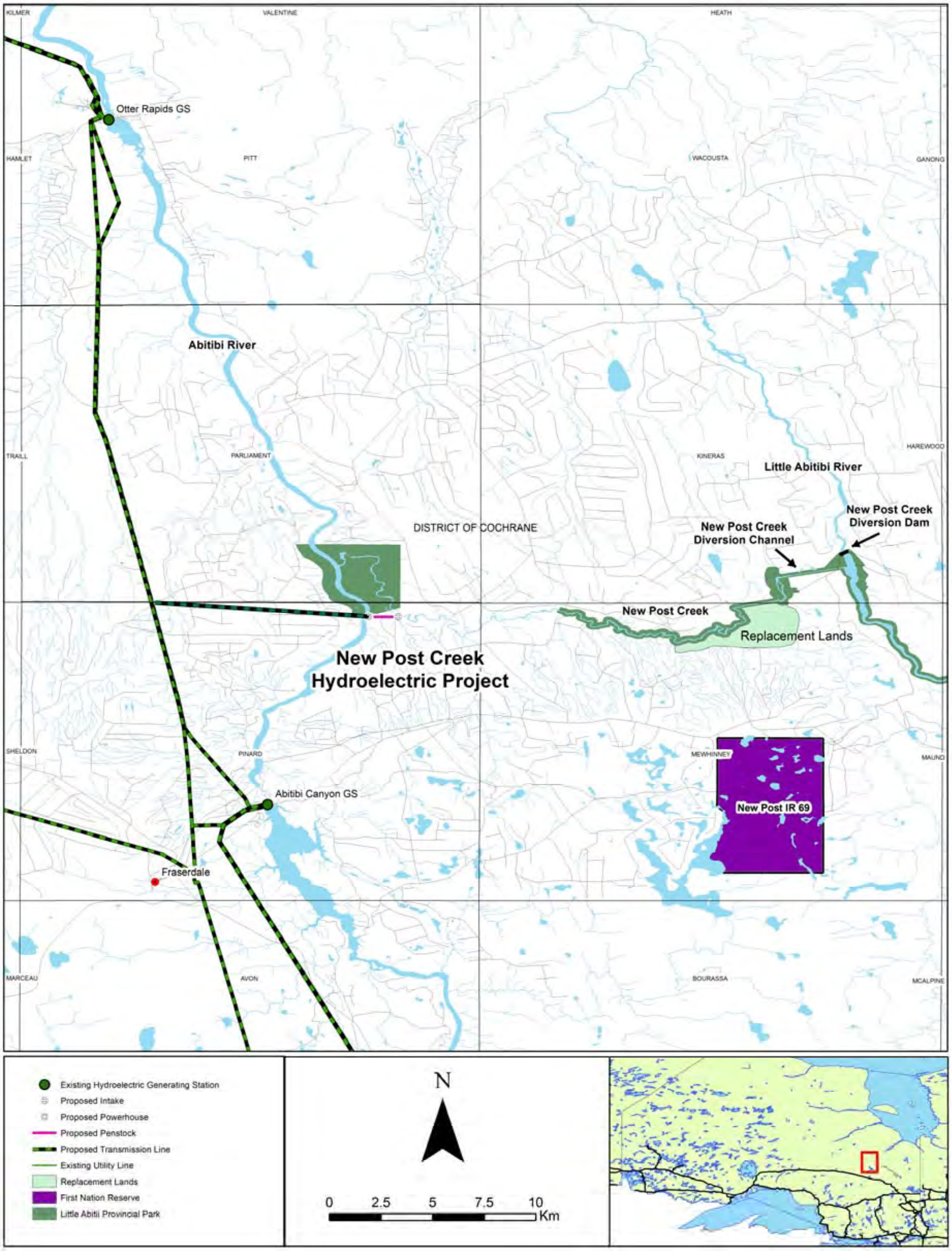


Figure 1.2 Proposed Project Site Location



1.1 REGULATORY FRAMEWORK AND ENVIRONMENTAL ASSESSMENT PROCESS

In Ontario, proposed waterpower facilities are subject to the *Environmental Assessment Act* (*EA Act*). The Ontario Waterpower Association (OWA, 2012a) developed the Class Environmental Assessment for Waterpower Projects (OWA Class EA) process which was approved by the Ontario Minister of the Environment and the Lieutenant Governor in Council in 2008. The *EA Act* formally recognizes the OWA Class EA process which outlines the requirements for Environmental Assessment (EA) approval.

Under the OWA Class EA, the proposed New Post Creek Project is classified as a “New Project on Managed River System”. Provided the requirements of the OWA Class EA planning process are met and a Part II Order request for a “bump-up” to an Individual EA is not made (or denied), a project is considered approved under the *EA Act*.

Prior to July 2012, projects like the proposed New Post Creek Project that were subject to the Ontario *EA Act* may also have been subject to the federal EA process under the *Canadian Environmental Assessment Act* (*CEAA*) if they required federal funding, were located on federal lands and/or required any federal authorization, permit or approval (“triggers” of the federal EA process) enabling the project to be carried out in whole or in part. A “Project Description for Federal Agency Review – New Post Creek Hydroelectric Project” (SENES, 2011a) was submitted to the Canadian Environmental Assessment Agency in July 2011 for determination of the applicability of the federal EA process. As part of the federal government plan for Responsible Resource Development, which seeks to modernize the regulatory system for project reviews, the *CEAA* (S.C. 1992, c.37) was repealed when the *Canadian Environmental Assessment Act, 2012* (*CEAA 2012*) came into force. The permit as “trigger”-based approach under *CEAA* has been replaced with a project list approach set out in regulation. As the proposed New Post Creek Project has not been listed under *CEAA 2012,* a federal EA is not required. All other applicable federal legislative, regulatory and constitutional requirements must still be fulfilled.

The generation of electricity is not permitted within a Provincial Park as stipulated by the *Provincial Parks and Conservation Reserves Act* (*PPCRA*). Since part of the proposed New Post Creek Project was located within Little Abitibi Provincial Park (LAPP), a deregulation of a small area of the specific Project site from LAPP accompanied by a concurrent regulation of suitable “Replacement Lands” was proposed and accepted in accordance with section 9(5)(c) of the *PPCRA*, and the agreed to Ontario Ministry of Natural Resources (MNR) processes for the deregulation. Section 9(5)(c) of the *PPCRA* enables the Lieutenant Governor in Council to dispose of an area in a provincial park that is 50 ha or more if the disposition is being made as part of a transaction that increases the size of the provincial park and enhances ecological integrity. MNR and TTN participated in the identification of Replacement Lands that compensated for the removal of the small portion of land related to the proposed Project. OPG, CRP and TTN had been working with MNR and Ontario Parks since 2006 to (i) discuss mechanisms for allowing the hydroelectric facility to be built on lands currently within LAPP, and

(ii) discuss the required site release process since the existing MNR Site Release Process does not allow for this. OPG, CRP and TTN came to an agreement with MNR and Ontario Parks for a coordinated process to deregulate a small portion out of LAPP and regulate the proposed Replacement Lands into LAPP. This required that the OWA Class EA for the proposed New Post Creek Project be coordinated with the MNR (2005a) "Class Environmental Assessment for Provincial Parks and Conservation Reserves" (MNR Class EA). Figure 1.3 shows the location of the Replacement Lands.

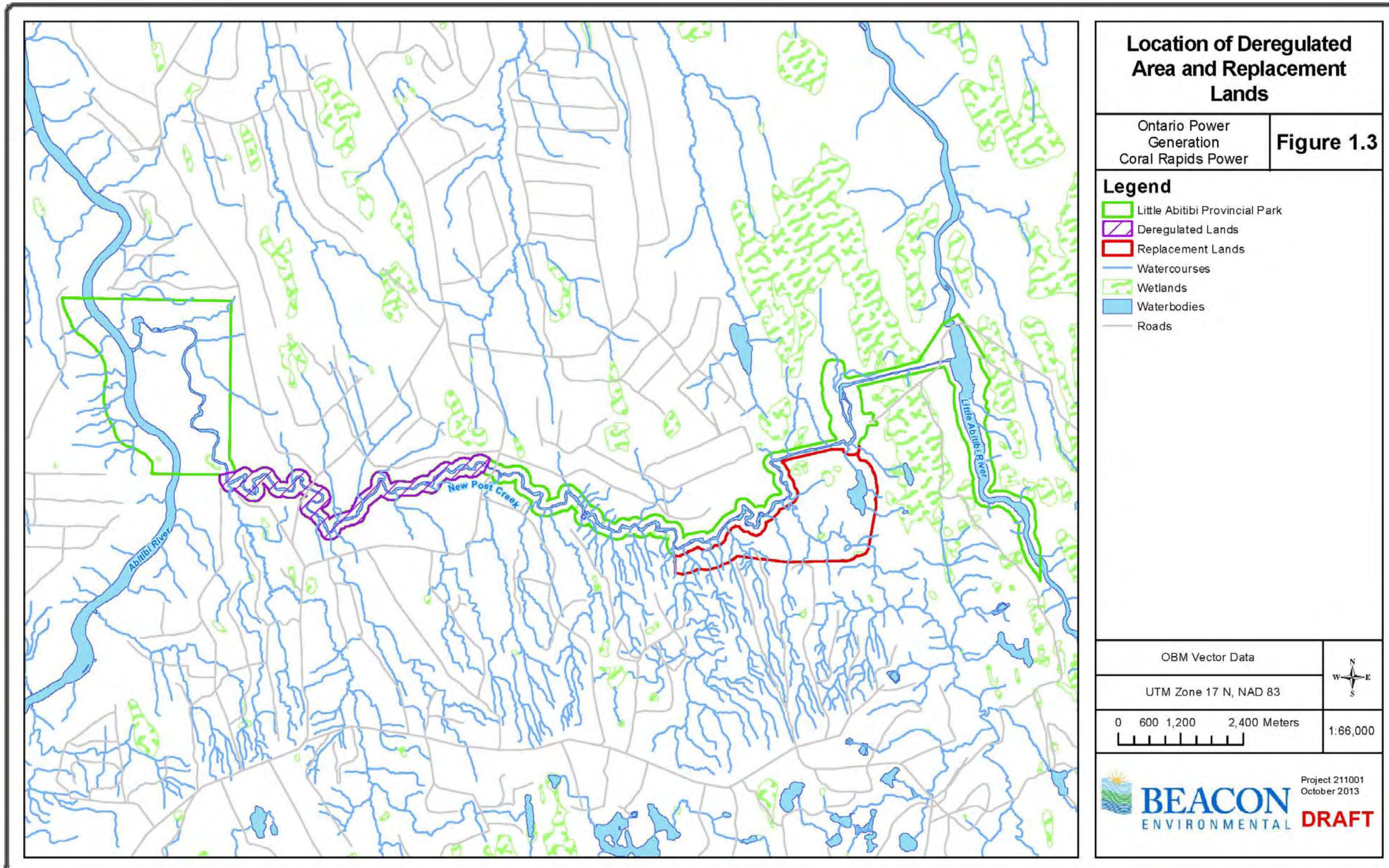
Through consultations between MNR, Ontario Parks and the TTN Community, an approximately 440 ha area, immediately south of LAPP in the vicinity of the New Post Creek Diversion Dam, was proposed as the Replacement Lands (Figure 1.3). The transaction was consistent with the provisions of the *PPCRA* that would allow for the deregulation of land to facilitate the proposed New Post Creek Project. The approximately 228 ha of land along New Post Creek within LAPP that was deregulated represents approximately 1.1% of the total LAPP area (20,296 ha). Basically, approximately 228 ha of land (including the creek bed and 120 m on either side of the high water mark) has been removed from LAPP and exchanged for an approximately 440 ha parcel of land referred to as the Replacement Lands. An Ecological Integrity Assessment was undertaken by Beacon (2010) which compared the land removed from LAPP and the Replacement Lands proposed by the TTN Community. Beacon (2010) concluded that the land exchange would increase the size of LAPP and enhance its ecological integrity. However, land deregulation resulted in the disjunction of LAPP as the waterway class portion is no longer a continuous system.

On November 21, 2011, MNR posted a policy proposal on the Environmental Registry for a major land use amendment to re-designate portions of LAPP and the adjacent Northern Resource and Commercial Recreation General Use Area to enable a boundary regulation change. Provincial, regional and local stakeholders were notified by mail of this policy proposal. No comments were received during this involvement opportunity. The land use amendment was approved on April 13th, 2013 and a decision has been posted on the Environmental Registry to reconfigure the park boundary that will increase the overall size and enhance ecological integrity of the park. The MNR boundary amendment process is proceeding internally with an expected date for regulation early in 2014.

1.2 OTHER ENVIRONMENTAL APPROVALS

Other permits, approvals and clearances will be sought as the proposed Project moves into the construction stage. Section 7.3.1 and Table 7.2 of this Environmental Report (ER) identify a range of possible approvals required; however, specific permits and approvals will likely be required under the provincial *Lakes and Rivers Improvement Act* (*LRIA*), *Environmental Protection Act* (*EPA*) and *Ontario Water Resources Act* (*OWRA*). It is also noted that at the time of the writing of this ER both the provincial and federal governments are making changes to legislation which may add, eliminate, or modify the types of permits and approvals required.

Figure 1.3 Location of Deregulated Area and Replacement Lands



1.3 OVERVIEW OF THE ENVIRONMENTAL REPORT AND TECHNICAL SUPPORT DOCUMENTS

This ER is the product of over six years of extensive study and consultation with the TTN, other First Nations and Aboriginal interests, the general public and government agencies. This ER and the associated Technical Support Documents (TSDs) were prepared by SENES Consultants (SENES) with the assistance of CRP/OPG and KGS Group.

Data sources used to document the existing environment included published and unpublished literature, government files, personal interviews, public Open Houses and field studies. Where possible, existing data sources were used; however, extensive field studies were required to complete the study.

Study areas were selected for each major component of the natural and socio-economic environment. This selection was based on a preliminary assessment of the areas that were expected to be affected directly or indirectly by the proposed Project. Therefore, the geographic study areas vary among the disciplines and environmental components.

For the natural environment, this ER refers to three study areas:

1. a regional study area generally defined by the Abitibi River watershed;
2. a local study area for the aquatic environment encompassing New Post Creek extending from New Post Creek Diversion Dam to its confluence with the Abitibi River and the Abitibi River from Abitibi Canyon GS to Otter Rapids GS, and a local study area for the terrestrial environment possibly affected by the proposed Project; and
3. site-specific study areas including those aquatic and terrestrial environment components that will be directly affected by the proposed Project.

For the socio-economic environment, this ER refers to two study areas:

1. regional socio-economic environment encompassing Cochrane District; and
2. local socio-economic environment encompassing areas in and around the proposed Project footprint.

This ER is organized into seven main chapters:

- Chapter 1.0 – introduces the proposed Project, outlines the EA process and other environmental approvals, and lists the TSDs;
- Chapter 2.0 – provides a detailed project description and a rationale for the proposed Project location;
- Chapter 3.0 – provides a description of the existing environment;
- Chapter 4.0 – provides an overview of environmental effects and mitigation measures during construction and operations and discusses the significance of effects;
- Chapter 5.0 – summarizes First Nations and Métis peoples consultation;
- Chapter 6.0 – provides an overview of public and government agency consultation; and
- Chapter 7.0 – provides an overall summary evaluation of the proposed New Post Creek Project.

Chapters 8.0, 9.0 and 10.0 provide the References, Acronyms/Abbreviations and Glossary, respectively.

This ER is supported by several TSDs covering the following topics:

- Aquatic Environment;
- Terrestrial Environment;
- Socio-Economics and Land Use;
- Public and Agency Consultation;
- First Nation and Métis Interests and Consultation; and,
- Stage 2 Archaeology and Cultural Heritage Resource Assessment, provided to the Ontario Ministry of Tourism, Culture and Sport (MTCS).

2.0 PROJECT DESCRIPTION

2.1 ALTERNATIVES ANALYSIS

In 1982, Ontario Hydro carried out an assessment of the hydroelectric potential of the diverted flows on New Post Creek. The study focussed on two sections of the creek below the diversion dam, one of which was similar to that presently proposed.

In 1996, Ontario Hydro revisited the site and conducted another review. This study used a head of 68 m, with a plant capacity of 26.4 MW and annual energy production of 175.8 GWh. The location is believed to have been near the New Post Creek waterfalls, located approximately 4.5 km downstream of the proposed Project intake weir location and 1.2 km upstream of the creek outlet to the Abitibi River, but few supporting details are currently available.

In 2006, following the signing of the MoU between OPG and TTN to jointly explore hydroelectric development opportunities within the Abitibi River drainage basin, a concept study was performed for four potential hydroelectric development options (alternatives) on New Post Creek near the waterfalls and within LAPP (KGS Group, 2006). The previous studies maximized the available head by going to local topographic maximums using dykes up to 8 m in height, altering a portion (<1 km^2) of the watershed and shoreline. The 2006 concept study reduced the proposed forebay elevation to minimize flooding of the existing creek shoreline and the flooded shore area within LAPP, thereby also reducing potential impacts on those portions of the creek with erodible silt and sand banks. The locations of the four alternatives assessed by KGS Group (2006) are presented in Figure 2.1.

A summary description for each alternative is provided below:

- **Alternative 1**: Most of this option is located south of LAPP with only the intake and a small section of penstock located in the Park. The in-stream spillway and intake are located at a bedrock outcrop extending across the creek approximately 4.4 km upstream from the waterfalls.

- **Alternative 2**: Farther north of Alternative 1, Alternative 2 is entirely within LAPP. Compared to Alternatives 3 and 4, a smaller area of the Park would require deregulation. The spillway and intake for Alternative 2 are conceptually identical to Alternative 1. However, there is no exposed bedrock and the presence of an old river meander and oxbow indicates the bank and channel are erodible at this location.

- **Alternative 3**: This option required a smaller length of penstock; however, its location in the middle of LAPP and its proximity to the culturally significant Hudson's Bay Company (HBC) New Post site made it unattractive. The spillway and intake for Alternative 3 are conceptually identical to Alternative 1 and would be located on exposed bedrock.

Figure 2.1 Alternative Hydroelectric Development Locations on New Post Creek

- **Alternative 4:** This option is located at the northernmost section of the Park, adjacent to the New Post Creek waterfalls. This option had the smallest footprint, but was eliminated due to adverse impact to waterfalls aesthetics. In addition, this option would have required the deregulation of the largest area of LAPP. The spillway and intake for Alternative 4 are conceptually similar to that of Alternative 1.

The gross head available for each alternative decreases as one proceeds north along New Post Creek, with the riverbed at Alternative 1 being +59 m above the Abitibi River, while the riverbed at Alternative 4 is in the order of 53 m above the Abitibi River. Based on the technical and environmental data collected and presented in the KGS Group (2006) concept study, preliminary ranking indicated that constructing a project at or just south of the Park (Alternative 1) was the preferred development alternative, with a transmission line built to the west of the proposed powerhouse to connect with the Otter Rapids GS to Abitibi Canyon GS transmission line.

In 2009, a study was performed to update and refine the technical feasibility of the Alternative 1 option based on updated topography and surveys, field exploration and reconnaissance of the proposed site, updated project costs, and updated energy production estimates (KGS Group, 2010). On the basis of the 2009 geotechnical investigation (KGS Group, 2013a, b), as well as the feasibility update and review, the project layout was revised and updated. It confirmed that the hydroelectric development potential of New Post Creek at the preferred alternative location (the current proposed New Post Creek Project) appears technically and economically feasible. In addition to technical benefits, this preferred option (Alternative 1) required the least amount of footprint to be located in LAPP, therefore having the least impact on the Park when compared to the other alternatives.

2.2 PREFERRED ALTERNATIVE

As indicated in Section 2.1, Alternative 1 is the preferred alternative. The proposed New Post Creek Project is a 25 MW facility utilizing historic flows diverted from the Little Abitibi River into New Post Creek by the New Post Creek Diversion Dam constructed in 1963 to augment hydroelectric generation at Otter Rapids GS, as well as the natural inflow originating within the New Post Creek catchment area. A small portion of the proposed Project was located within LAPP; however, with subsequent land deregulation and incorporation of the Replacement Lands, all of the proposed Project is located outside of LAPP (see Section 1.1), A transmission line approximately 7 km long will be constructed to the west of the proposed powerhouse to connect to the existing Hydro One Networks Inc. (Hydro One) 115 kV transmission line extending from Otter Rapids GS to Abitibi Canyon GS. The proposed transmission line is also located outside of LAPP.

2.3 PROPOSED GENERAL LAYOUT

The location of and general arrangement for the proposed Project are shown in Figures 2.2 and 2.3, respectively. However, it should be noted that the final layout of the proposed Project would be selected by the successful Design Build Contractor (DBC), who is chosen based on a competitive bidding process.

The layout will consist of the following primary Project components/structures:

- intake headworks, spillway structures and earth embankments;
- water conveyance system that includes two shallow buried penstocks and potentially a portion of open water canal;
- powerhouse structures equipped with two Francis turbine units;
- tailrace between the powerhouse and the Abitibi River;
- cofferdams at the intake and tailrace during construction;
- substation adjacent to the powerhouse;
- transmission line; and
- interconnection switchyard.

The proposed Project general arrangement, i.e., from the intake structure to the powerhouse, and penstock profile are presented in Figure 2.4.

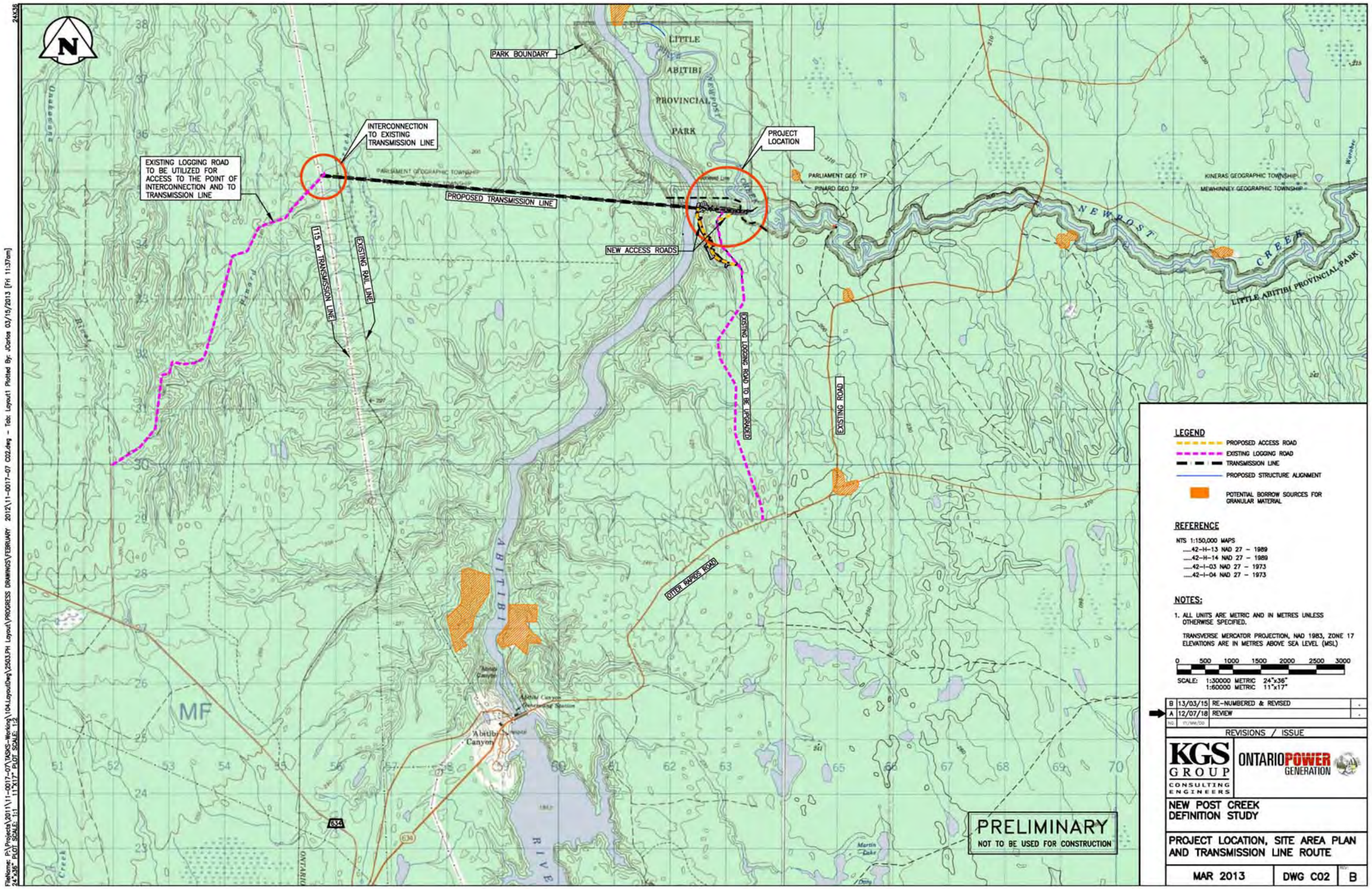
From the intake the flow will be carried by underground penstocks, or with a combination of a power canal and underground penstocks, and discharged through the powerhouse located on the east side of the Abitibi River. The anticipated powerhouse location is approximately 850 m west of the intake and just south of the Park boundary. Over 80% of the penstocks length (and potential power canal), the powerhouse and tailrace will be founded on sands, gravels and till, with bedrock located +15 m below the powerhouse draft tubes and tailrace.

Flow that is not utilized for power production will be discharged over the proposed spillway, taking into account prescribed minimum flow commitments downstream (see Sections 2.4.2.2 and 4.3.1.3), particularly at the base of the waterfalls. The proposed Project would utilize the flows and the head drop of approximately 66 m between the forebay elevation upstream of the spillway and the Abitibi River to generate sustainable power in the order of 125 GWh annually.

As presented in Figure 2.2, there are existing access roads south and east of the site that would be upgraded and extended (approximately 2,500 m) to the powerhouse and intake site. The access road to the intake will also serve as a water retaining dyke under high flood flow conditions.

As shown on Figure 2.3, the site will require some areas to be used for construction purposes. This includes settling ponds in the vicinity of the proposed powerhouse and intake for the dewatering of the excavations, an area to be used for lay down, trailers, equipment maintenance and possibly the batch plant, space to accumulate the extra excavated material, and new and upgraded access roads.

Figure 2.2 Project Location, Site Area Plan and Transmission Line Route[1]



[1] It should be noted that Figure 2.2 shows the previous LAPP boundary prior to land deregulation and replacement (see Section 1.1).

Figure 2.3 General Arrangement Project Site and Temporary Facilities

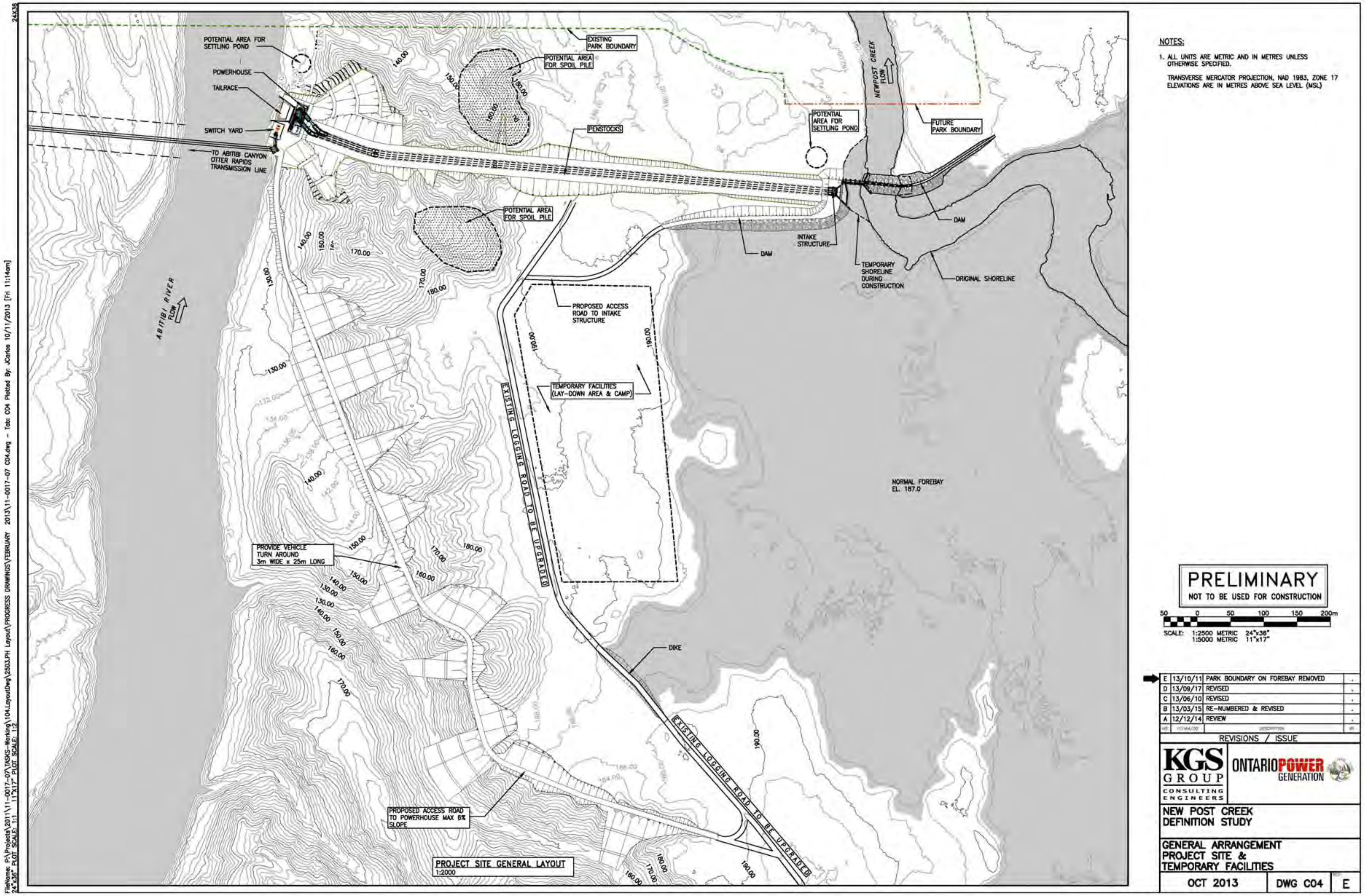
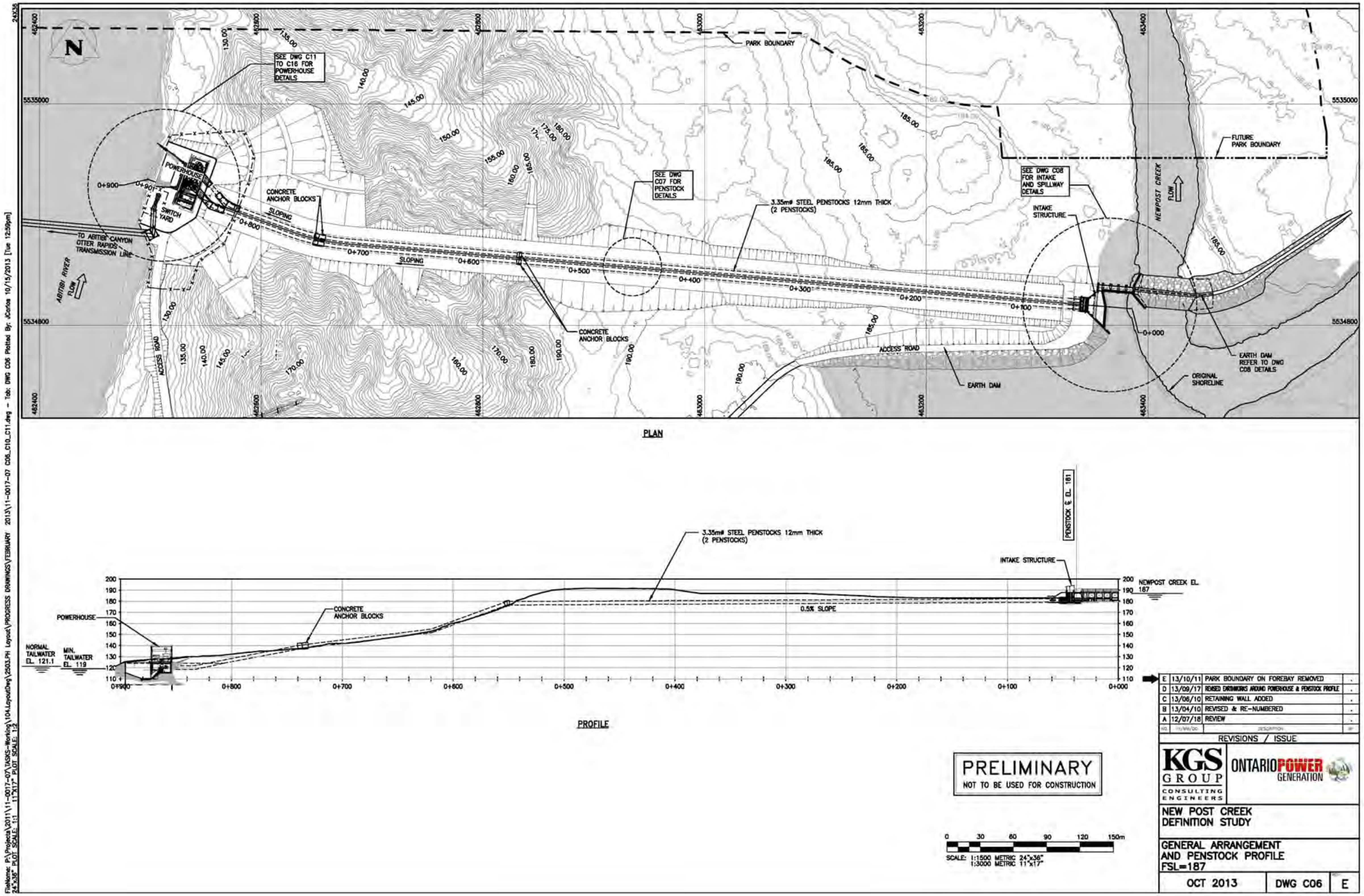


Figure 2.4 General Arrangement and Penstock Profile



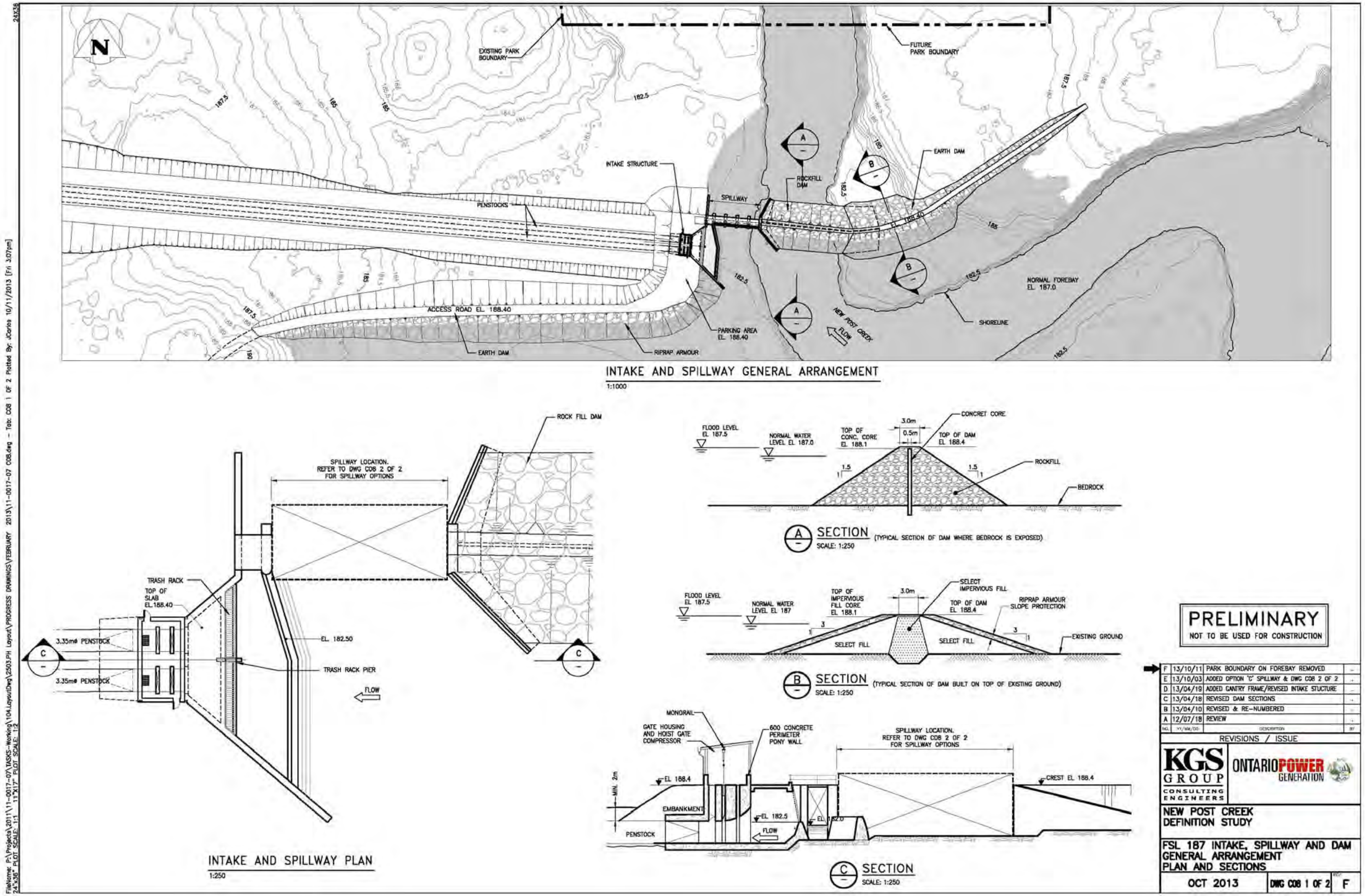
2.3.1 Intake and Spillway Structures

The proposed intake and spillway structures are located approximately 4.5 km upstream of the New Post Creek waterfalls near a bedrock (granitic gneiss) outcrop that extends across New Post Creek (Photograph 2.1). Due to its competence and good quality, the bedrock will provide an excellent foundation for the intake and spillway, with no settlement concerns. Most bedrock on the proposed Project site is not acid generating (see Section 4.2.2.5).

The proposed intake and spillway structures are separate but immediately adjacent to each other. The general arrangement of the spillway and intake structures is presented in Figure 2.5. The intent of the spillway and intake layout selected is to minimize inundation upstream while still ensuring flow withdrawals during all flow periods.

Photograph 2.1 Bedrock Outcrop

Figure 2.5 Intake, Spillway and Dam General Arrangements



The spillway structure consists of gates to maintain minimum flow requirements, gates or devices to manage high flow periods and maintain forebay levels and possibly an additional gate to provide means to evacuate sediment accumulation. The final choice of the type of equipment used will be determined by the DBC but the current concepts consist of either a series of stop logs (see Figure 2.5) or of an in-stream low (3.7 m high) steel crest gate section and an uncontrolled (fixed) concrete weir. The steel crest gate would be an Obermeyer type, which is operated by a pneumatic bladder. The combination of a gated or rubber dam section with a fixed concrete weir results in minimal incremental inundation upstream.

Control of the forebay water level is somewhat different when different types of spillways are considered. In the case of inflatable weirs (Obermeyer style equipment) the forebay water level is maintained automatically by the station controller by establishing a defined water level setpoint. The operator does have access to override the automatic control if necessary from a remote location. The water level is controlled by instrumentation which monitors the elevation of the weir crest and forebay water levels with the relative difference maintained by the operator by adjusting the inflation of the bladders. This difference controls the flows over the spillway to maintain the forebay level.

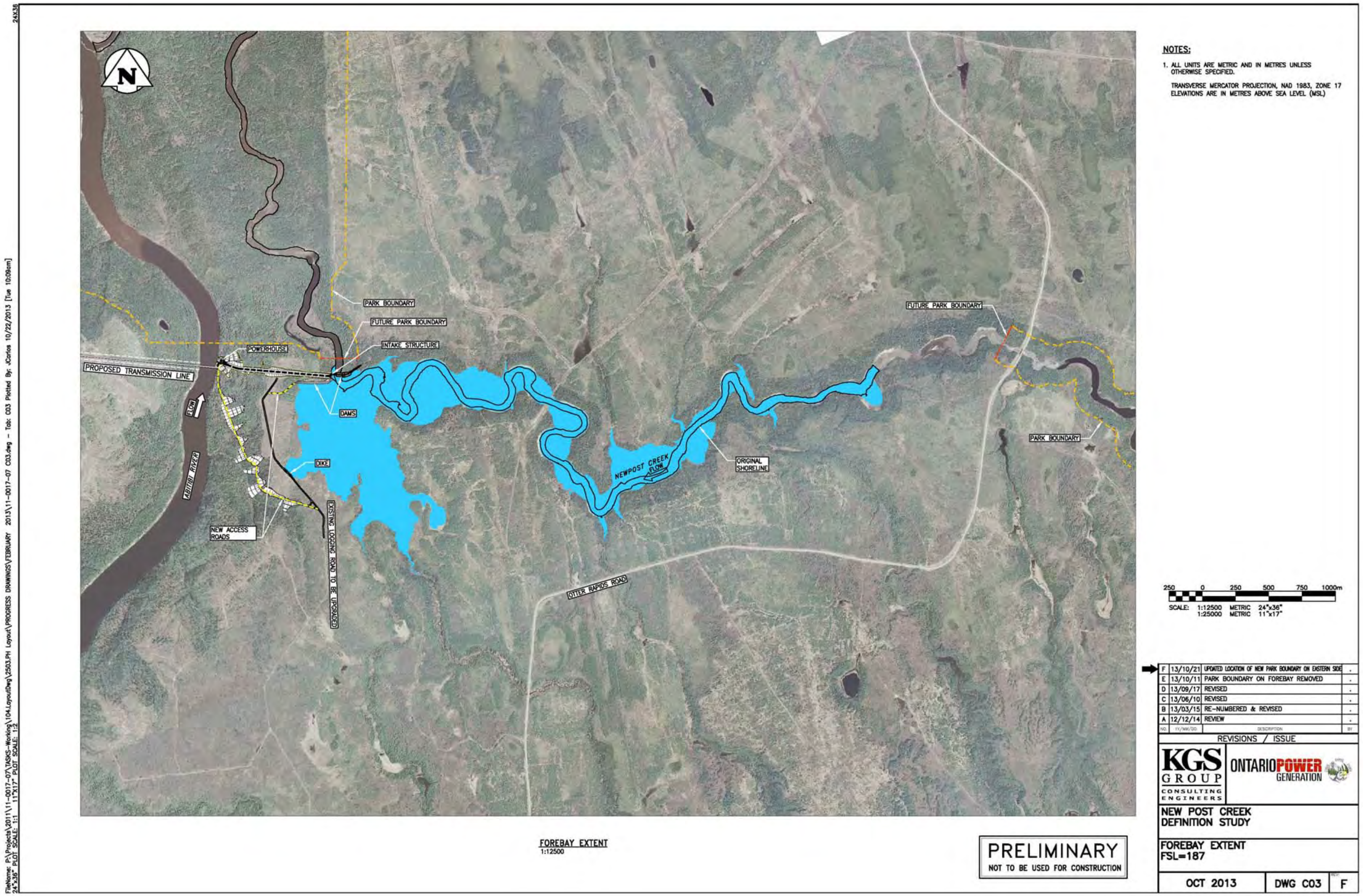
In case of stop logs the forebay level is maintained by the manual addition and removal of stop logs as required. In this approach the water levels are monitored remotely by the operator and instructions are issued when flows change sufficiently to warrant an adjustment in order to remain within the operating range of the forebay.

Normal operation of the proposed Project will increase the water level in New Post Creek by 5 m at the intake to a Full Supply Level (FSL) of 187.00 metres above sea level (m.a.s.l.), resulting in a total inundated area of approximately 170 ha (KGS Group, 2012). The upstream extent of the inundated area (approximately 7,166 m from the proposed intake weir location) is limited by the rather steep gradient at the rapids (see Figure 2.6). Under normal operating conditions, the inundated area will occur within the deregulated park area of approximately 228 ha upstream of the proposed Project spillway (Figure 1.3). Most of the flooding outside of the deregulated park area within Crown lands will encompass the unnamed tributary (MNR ID#523) that discharges to New Post Creek approximately 150 m upstream of the proposed Project intake location (Figure 2.6).

Considering the planned dimensions of the spillway, the 1:100 year flood levels would be expected to rise by 0.5 m to 187.50 m.a.s.l. The corresponding discharge to the 1:100 year event is 296 m^3/s.

A low head earth dam will be constructed on the eastern shore adjacent to the fixed concrete weir to contain flow within the creek channel. The access road and parking areas at the intake and at a location approximately 800 m south of the penstock will also serve as water-retaining dykes under high flow flood conditions. The western edge of the excavation downstream of the spillway will be in rock and not susceptible to erosion. Grouting of the bedrock may be required

Figure 2.6 Forebay Extent for FSL = 187 m.a.s.l.



in areas where the tie-ins for the proposed low head earth dams and spillway structures are on bedrock to minimize the potential of groundwater seepage through the abutments.

The proposed spillway structure will include a gravel trap and a sluice consisting of either a set of stop logs or an Obermeyer style crest gate. In addition, another gate may be required as a sediment sluice and outlet for continued minimum flow requirements downstream to the waterfalls (see Section 2.4.2.2).

The intake structure to the two shallow buried penstocks will be protected by trash racks and set to submerge the intake to the penstocks to minimize potential vortex problems. A sediment trap and a low level sluice gate may be included in the design to reduce the potential for suspended sediment and bedload entrainment in the diverted flow to the powerhouse. The sluice gate will allow for flushing of any sediment deposits at the intake during high flows downstream into the existing creek channel with appropriate permits and approvals.

The operation of the sediment gate will consist of opening the gate, likely manually. The actual need to clear the sediment trap would be with a frequency in the order of years if not decades. However, CRP/OPG has considered this issue and is suggesting that a yearly flushing occur during near the start of the freshet. A yearly flushing would reduce the effect of a larger less frequent (e.g., every 10 years) flushing event and may also help in providing sediment bank stabilization for the by-pass reach that otherwise may be starved of sediment.

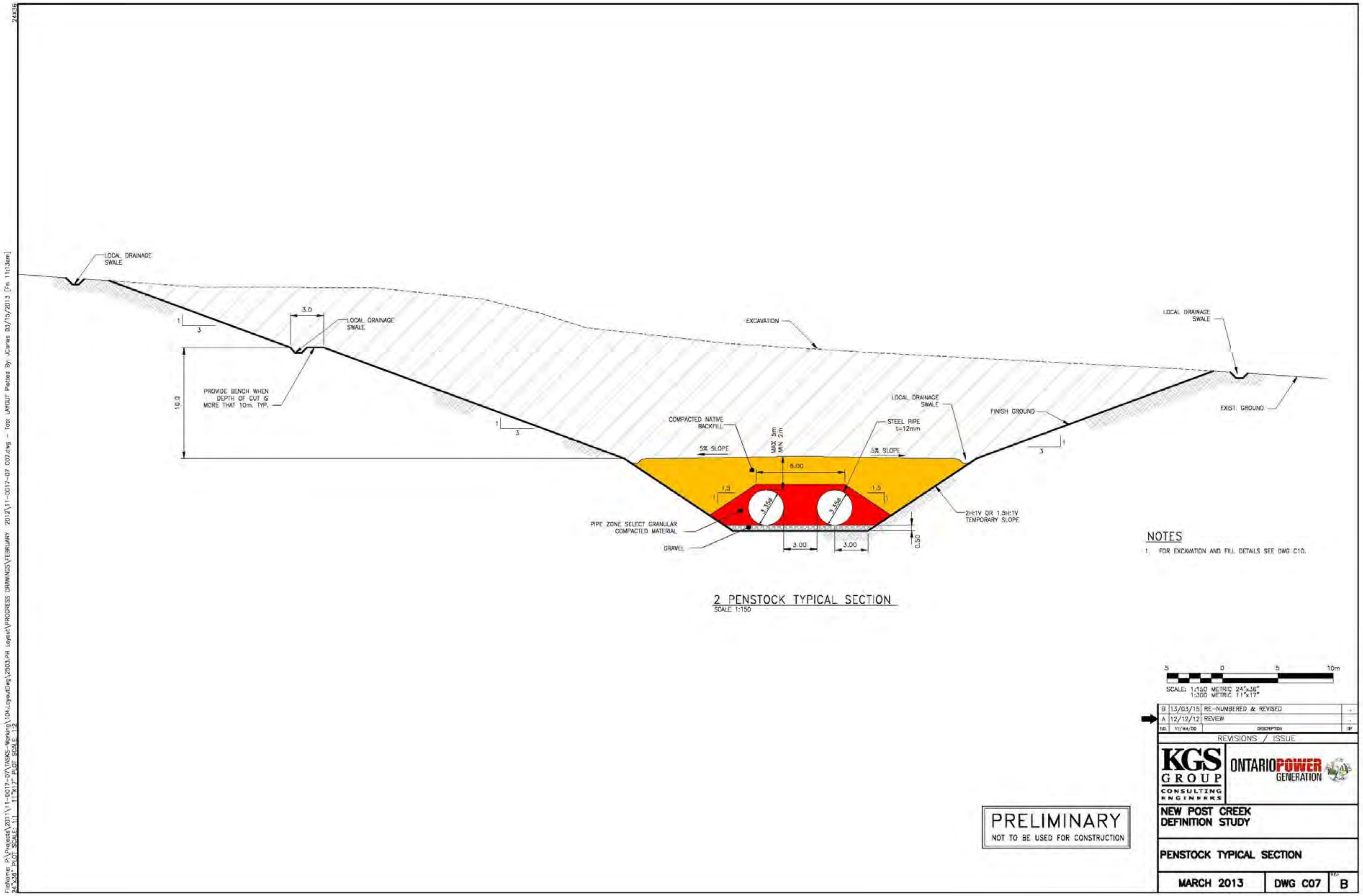
2.3.2 Water Conveyance System

The proposed water conveyance system includes two buried penstocks with the potential of a portion of open water canal. The two side by side buried steel penstocks, each 3.35 m in diameter, would extend approximately 820 m from the intake structure to the powerhouse. The twin penstock will extend from the intake area sloping very gently for about 650 m with minimal submergence below the forebay level and then drop approximately 61 m over 290 m down to the powerhouse at the Abitibi River shore. A head drop of just over 66 m occurs from the intake on New Post Creek to the Abitibi River. Figure 2.7 shows the penstock profile.

Due to shallow overburden, the penstock would be founded on competent bedrock along its first 150 m length from the intake structure with the remaining portion constructed within overburden. As the overburden sands and silts are erosion prone, the penstock system will be provided with granular drainage layers and drains that can be monitored for leak detection.

The proposed penstocks may be equipped with manhole access along the route near the end of the shallow sloping section and above the steeper portion. Impressed current or sacrificial anode cathodic protection will be provided along the penstock.

Figure 2.7 Penstock Profile

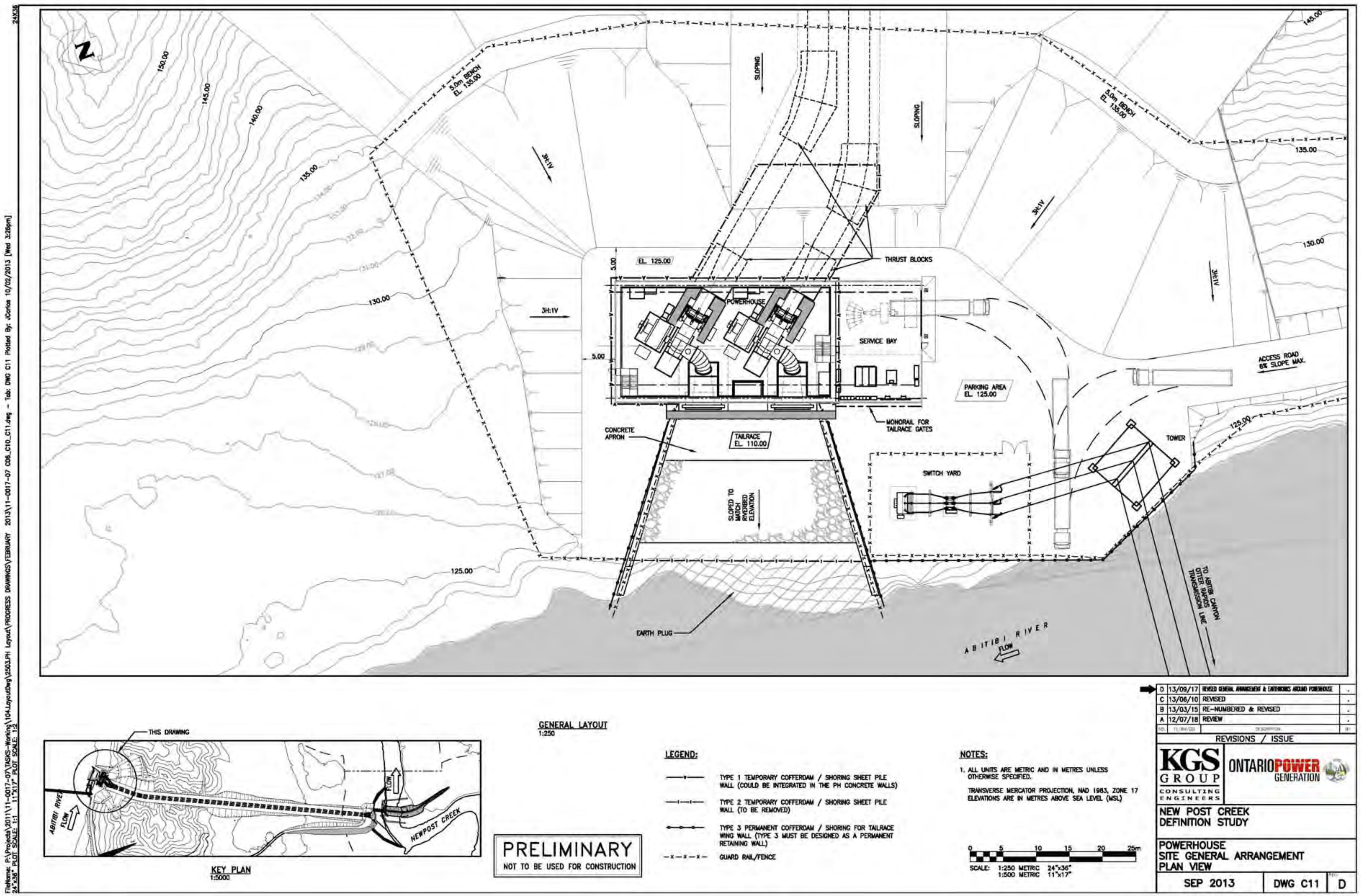


2.3.3 Powerhouse Structures

The proposed powerhouse will have a concrete substructure for the turbine draft tubes, with potentially the two identical horizontal Francis turbine/generator sets (approximately 12.5 MW each) and all required ancillary equipment mounted on the powerhouse floor. Each turbine is expected to have Francis type runners with 13 blades operating at nominal speeds between 277 to 360 rpm depending on the final runner dimensions. The turbine units may be mounted near or below the normal tailwater level. The turbine shutoff valves will have gravity trip counterweights located within the powerhouse. The layout and details of the powerhouse facility are presented in Figure 2.8.

The powerhouse foundation structure will be constructed on a dense sand deposit with sufficient load bearing capacity. The powerhouse and tailrace area will be excavated and founded on dense sands and gravels (Photograph 2.2), with bedrock located more than 15 m below the powerhouse draft tubes and tailrace. The surficial overburden material above the water table is relatively firm and can be excavated and temporarily sloped back at a 2H:1V slope angle, or 3H:1V for slope height higher than 10 m (KGS Group, 2013a). The firm sand deposit will be saturated below the water table reflecting the proximity to the Abitibi River. Therefore, it will be necessary to dewater the area prior to excavating below the water table. Temporary construction shoring will be required due to the depth of the required excavation and groundwater condition, and to minimize the footprint that would be disturbed. The sand deposit can be excavated using standard soil excavation equipment such as bucket excavators, bulldozers and similar equipment, in combination with an appropriate and effective dewatering procedure. A properly designed sheet pile wall, diaphragm wall and/or contiguous bored pile wall can be used to support and dewater the excavation. Groundwater depressurization/dewatering will be required for powerhouse foundation excavation below the river water level. In addition, long-term seepage control, if necessary, can be provided by the use of cut-off walls, low maintenance gravity drains and relief wells.

Figure 2.8 Powerhouse General Arrangement



Photograph 2.2 View Along the Abitibi River Shoreline in the Vicinity of the Proposed Tailrace

2.3.4 Cofferdams

A series of cofferdams will be required during construction at both the intake/spillway structure and at the powerhouse tailrace.

The cofferdams will generally be low structures (1.5 to 2 m) and will be constructed utilizing several methods. The tailrace and powerhouse excavation is expected to be done behind a cofferdam consisting of an earth plug or a section of unexcavated shoreline with sheet piling to improve the water barrier given the existing soil conditions.

At the intake the cofferdams will also be low structures consisting of either rock plugs of unexcavated shoreline on the west side of the creek or rock fill berms that may include some membranes or grouting to improve imperviousness.

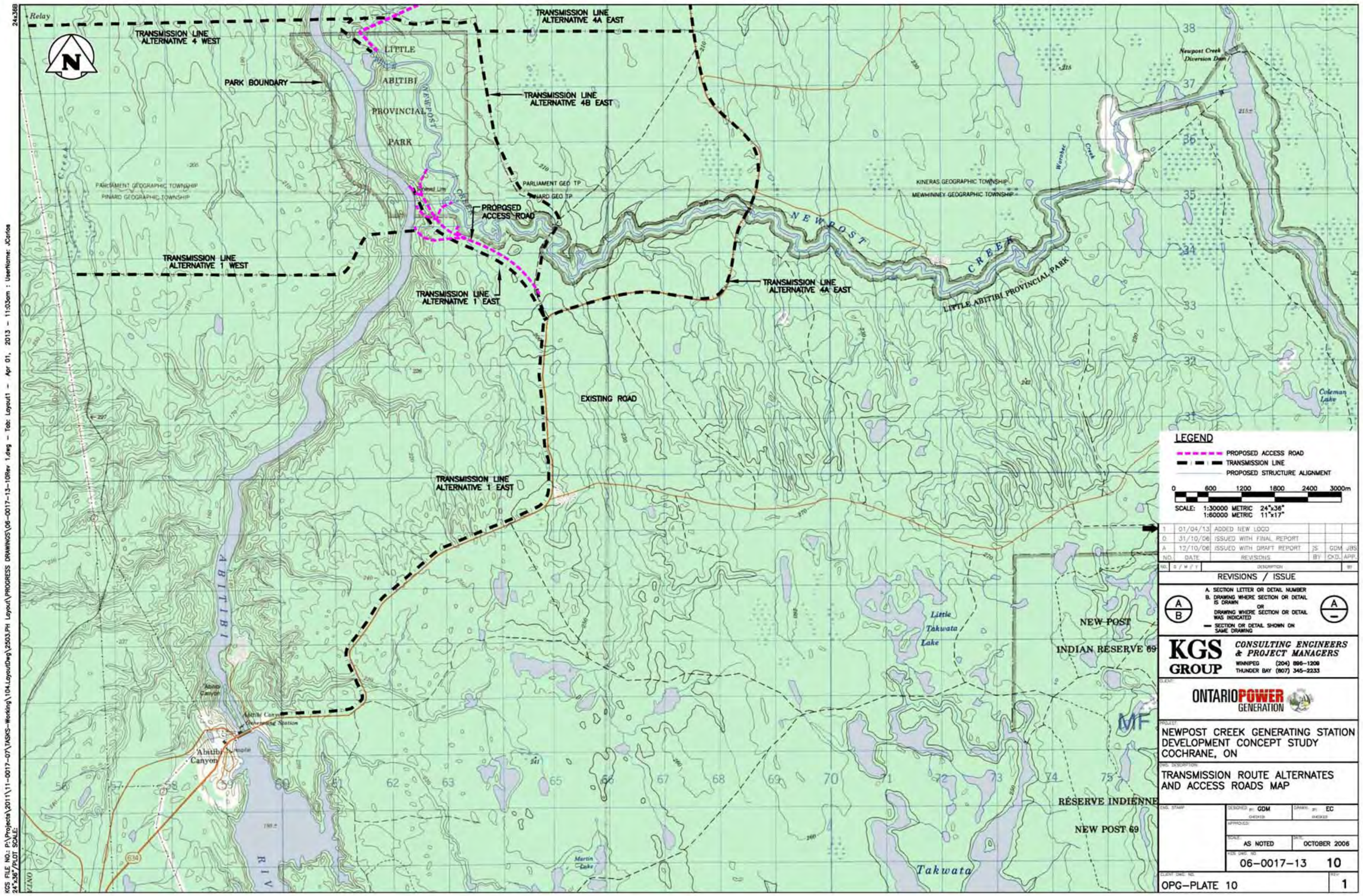
2.3.5 Transmission Line

A number of alternative transmission routes were assessed before selecting the preferred route (see Figure 2.9). The alternate routes shown correspond to the alternative powerhouse locations assessed in 2006 (see Section 2.1 and Figure 2.1). Both alternative “east” and “west” routes were considered. The “east” routes would follow access roads back to Abitibi Canyon GS, whereas the “west” routes would cross the Abitibi River and mainly recently harvested forest areas to the existing Hydro One 115 kV transmission line between Abitibi Canyon GS and Otter Rapids GS.

Once Alternative 1 had been selected for the powerhouse location (see Section 2.1), a “west” route was selected on the basis that it was the shortest route with fewer bends. The route of this alternative, designated as “Transmission Line Alternative 1 West” in Figure 2.9, was later modified to locate the point of interconnection with the existing Hydro One transmission line at an existing road (see Figure 2.10). The proposed transmission line right-of-way (ROW) is located outside of LAPP.

The proposed single-circuit 115 kV transmission line extending from the powerhouse switchyard directly west over a distance of approximately 7 km to the existing 115 kV Otter Rapids GS/Abitibi Canyon GS transmission line is the technically preferred connection option (see Figure 2.10). Based on available information, the preferred interconnection would involve a T-tap direct with protection provided by a circuit breaker at the new switchyard outside the powerhouse. Based on a System Impact Assessment (SIA) by the IESO (2010), the proposed connection to the existing 115 kV transmission line is acceptable conditional on a number of requirements that have been incorporated by KGS Group (2013c). Based on the Customer Impact Assessment, Hydro One (2010) concluded that the proposed New Post Creek Project can be incorporated with minor impact to Hydro One customers conditional on adherence to the requirements identified in the IESO (2010) SIA.

Figure 2.9 Alternative Transmission Line Routes[1]



[1] It should be noted that Figure 2.9 shows the previous LAPP boundary prior to land deregulation and replacement (see Section 1.1).

Figure 2.10 Proposed Transmission Line Route

The proposed transmission line begins at the substation located adjacent to the powerhouse on the east bank of the Abitibi River (see Figure 2.11). The proposed transmission line will cross the Abitibi River and extend in a direct route to a point near the intersection of the existing Hydro One transmission line and access road. The western shoreline of the Abitibi River has a fairly rapid rise in elevation with few changes in elevation to the interconnection point. The proposed transmission line will cross over land that has been subject to previous forest harvesting, some wet areas and the Ontario Northland Railway (ONR) rail line.

The proposed transmission line will be constructed within a minimum 30.5 m (100 feet) wide ROW (KGS Group, 2013d). Any non-compatible trees outside of the 30.5 m ROW will also be removed to prevent their fall over the transmission line conductors. The remaining vegetation (compatible trees, shrubs, understory) will remain intact. The transmission line will consist of untreated wood (likely cedar) poles, aluminum conductor steel reinforced cables, polymer insulators, and optical ground wire, as well as guy-wire and anchors, as necessary. The aerial cable crossing of the Abitibi River is approximately 150 m wide.

Access for transmission line construction is provided by an existing road network between the interconnection point and the west bank of the Abitibi River (see Figure 2.10) considered to be adequate for construction equipment use.

A small switchyard is to be constructed at the point of interconnection which will require the construction of a small access area from the existing road (see Figure 2.11). No permanent roads will be constructed to or along the remainder of the proposed transmission line route. It is expected that the DBC selected for this work will execute the construction of the transmission line in the same manner as other such work in this region with the work likely being done in the winter to minimize the impact on the natural environment, particularly wet areas.

A fibre optic cable will be installed by trenching directly west from the point of interconnection switchyard (see Figure 2.11) to the Ontera-owned fibre optic communications trunk, located within the existing Hydro One transmission line ROW.

The selected DBC will be responsible to secure the necessary licences and permits including those for timber removal along the ROW, watercourse crossing installations and overhead crossing of the ONR rail line. Amendments to the *Navigable Waters Protection Act* under Bill C-38 has resulted in the exemption of construction of any works in, on, over, through or across water bodies from the provisions of the new *Navigation Protection Act* with the exception of those listed in Schedule 2 of the new Act. The Abitibi River is not listed in Schedule 2.

2.3.6 Proposed New Post Creek Project Technical Summary

The technical details of the proposed New Post Creek Project are summarized in Tables 2.1 and 2.2.

Figure 2.11 Transmission Line Plan and Profile/Interconnection General Arrangement

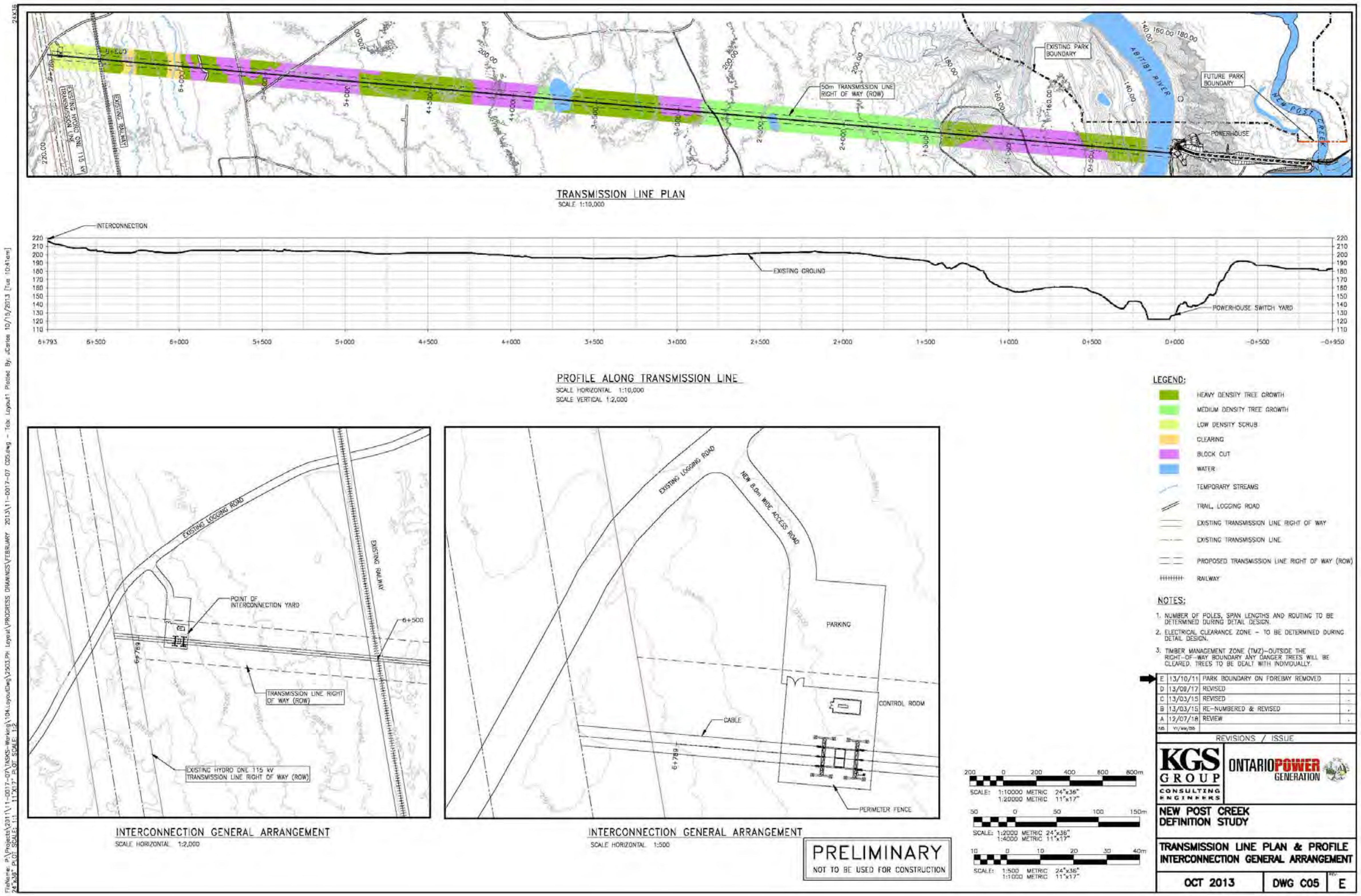


Table 2.1 Proposed New Post Creek Project Hydraulic Characteristics

Gross Head		66 m
Average Annual Flow		~42 m^3/s (based on 1975-2012 data)
Rated Plant Flow		50 m^3/s
Minimum Flow:[1]	*May 1 to mid-June*	15 m^3/s
	Mid-June to August 31	7.5 m^3/s
	September 1 to 30	5 m^3/s
	October 1 to April 30	2 m^3/s
Installed Capacity		25 MW
Average Annual Energy Output		125 GWh
Inundation		170 ha

[1] See Section 2.4.2.2 for more details.

Table 2.2 Proposed New Post Creek Project Components[1]

Earth Dam	
Type	Earthfill
Crest height	Approximately 7.1 m (varies)
Crest length	Approximately 500 m
Base width	Approximately 76 m
Crest width	3.0 m
Core height	Approximately 6.8 m (varies)
Headpond	
New inundation area	170 ha (extending 7,166 m upstream of dam)
Spillway Structure	
Type	Steel crest gate section with an uncontrolled (fixed) concrete weir or stop logs
Crest height	3.7 m
Length	32 m
Intake	
Number of intakes	Dual
Type	Concrete
Gates/intakes	2
Penstock	
Number of penstocks	2
Type	Steel
Diameter	3.35 m
Length of each penstock	Approximately 820 m
Powerhouse	
Type	Surface
Turbine-generator units	2 x 12.5 MW
Tailrace	
Type	Cut in overburden
Length	30 m

[1] Note: All dimensions provided are approximate and will be finalized during the detailed design of the proposed Project.

The spillway structure will facilitate year-round minimum flow requirements downstream of the spillway to the waterfalls (see Sections 2.4.2.2 and 4.3.1.3).

Safety devices, such as booms and buoys, will be placed in the water upstream and downstream of the spillway, and downstream of the tailrace. A risk assessment exercise will be undertaken to identify requirements and locations for signs, booms and buoys prior to operations. Figure 2.12 provides preliminary fencing, signage and safety boom locations, but is subject to change based on the risk assessment results.

2.4 PROJECT ACTIVITIES

2.4.1 Construction

It is assumed that a temporary construction camp will be needed to accommodate the workers for the approximate 2 to 3 year construction period. It is anticipated that this construction camp could house up to 100 workers depending on the particular phase of the proposed Project. Workers at the construction camp will not be permitted to fish, hunt or use ATVs while they are working at the camp. A concrete batch plant is also likely to be required in the vicinity of the proposed Project.

Work areas will be cleared of trees and the camp, construction, laydown and concrete batch plant areas would be grubbed and levelled. After construction, the temporary work areas would be re-planted with native tree species and allowed to re-vegetate naturally.

As indicated in Section 2.3.1, the proposed intake and spillway structures will be constructed adjacent to each other on competent bedrock. At the intake and spillway location, New Post Creek is currently 1 to 4 m deep and approximately 50 m wide.

An initial perspective on what might be the intake and spillway construction method that would be employed by the DBC is presented below. However, it should be noted that the final sequencing of excavations, cofferdams, construction and dewatering methods used would be defined by the successful DBC on the basis of environmental requirements and constraints outlined in the tender documents.

The intake and spillway are integrated, and consequently construction of the two works requires close coordination. The initial intake and west portion of the spillway could be excavated in “dry” conditions behind a rock plug serving as a cofferdam (Figure 2.13a). This rock plug may be topped with a low level berm to achieve the desired freeboard. The access road will form a permanent berm along the west creek edge when completed.

Figure 2.12 Preliminary Fencing, Signage and Safety Boom Locations

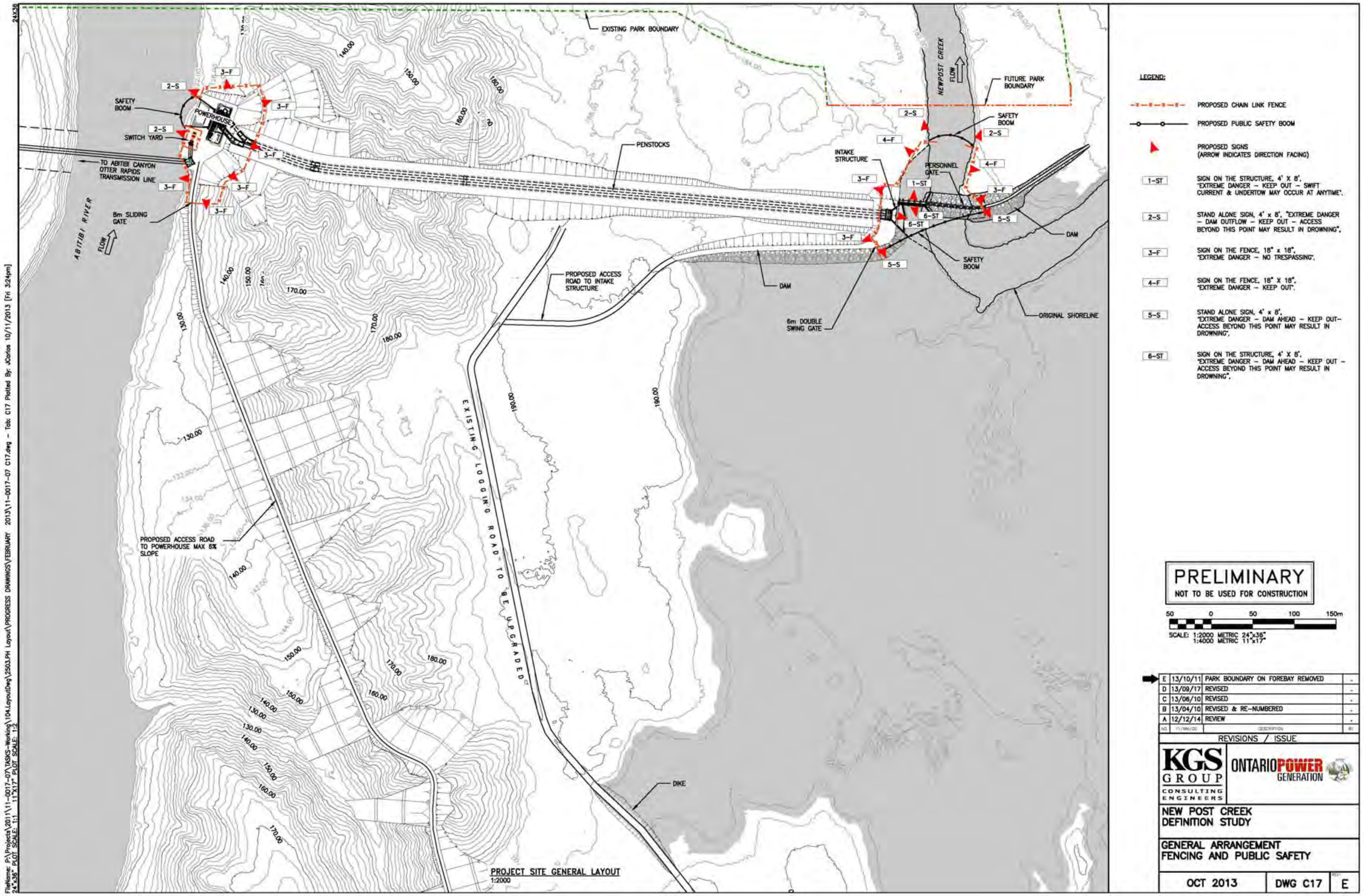
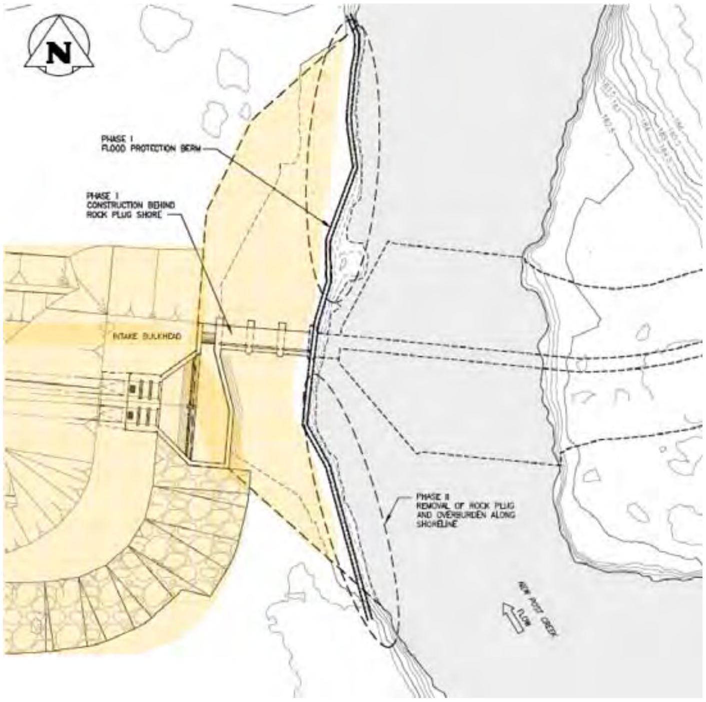
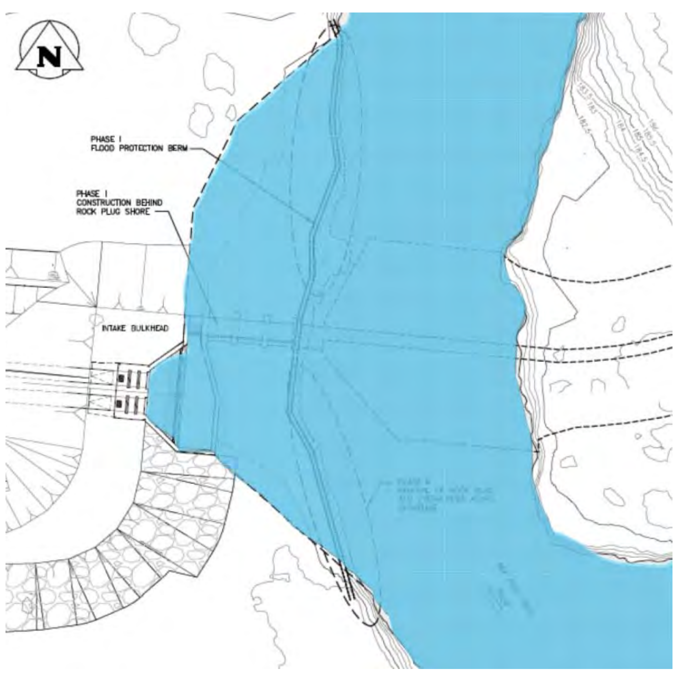


Figure 2.13a Phase I – Excavations



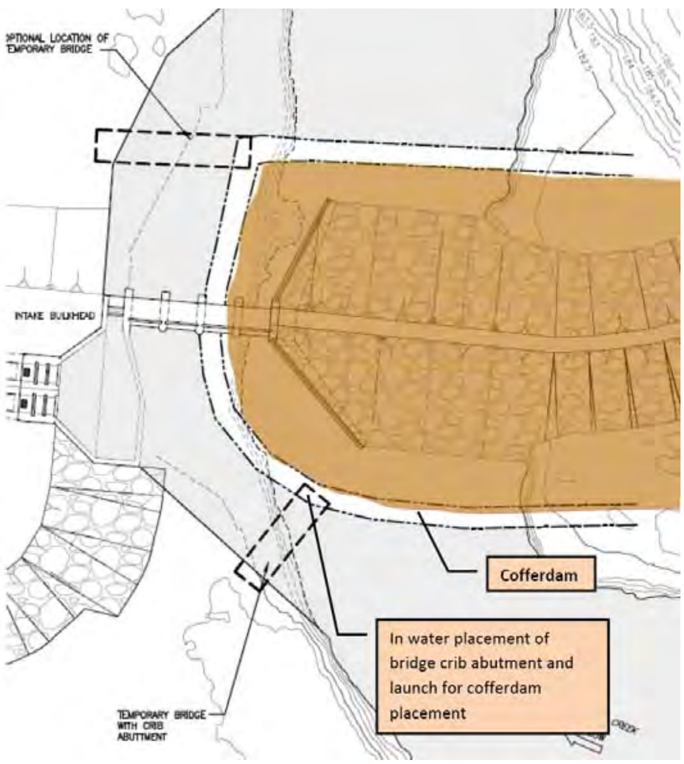
Upon completion of the intake and the concrete spillway work, the cofferdam and remaining rock plug would be removed and the new spillway bay on the west side will be used to pass creek flows downstream (Figure 2.13b).

Figure 2.13b Phase II – Removal of Rock Plug



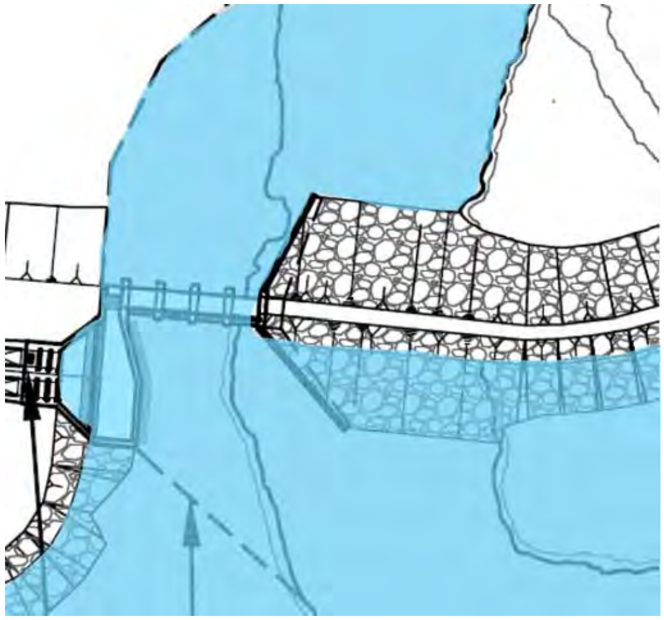
A small cofferdam for the construction of the earth dam could be constructed from the eastern shoreline (Figure 2.13c). It is anticipated that an access trail from Parliament Loop Road to the east abutment could be enhanced to facilitate construction (see Section 2.4.1.2). Alternatively, a temporary bridge could be used to cross the open portion of diverted flow, in combination with limited in-stream work for timber crib abutments. In either case the cofferdam would be quite small, with a dewatered river channel area in the order of 150 m by 50 m using a cofferdam in the order of 1.5 to 2 m high. The cofferdam selected by the DBC is anticipated to be either an in-stream water tight barrier (e.g., aquadam), or constructed of granular fill with a water retaining core (membrane or silty sand). In this phase of construction the spillway concrete components would be completed and the earth dam would be put in place.

Figure 2.13c Phase III – Construction of Earth Dam



In the final phase the cofferdam would be removed and the forebay eventually flooded as shown in Figure 2.13d. The material from the cofferdam may be used as part of the earth dam, or placed in designated spoil piles.

Figure 2.13d Phase IV – Removal of Cofferdam



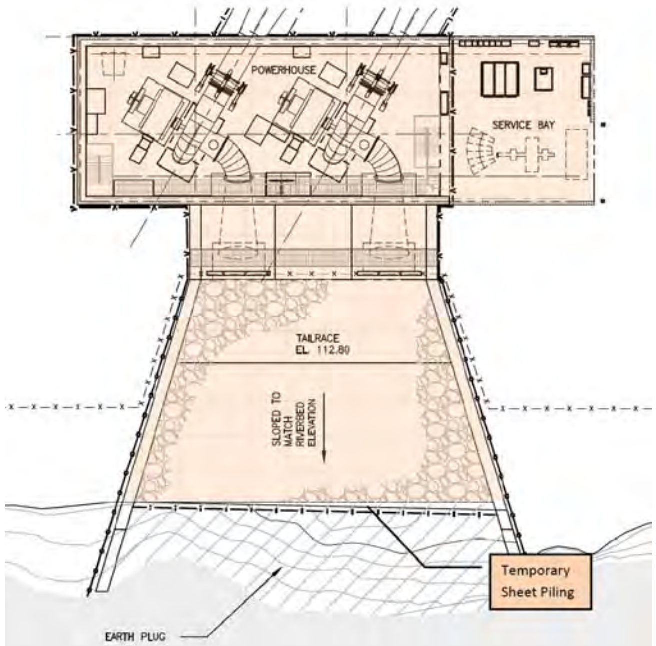
Existing slopes along the Abitibi River and inland at the proposed Project site are relatively steep. Some slope angles were near 1V:1H locally, with overall slopes of 1V:3H, reflecting fairly high strength materials in the *in-situ* sands, silts and tills and limited groundwater pressure influence. There was no evidence of deep-seated slumping or slides occurring at the proposed Project site. For preliminary design purposes, a slope angle of 1V:2H could be used for temporary construction excavations above the groundwater table. As the native soils are highly erodible, extensive stabilization works may be required to prevent vegetation removal, drainage pattern alteration and slope destabilization by heavy loads. Freshly exposed surfaces due to construction activities will require erosion control measures such as granular material placement over exposed surfaces, surface water diversion from slopes and French drain installation for water control in water-bearing granular areas.

The proposed penstocks will extend approximately 820 m from the intake to the powerhouse and will be buried with a minimum 2 m cover to provide thermal insulation during winter operation. Blasting of surface and near-surface bedrock along the initial 150 m distance from the intake will be required to facilitate penstock burial.

Groundwater depressurization/dewatering will be required for powerhouse foundation excavation. This may be achieved by installation of a pump well system or a low permeability seepage barrier such as sheet pile walls or slurry trench to reduce seepage gradients at the downstream face of the natural cofferdam (dyke) around the powerhouse foundation excavation.

Construction of the proposed powerhouse and a portion of the tailrace will be set back from the Abitibi River shoreline (see Figure 2.8). Due to the presence of sand, it is anticipated that a pumped dewatering system possibly combined with a trench cut-off and/or sheet pile cut-off will be required during excavation and construction (Figure 2.14).

Figure 2.14 Powerhouse Excavation Behind Earth Plug and Sheet Piling Cofferdam



It is anticipated that tailrace construction in the channel involving overburden excavation would be undertaken after completion of the powerhouse substructure. Once the cofferdam is constructed, the area enclosed by the cofferdam will be pumped dry to facilitate nearshore sediment excavation and extension of the tailrace. The tailrace area will require rip-rap lining to protect against erosion and sloughing of the overburden. Portions of the Abitibi River bank in the immediate vicinity of the tailrace area may also require shoreline rip-rap protection to minimize toe erosion due to scouring and lower bank sloughing along the river bank. A retaining wall or a tied steel sheet pile wall will extend out from the powerhouse draft tube piers to assist in reducing the excavated quantities. After construction completion the final shoreline plug/sheet pile will be removed in the wet.

The final site grading and elevations will be designed to minimize erosion and manage stormwater in accordance with the Stormwater Management Plan prepared by the DBC based on the Ontario Ministry of the Environment (MOE, 2003) report “Stormwater Management Planning and Design Manual” and the conditions of the Environmental Compliance Approval (ECA) under the *OWRA*.

Upon construction completion, the site will be restored and re-vegetated based on the Site Rehabilitation Plan.

CRP/OPG currently envisions hiring a DBC that will be responsible for the detailed design and construction of the proposed New Post Creek Project. The DBC would also be responsible for obtaining construction-related permits and approvals that would be required for the proposed Project dependent on the final designs prepared by the DBC. A list of anticipated permits and approvals required during construction and operation phases is provided in Section 7.2.1.

Construction is anticipated to last up to 30 months.

2.4.1.1 Inundation and Total Cleared Areas

As indicated in Table 2.2, the proposed Project is projected to result in an estimated inundated area of 170 ha. The inundation is limited to the portion of waterway and land upstream of the proposed spillway structures. The inundated areas associated with the proposed Project are a combination of riparian shoreline and moist forest-covered areas (see Figure 2.6). The total area affected by the proposed Project has been calculated from mapping and by adding up the areas of the various proposed Project components. The total area affected was apportioned into three categories:

1. Permanent Loss of Area – this is a permanent loss of existing habitat to facilities and structures such as a road, dam, powerhouse and transmission line ROW.
2. Temporary Loss of Area – this is a temporary loss of existing habitat associated with land required for the construction period of the proposed Project.
3. New Water Area – is the total loss of terrestrial habitat due to the reservoir inundation and creation of aquatic habitat.

The areas affected by the proposed Project components are presented in Table 2.3.

Table 2.3 Quantification of Areas Affected by Proposed Project Components

Project Component	Permanent Loss of Area (ha)[1]	Temporary Loss of Terrestrial Area (ha)[1]	Creation of New Water Area (ha)
Camps (maximum)	NA[2]	8	NA
Borrow Areas (maximum)	NA	NA	NA
Access Roads	15	9	NA
Intake and Spillway Structures	<1	<1	
Power Canal, Penstocks, Powerhouse and Tailrace	7	7	NA
Switchyards and Substations	<1	<1	NA
Inundation	170[3]	NA	131
Transmission Line ROW (maximum)[4]	34	NA	NA
Total	226	24	131

[1] Includes New Post Creek, associated tributaries and land base.
[2] NA=not applicable.
[3] Including permanent conversion of riverine habitat to lacustrine habitat.
[4] Based on 50 m width.

The final total area to be cleared will be refined as detailed design of the proposed Project progresses. It is assumed that all temporary construction roads will be included in the footprint identified in Table 2.3. It also assumes that borrow areas would not be a permanent loss from the land base, since once the resources are depleted, site restoration will be undertaken by the borrow operators.

Vegetation clearing will involve a combination of manual and mechanical approaches. Based on commitments made to the Aboriginal communities, no chemical methods will be utilized for vegetation clearing.

2.4.1.2 Requirements for Off-site Land Use and Other Ancillary Features

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

Existing road access leading to the proposed GS Site is provided by Provincial Highway 634 to the Abitibi Canyon GS and a short section of the Otter Rapids Road (private road) which ends at the Otter Rapids GS (see Figure 2.2).

Further access to the proposed GS Site would be via a disused clay-topped forestry road, approximately 6.1 km in length, that would have to be substantially expanded and reinforced (see Figures 2.2 and 2.15). This is a single-lane road that was constructed by grubbing and heaping the clay soil to create a sub-grade, with portions topped with sand and/or gravel. This road is assumed to have been constructed in 1980 to provide access for harvesting and has subsequently not received maintenance. The existing road would have to be upgraded and extended approximately 530 m and 1,450 m to the proposed intake and powerhouse locations, respectively. This road traverses two permanent unnamed watercourses. In addition, there are six cross-drainage culverts along the operational road to facilitate seasonal water flows and avoid pooling along the road. Culvert replacement will require a permit from the MNR.

CRP/OPG presumes that access to the east bank of the New Post Creek, as may be necessary for the construction of the dam structures, will be provided with a temporary bridge across the creek at the intake area. Other old forestry roads north of the Otter Rapids Road bridge over New Post Creek such as Parliament Loop Road may also provide access to the east bank of the creek. Figure 2.15 shows the potential access route along Parliament Loop Road. These roads would require construction and environmental mitigation measures by the DBC prior to use, and would be upgraded in accordance with permit approvals from MNR.

Access to the west bank of the Abitibi River for construction of the proposed transmission line is provided by an existing road network to the interconnection point with the existing Hydro One transmission line and is considered adequate for construction equipment traversal (see Figure 2.10). Proposed transmission line construction is expected to be carried out in winter with no additional access road creation. In any case, the DBC will have to secure permits and approvals regardless of the season of proposed transmission line construction.

Figure 2.15 Proposed Project Access

The proposed interconnection point will be accessed using the Fraserdale Primary Road (#634), Branch Road #1 and an unnamed operational (logging) road (see Figures 2.2 and 2.15) that bisects the Pinard Moraine Conservation Reserve which was regulated by the MNR in 2005. Upon regulation, this road continues to be used by the forestry industry as per agreement with the MNR. An Area of Concern (AoC) prescription for use of this road during proposed Project construction may be required from the MNR.

A construction camp will likely be required to accommodate up to approximately 100 workers for the three-year duration of proposed Project construction. The DBC will decide the camp location and have responsibility for acquisition of relevant permits. It is anticipated that the camp would be constructed in the Abitibi Canyon GS area where OPG currently has a Water Power Lease and a Licence of Occupation (LO).

Construction staging or lay-down areas will be required and are expected to be close to the main construction sites, e.g., intake and spillway structures, penstocks and powerhouse. These areas will be used for vehicle and equipment parking, materials storage, construction facilities (e.g., site office, security buildings/cabins) and construction access provision. CRP/OPG has identified from a practical perspective a number of areas that will likely be used during construction (see Figure 2.3). In some cases, the DBC will use areas that will be permanently lost to infrastructure for temporary uses. These opportunities can occur during proposed Project staging. The DBC will be required to obtain any land use permits and licences for temporary construction activities.

Borrow areas will be required primarily for the earth fill dam and dykes and other aggregate use. CRP/OPG anticipates that aggregate from the excavations would be used and supplemented from several nearby existing borrow areas for which the DBC would have to secure permits or procurement from those already holding the permits. Figure 2.2 shows the locations of potential borrow areas.

CRP/OPG will provide as much information as possible regarding the locations of borrow areas which might be used during the construction phase. Confirmation of the specific borrow areas is not possible for CRP/OPG to provide at the EA stage, as the final selection and permitting for use of these areas will be the responsibility of the DBC.

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

2.4.1.3 Construction Schedule and Strategy

The proposed New Post Creek Project is currently completing the Definition Phase, which includes:

- completion of the OWA Class EA process;
- selection of a DBC for construction; and
- procurement of a revenue agreement or contract with the Ontario government.

When all Definition Phase tasks are complete, CRP/OPG will complete a final review of the proposed Project and make a decision to proceed into the "Execution Phase". This phase includes CRP and OPG obtaining respective board approval to proceed.

The earliest time frame in which construction would start is 2014 and it is expected that construction phase will last approximately 30 months.

In the Execution Phase, CRP/OPG currently envisions hiring a third party contractor, i.e., DBC, who will be responsible for the detailed design and construction of the proposed Project. The DBC would be responsible for completing detailed final stamped designs and obtaining all construction-related permits and approvals, e.g., Permits-to-Take-Water (PTTWs) for cofferdams and construction-related activities, road use and watercrossing approvals, aggregate permits, etc.

CRP/OPG is committed to working with federal and provincial agencies to address information requirements related to construction and operation approvals or authorizations.

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

CRP/OPG anticipates that explosives will be required during construction. All necessary permits will be obtained by the DBC, who will also comply with all legal requirements in connection with the use, storage and transportation of explosives, including, but not limited to, the *Canadian Explosives Act* and the *Transportation of Dangerous Goods Act* (see Section 4.2.2.4). Environmental monitoring during construction will also occur to ensure commitments in the ER and other permits are being followed as intended (see Section 7.2).

2.4.2 Operation

2.4.2.1 Proposed New Post Creek Hydroelectric GS

Operation of the New Post Creek Diversion Dam has been designed in a manner which requires minimal intervention by OPG personnel. Since 1974, the dam has been operated by leaving the stop logs set at elevation 218.80 m to maximize diversion flow while eliminating the need for ongoing log operations at the dam (OPG *et al*., 2006). When the headwater exceeds this elevation, water spills over the stop logs and flows downstream along the old channel of the Little Abitibi River.

Operation of the proposed New Post Creek Hydroelectric GS will be unmanned. No permanent staff will be stationed at the facility. Operating and maintenance personnel will visit the site only to perform specific periodic routine inspection and servicing tasks, or to deal with necessary investigations and repairs, when these are required.

Once placed into service, the proposed GS will be operated from the OPG North East Control Centre (NECC) in Timmins. The station will be monitored on a continuous basis by OPG operators from a control room where all North East Plant Group (NEPG) units are controlled. As well as monitoring the operation of the station, the NECC control room operators will initiate such operations as starting, synchronizing and stopping the turbine generators and adjusting their loads, opening and closing sluice gates as required to manage the forebay operations and downstream flows, and responding to malfunctions of the equipment brought to their attention.

Maintenance of the trash rack and intake, such as removal of timber debris, will be performed manually or with mobile equipment from the intake deck. There is an option to add automated equipment for this activity in the future.

The intake bay for each penstock will have self-closing vertical lift gates to ensure that the penstocks and powerhouse can be safely isolated and dewatered under all conditions.

Maintenance of the draft tubes or turbines will require the use of a draft tube bulkhead system. Consequently, the powerhouse will be equipped with one set of draft tube bulkhead gates (for one unit at a time), with the gates to be installed using a monorail hoist travelling across the tailrace deck. The gates will be stored in the gate slots above tailwater level.

The base case operating scheme, as outlined in the feasibility update report (KGS Group, 2010), involves the passage of minimum flows downstream to the New Post Creek waterfalls and the remaining flow diverted from the creek and passed through the turbine units to generate electricity. During high flow periods, flow diversion will meet the maximum flow capacity of the turbines. Plant capacity will be 50 m^3/s. During spring, significant flows will continue downstream of the intake weir to the waterfalls, as the estimated average New Post Creek flows for May and June are 131 m^3/s and 71 m^3/s, respectively. During the rest of the year, the minimum flow will be first released downstream of the weir with the remaining flow diverted to the turbines to generate electricity.

When the diverted creek flow is less than the lowest plant operating flow of the smallest turbine unit (typically 40% of the unit capacity for a Francis turbine), pulsed operation would occur. It is expected to occur primarily during the low flow winter periods and would use the limited storage available in the forebay to provide additional generation. Using a FSL of 187.00 m.a.s.l., sufficient storage would be available to augment low creek inflow in order to operate one turbine unit for several hours. This operation could be repeated throughout the day as flow permits, thereby generating additional energy during a period when the plant would otherwise be shut down. The plant will release flow in any day equal to the volume of inflow. This pulsing operation provides additional technical (and cost) benefits such as ensuring continued flow through the penstocks and station heating in the winter months. For example, for two equal sized turbine units with a capacity of 25 m^3/s each, the plant would operate in pulsed mode at riparian flows between approximately 2 and 12 m^3/s during parts of February and March (based on a 2 m^3/s minimum flow for this period). Pulsing will be undertaken during other times of the year when there is not enough flow to provide the minimum flow and run the turbines.

Annual water levels in New Post Creek vary by approximately 3 m. With pulsing, water level fluctuations will be less, but occur more frequently over short periods of time. Water level fluctuations will be limited to 0.5 m below the usual full headpond water level. Pulsing will be permitted at any time during the year within this operating range of 0.5 m provided minimum flows are directed over the spillway and no negative effects due to pulsing, that can not be otherwise mitigated, are observed (G. Funnell, MNR, 2013, pers. comm.).

2.4.2.2 Operating Regime

The existing Abitibi River Water Management Plan (WMP) (OPG *et al*., 2006) will need to be amended through an Administrative Amendment. Flows and levels for the proposed New Post Creek Hydroelectric GS will comply with the amended Abitibi River WMP.

Operation will be constrained by the minimum flow required in the existing channel mandated as required for the waterfalls downstream. This minimum flow was agreed to with MNR, Ontario Parks and Department of Fisheries and Oceans (DFO) during the Definition Phase. All parties have been working towards the operating regime that:

a) continues to provide important ecological functions;
b) ensures that the proposed Project is economically viable;
c) respects TTN's historic and modern day interests;
d) ensures and enhances public safety; and
e) ensures continual flow down New Post Creek and over the waterfalls to maintain aesthetic value.

As a pre-condition, it was agreed that the proposed Project will not change the total volume of water flowing into the Abitibi River, or the operating considerations for OPG's Abitibi Canyon GS and Otter Rapids GS. Total flows from New Post Creek into the Abitibi River will remain unchanged (except that there will now be two discharge locations, i.e., at the proposed GS tailrace and the existing New Post Creek outlet). As a result, flow magnitude, frequency, timing, duration and rate of change will be different than current flow conditions at the New Post Creek outlet.

The minimum flows that must be maintained downstream of the spillway structure at all times are provided below:

Period	Minimum Flow (m^3/s)
Approximately May 1 to mid-June[1]; timing dependent on spring spawning and egg incubation period[2]	15
Mid-June to August 31	7.5
September 1 to 30	5
October 1 to approximately April 30; timing dependent on Walleye (*Sander vitreus*) spawning initiation	2

[1] To be expanded to include Lake Sturgeon spawning and egg incubation period if spawning occurrence is demonstrated.

[2] Brief transition of flows from 15 to 7.5 m^3/s from the end of egg incubation (based on thermal units accumulated) with the rampdown rate (m^3/s per day) to be determined in consultation with the MNR and DFO.

The proposed Project will have a relatively small headpond (approximately 170 ha) and will hold approximately 8,000,000 m^3 of water. However, all of the water within the headpond is not available to the proposed facility to use for generation since the facility is only permitted to vary the headpond water level by 0.5 m. Therefore, the headpond will have limited ability to store water and the intended operation of the facility is to utilize the water as it comes down New Post Creek, while maintaining a minimum flow through the downstream creek reach and over the waterfalls. For clarity, the proposed headpond will not be drained for generation and replenished.

The forebay fluctuations are intended to provide operation during low flow periods primarily in late winter and late summer. This pulsing will be an automatic process and will involve the following:

1. The turbines are expected to require a minimum of approximately 10 m^3/s to operate. Any time the total flow in New Post Creek is less than 10 m^3/s plus the minimum downstream flow requirement, the turbine units will not be able to operate.
2. In such situations, the proposed GS will be allowed to draw down the forebay within the prescribed range at a flow rate that will optimize efficiency.
3. When the water level reaches its lower limit, the units will shut down until the forebay returns to its high level. This will not be co-ordinated with the time of day for increasing revenue but will be an automatic process.
4. The fluctuation is expected to be lower in the winter to maintain an ice cover on the forebay.
5. This cycle will repeat most frequently in situations when flows are just below the required 10 m^3/s plus the minimum downstream flow requirement. The situation that would cause the most frequent starts/stops would be during the winter. In such cases the cycle could be expected to repeat every 8 to 48 h, depending upon riparian flow.
6. In the prescribed period where a 50 cm band is achievable, the cycle would be expected to repeat every 48 to 150 h, depending upon riparian flow.
7. The flows downstream of the dam would not change during this process as they will remain as the defined minimum flow requirement.

The 7.5 m^3/s requirement between mid-June and August 31 is used as an example to better illustrate the minimum flow operation. Depending on the available inflow, there are basically three scenarios:

1. When there is not enough flow to provide the minimum flow of 7.5 m^3/s **and** run the turbines (requires approximately 10 m^3/s), the minimum flow of 7.5 m^3/s will continue to be provided down New Post Creek and over the waterfalls. Any remaining water will be held back within the headpond. The headpond has limited capacity to hold water within the 0.5 m band. Therefore, once enough water has collected in the headpond to run the station for a reasonable duration, it will restart and begin generation. When the lower limit of the band is reached, generation will stop. This cycle could happen a few times a day during a low flow period; however, the 7.5 m^3/s minimum flow will be maintained.

2. For the majority of the summer period, it is expected that there will be enough flow to provide the 7.5 m^3/s and operate the proposed GS continuously. The proposed GS will be designed in a manner to run in low flow situations so that operations can continue as frequently as practical in order to minimize any stop/start cycles for the equipment. In this scenario, a constant flow of 7.5 m^3/s is provided down New Post Creek.

3. In situations where the flow exceeds the amount required to provide the 7.5 m^3/s minimum flow and the maximum flow that the proposed GS can utilize (approximately 50 m^3/s), the additional water will be spilled through New Post Creek increasing the flow above 7.5 m^3/s.

In all cases (other than a natural drought condition in which all available flow will be released down the creek), a minimum flow of 7.5 m^3/s will be provided during the summer period downstream in New Post Creek and over the waterfalls.

With respect to water levels, it is proposed that the upper FSL of 187.00 m.a.s.l. be used as the normal maximum operating level with a minimum operating level of 182.00 m.a.s.l. The proposed headpond water levels are summarized below:

- Maximum Operating Level (flood conditions): 187.50 m.a.s.l.
- Normal Maximum Operating Level: 187.00 m.a.s.l.
- Normal Minimum Operating Level: 186.50 m.a.s.l.
- Absolute Minimum Level: 182.00 m.a.s.l.
- Minimum Level for Periodic Headpond Maintenance: 182.30 m.a.s.l.

2.4.2.3 Transmission Facilities

The proposed transmission facilities would be inspected on an annual basis using a combination of aerial and/or ground reconnaissance. Additional inspections may be required after the occurrence of any harsh weather conditions or upon occurrence of any line faults. Emergency repairs could occur at any point in the year.

Vegetation control on the ROW will be required, involving a combination of manual and mechanical approaches. Based on commitments made to the Aboriginal communities, no chemical treatment will be utilized for vegetation management.

2.4.3 Decommissioning

The history of hydroelectric generating stations in Ontario is that they are typically not decommissioned. Rather, as the structures near the end of their engineered life, they are either re-developed or refurbished. The societal benefit of these hydroelectric assets and their associated infrastructure, e.g., transmission and distribution lines, is such that these re-investments are usually considered economically, socially and environmentally preferable to developing new energy projects. As such, no specific decommissioning activities have been identified. Rather, transmission and distribution structures and lines would be maintained and/or replaced as part of ongoing operations.

3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

3.1 AQUATIC ENVIRONMENT

More detailed information on the existing aquatic environment baseline conditions is provided in the Aquatic Environment TSD.

3.1.1 Site Surface and Groundwater Hydrology

At the proposed New Post Creek site, surface water drainage is towards New Post Creek to the east and the Abitibi River to the west.

No defined watercourses are present within the proposed GS construction footprint (encompassing the intake, water conveyance system, powerhouse and laydown/ assembly areas). A permanent unnamed watercourse (MNR ID# 523) discharges to New Post Creek approximately 150 m upstream of the proposed Project intake location, draining lands to the south and north of Otter Rapids Road. The lower reaches of this and nine other unnamed watercourses further upstream would be inundated by the proposed headpond (see Section 4.3.8).

The existing operational access road from Otter Rapids Road to the proposed construction footprint traverses two permanent unnamed watercourses, i.e., MNR watercrossings #589 and #635 that drain into the Abitibi River (Section 4.3.8). In addition, there are six cross-drainage culverts along the road to facilitate seasonal water flows and preclude pooling.

The proposed transmission line ROW traverses Pinard Creek (MNR ID#540) and its tributary (MNR ID#538), as well as two tributaries (MNR #554 and #629) of an unnamed watercourse and a second unnamed watercourse (MNR ID#485). All watercourses traversed discharge into the Abitibi River (see Section 3.1.9.1). A small (0.4 ha) pond (MNR #6273) is also traversed.

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

Based on hydrogeological investigations near New Post Creek, there is a relatively shallow groundwater table, approximately 2 m below ground surface, within the upper silty soils and till zones. Somewhat deeper (approximately 3.7 m) perched groundwater regimes were also identified within the overburden due to the differing permeability characteristics of the stratigraphic units. Inland, the groundwater table was deeper ranging from approximately 21 to 25 m. Groundwater levels ranging from approximately 5 to 7 m in the sand and basal till layers of the overburden near the proposed powerhouse location closely reflect the water levels of the

Abitibi River. A slight upward seepage gradient was observed in the test holes along the east bank of the Abitibi River (KGS Group, 2013a).

3.1.2 Abitibi River

3.1.2.1 Hydrology

The Abitibi River occurs within the Moose River drainage basin of the Hudson Bay Drainage System (Figure 3.1). The Moose River drainage basin drains approximately 109,000 km^2 traversing two physiographic regions, i.e., the Great Clay Belt and the Hudson Bay Lowlands, and extending south to the Canadian Shield (Brousseau and Goodchild, l989).

The Abitibi River extends approximately 285 km from its headwaters to its confluence with the Moose River draining two other major rivers, Frederick House River and Little Abitibi River (OPG *et al*., 2006). The Abitibi River and its tributaries drain approximately 33,987 km^2.

Based on historical hydrological data, greatest streamflow occurs during the spring freshet in May and June with the lowest flows occurring generally during the winter (see Table 3.1).

Figure 3.1 Moose River Drainage Basin

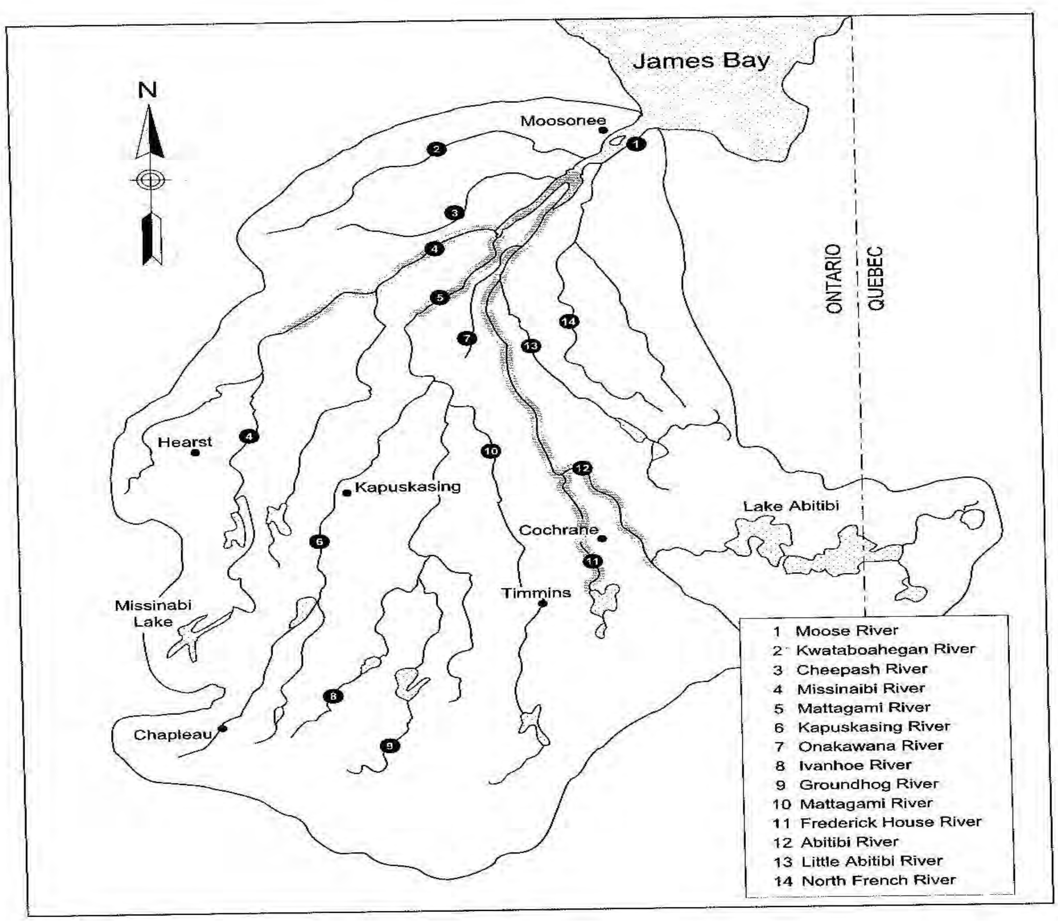


Table 3.1 Minimum, Maximum, as well as Monthly and Annual Mean Discharges (m^3/s) of the Abitibi River[1]

Location	Period of Record	Metric	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Abitibi Canyon GS[2]	1929 – 1994	Mean	205	213	227	451	653	380	263	213	235	300	276	213	300
		Max	309	392	394	898	1,620	1.040	688	407	591	710	713	368	424
		Min	114	121	141	192	198	172	152	141	146	150	129	106	213
Otter Rapids GS[3]	1961 – 1994	Mean	226	232	233	472	722	418	290	250	268	347	310	242	334
		Max	325	407	375	881	1,330	911	618	442	399	666	746	404	473
		Min	136	138	158	201	249	224	178	161	160	168	186	163	220

[1] Source: Water Survey of Canada (WSC): http://www.wsc.ec.gc.ca.
[2] Station ID: 04ME002; Location: 49°52’55”N; 81°34’0”W; drainage area of 22,900 km^2.
[3] Station ID: 04ME004; Location: 50°10’55”N; 81°38’12”W; drainage area of 23,400 km^2.

Annual flow metrics based on the 30 years of data are presented in Table 3.2.

Table 3.2 Annual Regulated Flow Metrics for the Abitibi River[1]

Descriptive Metric	Value	
	Abitibi Canyon GS[2]	**Otter Rapids GS[3]**
Drainage Area (km^2)	22,900	23,400
Mean Annual Flow (m^3/s)	279.2	317.9
20% Time Exceeded Flow (m^3/s)	311.5	371.3
Median Flow (m^3/s)	227.7	252.4
80% Time Exceeded Flow (m^3/s)	175.9	188.1
Month of Maximum Median Flow	May	May
Month of Minimum Median Flow	September	August

[1] Source: OPG *et al.* (2006); based on 1973-2002 data.

The Abitibi River at the proposed Project tailrace location is affected by the backwater influence of the Otter Rapids Reservoir controlled by the Otter Rapids GS approximately 28 km downstream. The river at the tailrace location is relatively deep and velocities are low. The water level is essentially equivalent to the water level controlled at the Otter Rapids Dam, and typically ranges between 119.90 and 121.89 m.a.s.l. The water level can fluctuate rapidly, possibly varying over the full range within a few hours, or less.

River freeze-up generally occurs at the end of November, whereas ice break-up usually occurs in April (MNR, 1984). The freeze-up and break-up dates are approximate and will vary according to ambient temperature, channel width and orientation, and water flow.

3.1.2.2 Morphology and Bathymetry

Within the Great Clay Belt, gradients are more regular with bedrock outcrops tending to occur along significant faults (Brousseau and Goodchild, 1989). River channels are contained within well-defined, narrow flood plains. Long meandering runs occur between rapids and falls. Channel widths generally vary between 100 and 200 m.

An escarpment marks the beginning of the Hudson Bay Lowlands. This bedrock fault is manifested at Otter Rapids GS.

High steeply sloping soil banks predominantly occur along both banks of the Abitibi River with no exposed bedrock above the existing river level (Ontario Hydro, 1982). Subsequently, several small locations of exposed bedrock above the river level have been observed between Abitibi Canyon and the outlet of New Post Creek (G. Coker, C. Portt and Associates, 2013, pers. comm.). Vegetation frequently extends down to the shoreline, with intermittent areas of exposed steep overburden (sands, silts, tills) bluffs of low (1 to 3 m) to high (10 m) elevations (KGS Group, 2006).

A detailed description of the morphology and bathymetry of the Abitibi River at the proposed tailrace location is presented in Section 3.1.9.1.

3.1.3 New Post Creek

3.1.3.1 Hydrology

<u>Pre-diversion</u>

Historically, New Post Creek was a permanent lotic system and minor tributary of the Abitibi River, with an estimated average flow of less than 4 m^3/s, approximately nine times lower than the current average diverted flow (~35 m^3/s based on 1975 to 2010 data) (KGS Group, 2010). Based on Traditional Knowledge, the creek was only navigable by canoe during the spring freshet and in the fall during extended periods of precipitation (P. Archibald Sr., TTN, 2011, pers. comm.). In contrast, most of New Post Creek can currently be travelled by canoe during the entire navigation season, requiring portages only at the Otter Rapids Road bridge and the New Post Creek waterfalls just upstream of its outlet to the Abitibi River (http://www.myccr.com).

Table 3.3 presents the estimated natural (pre-diversion) flows of New Post Creek. The mean monthly flow range from lows of 1.3 m^3/s in February and March to highs of 13.8 and 7.5 m^3/s in May and June, respectively, during the freshet. The highest monthly flows in May and June were 21.4 and 18.0 m^3/s, respectively. For the remainder of the year, the mean monthly flows ranged from 2.0 to 4.8 m^3/s in January and October, respectively. For the ten non-freshet months, the overall mean monthly flow was approximately 3.2 m^3/s.

Table 3.3 Estimated Natural (Pre-diversion) Mean, Maximum and Minimum Monthly Flows (m^3/s) at New Post Creek Outlet to the Abitibi River[1]

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1975	1.8	1.4	1.0	1.0	11.9	8.4	3.7	1.7	1.2	1.2	2.9	2.4
1976	1.8	1.2	1.0	4.3	16.0	6.4	2.4	2.9	2.3	4.2	2.7	1.9
1977	1.4	1.0	0.9	7.4	12.5	4.8	5.3	3.2	8.5	3.9	4.8	3.7
1978	2.6	1.3	0.9	0.8	17.0	18.0	11.4	3.8	5.4	11.3	5.1	2.8
1979	1.6	1.0	0.9	3.5	15.3	11.1	5.1	3.3	3.9	7.1	7.6	3.8
1980	2.3	1.5	1.2	3.9	16.9	8.2	3.2	3.2	3.4	4.8	4.4	3.0
1981	2.0	1.3	1.3	6.2	18.6	11.5	4.4	2.5	3.4	4.8	4.4	3.0
1982	2.3	1.4	0.6	1.2	17.2	5.3	4.7	4.1	5.4	8.8	10.4	5.5
1983	2.9	1.4	0.8	1.4	17.4	12.2	2.8	2.9	3.4	4.8	4.4	3.0
1984	1.7	1.1	1.0	5.3	9.3	7.9	9.7	2.0	0.4	4.5	4.4	3.0
1985	2.6	1.0	0.5	3.2	14.5	5.4	4.9	4.2	2.2	4.5	4.4	2.2
1986	2.0	1.3	1.3	3.9	14.8	4.9	4.5	6.3	4.9	6.6	4.0	2.1
1987	2.0	1.3	1.3	3.8	6.6	6.5	3.9	3.6	3.4	4.8	4.4	3.0
1988	2.0	1.3	1.1	3.4	21.3	6.5	3.6	7.8	4.4	4.7	4.3	3.0
1989	2.8	1.8	1.3	2.6	16.8	11.7	4.9	2.9	1.4	3.3	6.0	3.3
1990	2.0	1.3	1.1	4.1	16.8	10.5	6.3	6.0	4.3	5.4	4.4	3.0
1991	2.0	1.3	1.3	5.7	13.3	5.9	1.5	1.7	4.9	4.8	4.4	3.0

Table 3.3 Estimated Natural (Pre-diversion) Mean, Maximum and Minimum Monthly Flows (m^3/s) at New Post Creek Outlet to the Abitibi River[1] (Cont'd)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1992	2.0	1.3	1.3	4.2	20.2	5.2	2.7	1.6	3.1	4.5	4.0	2.7
1993	2.4	1.4	1.3	4.2	13.8	7.5	4.1	3.3	3.4	5.5	3.9	1.6
1994	2.0	1.3	1.3	3.4	10.2	8.6	4.9	7.7	4.7	4.1	4.1	2.9
1995	1.7	1.2	1.3	1.5	15.6	9.2	3.5	2.3	3.2	6.6	7.0	2.7
1996	1.6	1.3	1.3	4.2	13.8	7.5	4.1	3.3	3.4	4.8	4.4	3.0
1997	2.0	1.3	1.3	4.2	13.8	7.5	4.1	3.3	3.4	4.8	4.0	1.1
1998	1.0	1.3	1.3	6.5	4.1	1.9	2.2	3.3	3.1	1.7	1.2	1.5
1999	1.1	0.9	1.3	4.2	12.0	6.8	2.5	1.1	3.4	4.5	4.3	2.8
2000	3.0	1.9	1.1	4.1	8.3	9.5	4.8	1.6	0.6	0.9	1.0	1.0
2001	0.6	0.6	1.2	6.5	12.5	3.3	2.8	1.0	4.3	5.1	4.7	4.8
2002	2.9	2.2	1.7	7.6	17.2	6.9	1.8	1.5	1.6	6.9	4.4	3.0
2003	2.0	1.3	1.3	4.2	13.9	4.4	4.7	7.8	7.8	10.0	4.3	3.0
2004	2.0	1.3	1.3	4.2	13.9	7.3	4.1	2.9	3.6	3.2	5.2	3.0
2005	2.8	1.4	1.4	6.1	12.6	3.4	1.9	3.3	3.4	8.0	7.2	5.2
2006	1.3	0.8	1.3	4.2	9.1	1.8	0.9	3.1	3.4	4.8	4.4	3.0
2007	2.7	1.3	1.3	4.7	9.1	15.8	6.1	1.9	2.9	3.2	3.8	3.2
2008	2.5	1.3	1.3	6.8	21.4	8.6	5.3	3.7	3.5	4.4	4.5	3.0
2009	2.3	1.5	1.2	2.6	20.6	9.2	8.2	4.6	1.4	1.1	2.1	2.9
2010	0.9	0.7	0.6	3.7	3.8	2.3	2.2	2.1	5.2	5.0	3.1	3.1
2011	1.7	1.0	0.7	2.4	15.0	9.0	2.9	1.4	1.2	1.6	2.9	1.8
2012	1.2	0.9	6.8	9.8	8.4	3.4	1.0	1.7	1.2	1.8	4.8	6.3
Mean	2.0	1.3	1.3	4.2	13.8	7.5	4.1	3.3	3.4	4.8	4.4	3.0
Maximum	3.0	2.2	6.8	9.8	21.4	18.0	11.4	7.8	8.5	11.3	10.4	6.3
Minimum	0.6	0.6	0.5	0.8	3.8	1.8	0.9	1.0	0.4	0.9	1.0	1.0

[1] Discharge data for the period January 1975 to December 2012 based on Ontario Hydro/OPG New Post Diversion Dam gauge data and using the Regional Flood Frequency method based on the ratio of the delineated drainage basin of New Post Creek downstream of the diversion dam (319 km^2) and that of the known drainage area of the Little Abitibi River upstream of the diversion dam (2,706 km^2).

Post-diversion

The New Post Creek Diversion Dam was constructed in 1963 by Ontario Hydro on the Little Abitibi River to divert flows from the river into New Post Creek to discharge into the Abitibi River approximately 12 km downstream of Abitibi Canyon GS and 20 km upstream of Otter Rapids GS. The dam allows significant flows to be diverted along the constructed New Post Creek Diversion Channel and New Post Creek to the Abitibi River, increasing inflows to Otter Rapids GS by approximately 12%. Flow in New Post Creek increased approximately ten times, from an estimated mean flow of approximately 4.4 m^3/s to the current mean diverted flow of approximately 42 m^3/s (based on 1975-2012 data).

Since 1974, the New Post Creek Diversion Dam has been operated by leaving the stop logs set at elevation 218.80 m. This allows OPG to maximize diversion flow while eliminating stop log operations at the diversion dam. When the headwater exceeds the elevation of the stop logs, water spills into the old channel of the Little Abitibi River. As a result, significantly lower flows currently occur in the Little Abitibi River downstream of the diversion dam than were present historically. Access to the diversion dam is by helicopter, and a MNR-authorized winter trail.

The drainage area of New Post Creek is 319 km^2, whereas the drainage area of the Little Abitibi River upstream of the dam is approximately 2,706 km^2. This entire area of approximately 3,025 km^2 would be drained through New Post Creek when flow is not being passed through the dam on the Little Abitibi River.

Based on hydrological data between 1975 and 2012, greatest streamflow occurs during the spring freshet in May and June with the lowest flows occurring generally in the winter (see Table 3.4).

Table 3.4 Mean, Maximum and Minimum Monthly Flows (m^3/s) at New Post Creek Outlet to the Abitibi River (1975 to 2012)[1]

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1975	16.8	13.7	9.8	9.8	112.7	79.7	35.3	16.3	11.5	11.4	27.4	22.5
1976	17.2	11.6	9.1	40.7	151.4	60.8	22.6	27.7	22.1	39.7	25.3	18.0
1977	13.4	9.5	8.9	69.8	118.1	45.5	50.4	30.7	81.0	36.9	45.6	34.7
1978	24.8	12.1	8.2	8.0	161.3	171.0	108.1	36.4	50.7	107.5	48.0	27.0
1979	14.8	9.9	8.2	32.8	145.2	105.7	48.6	31.1	36.7	67.5	71.8	35.9
1980	22.0	14.4	11.4	37.4	160.3	77.6	30.7	30.2	32.7	45.4	42.1	28.2
1981	18.8	11.9	12.2	58.4	176.4	108.6	41.5	23.4	32.7	45.4	42.1	28.2
1982	22.1	13.6	5.9	11.1	163.4	50.5	44.7	39.2	51.0	83.5	98.6	52.5
1983	27.2	13.1	7.9	13.2	164.9	115.3	26.4	27.4	32.7	45.4	42.1	28.2
1984	16.3	10.5	9.6	50.0	88.1	75.3	92.2	18.5	3.4	42.8	42.1	28.2
1985	24.9	9.9	4.5	30.5	137.2	51.4	46.6	40.2	21.0	42.6	42.0	20.9
1986	18.8	11.9	12.2	37.4	140.0	46.3	42.7	60.0	46.2	62.2	38.3	20.3
1987	18.8	11.9	12.2	35.6	62.9	61.8	36.6	33.8	32.7	45.4	42.1	28.2
1988	18.9	12.5	10.6	31.9	202.2	61.3	34.3	73.7	41.8	45.0	40.5	28.2
1989	26.9	16.9	12.6	24.9	159.1	110.8	46.5	27.8	13.5	31.4	57.2	31.0
1990	18.7	12.2	10.8	38.5	159.1	99.7	59.7	56.9	40.8	51.1	42.1	28.2
1991	18.8	11.9	12.2	54.2	126.3	56.1	14.1	16.4	46.8	45.4	42.1	28.2
1992	18.8	11.9	12.2	39.8	191.3	49.6	25.7	15.2	29.0	42.6	37.9	25.2
1993	22.3	13.1	12.0	40.2	131.2	70.9	39.3	31.1	32.7	52.0	37.2	15.2
1994	18.8	11.9	12.2	32.0	97.0	81.3	46.4	73.3	44.7	39.2	38.6	27.9
1995	16.2	11.6	12.2	14.0	148.1	87.4	33.6	22.8	30.0	62.7	66.2	25.6
1996	14.9	12.5	12.2	40.2	131.2	70.9	39.3	31.1	32.7	45.4	42.1	28.2
1997	18.8	11.9	12.2	40.2	131.2	70.9	39.3	31.1	32.7	45.4	38.2	10.9
1998	9.5	11.9	12.2	61.9	38.9	17.9	20.9	31.1	29.5	15.8	11.0	13.8
1999	10.5	8.3	12.2	40.2	113.4	64.3	24.0	10.7	32.7	42.6	41.1	26.6
2000	28.6	18.0	10.8	38.6	78.9	89.7	45.3	15.0	5.5	8.7	9.6	9.1
2001	5.9	5.5	11.1	61.9	118.6	30.9	26.2	9.7	41.2	48.4	44.6	45.9
2002	27.5	20.9	15.7	72.0	163.3	65.0	17.2	14.2	15.6	65.0	42.1	28.2

Table 3.4 Mean, Maximum and Minimum Monthly Flows (m^3/s) at New Post Creek Outlet to the Abitibi River (1975 to 2012)[1] (Cont'd)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2003	18.8	11.9	12.2	40.2	132.0	41.6	44.5	73.6	73.6	94.5	41.0	28.2
2004	18.8	11.9	12.2	40.2	132.1	69.5	39.0	27.2	34.3	30.4	49.6	28.1
2005	26.3	13.3	13.2	57.9	119.0	31.8	18.4	31.1	32.2	76.0	68.0	49.4
2006	12.6	7.5	12.2	40.2	86.0	17.1	8.7	29.3	32.7	45.4	42.1	28.2
2007	25.4	11.9	12.2	44.4	86.5	149.7	57.5	17.7	27.4	30.6	35.9	30.7
2008	23.4	11.9	12.2	64.9	202.8	82.0	50.4	35.0	32.8	41.6	42.9	28.6
2009	21.9	14.5	11.6	25.0	195.7	87.2	78.2	44.0	13.5	10.3	20.2	27.4
2010	8.9	6.8	6.1	34.7	36.5	21.7	20.9	20.3	49.6	47.4	29.4	29.4
2011	16.4	9.1	6.2	22.8	142.5	85.4	27.7	13.6	10.9	15.3	27.7	17.5
2012	11.5	8.2	64.4	92.8	79.4	31.8	9.7	16.0	11.3	16.7	45.5	60.0
Mean	18.8	11.9	12.2	40.2	131.2	70.9	39.3	31.1	32.7	45.4	42.1	28.2
Maximum	28.6	20.9	64.4	92.8	202.8	171.0	108.1	73.7	81.0	107.5	98.6	60.0
Minimum	5.9	5.5	4.5	8.0	36.5	17.1	8.7	9.7	3.4	8.7	9.6	9.1

[1] Discharge data for the period January 1975 to October 2009 based on Ontario Hydro New Post Diversion Dam gauge data; November 2009 to December 2012 based on WSC gauge station 04ME005 provisional data (Location: 49°58'19"N; 81°30'43"W; approximately 1 km downstream of proposed intake weir location).

Annual flow metrics for the Little Abitibi River at New Post Creek Diversion Dam are presented in Table 3.5.

Table 3.5 Annual Regulated Flow Metrics for the Little Abitibi River at New Post Creek Diversion Dam[1]

Descriptive Metric	Value
Drainage Area (km^2)	2,702
Mean Annual Flow (m^3/s)	36.0
20% Time Exceeded Flow (m^3/s)	54.4
Median Flow (m^3/s)	22.3
80% Time Exceeded Flow (m^3/s)	7.8
Month of Maximum Median Flow	May
Month of Minimum Median Flow	March

[1] Source: OPG *et al.* (2006); based on 1973-2002 data.

3.1.3.2 Morphology and Bathymetry

<u>Pre-Diversion</u>

Ontario Hydro (1961) undertook a pre-diversion reconnaissance of New Post Creek and its tributary Worobec Creek in late August 1961 to assess the potential effects of the proposed diversion. A detailed description of the reconnaissance findings is provided in the Aquatic Environment TSD.

Valley erosion in or along the north edge of the "so-called Takwata moraine", composed predominantly of fine granular soils, was evident along a portion of Worobec Creek and much of New Post Creek (Ontario Hydro, 1961). As these soils were more subject to erosion, the streams were eroding a deep narrow valley, with evidence of considerable erosion and/or deposition over some reaches. From the confluence of the two creeks to the rapids at Otter Rapids Road, Ontario Hydro (1961) opined that under conditions of increased flow and velocities due to the proposed diversion, "serious erosion may occur, "S"-shaped meanders may deepen and finally connect forming oxbows, and in this process many woodfalls would occur." Water level elevation above the present stream would also result in extensive flooding into the dense forest on the adjacent broad alluvial flats.

From the rapids at Otter Rapids Road to approximately 7 km downstream, New Post Creek was eroding a deep narrow valley through generally unstable, easily eroded, fine granular soils. The slopes were rendered unstable by undercutting at their toes resulting in slides and numerous woodfalls blocking the channel. Ontario Hydro (1961) indicated that under conditions of increased flow and velocities, these erosional processes would be accentuated.

Farther downstream to the waterfalls, New Post Creek flowed through a glacial till plain transected by easterly trending bedrock ridges. Erosion effects were negligible with no woodfalls in the creek.

<u>Post-diversion</u>

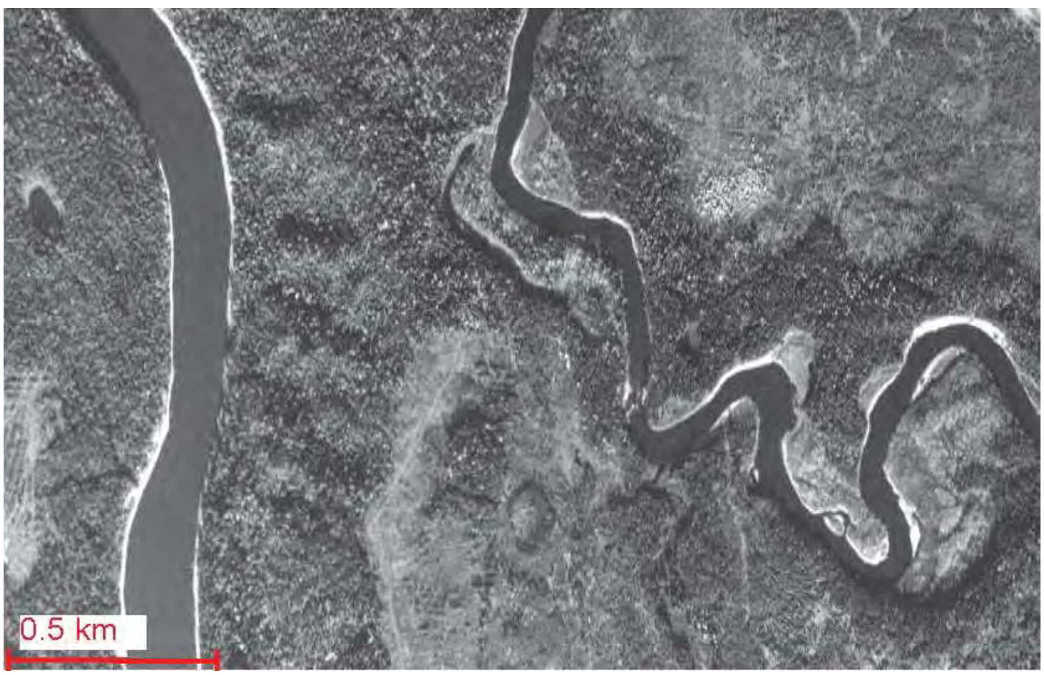
As indicated in Section 3.1.3.1, with the construction and operation of the New Post Creek Diversion Dam, flow in New Post Creek increased approximately nine times, from an estimated mean flow of less than 4 m^3/s to the current mean diverted flow of approximately 35 m^3/s, based on 1975 to 2010 data (KGS Group, 2010). The majority of erosion of New Post Creek occurred in the 1960s upon initiation of the New Post Creek Diversion Dam operation with subsequent reduction of erosion rates. The increase in flow and associated erosion would have a dramatic impact on the channel morphology of the creek (Parish, 1998). The channel would have to adjust its cross-sectional form and planform pattern. The adjustments would create a wider and deeper channel. The spacing of pools and riffles would increase and channel sinuosity would decrease. These responses would occur over decades, and if the channel flows do not change further, a stable channel form would eventually be attained.

The magnitude of the impact of Little Abitibi River diversion on New Post Creek is clearly evident by comparing pre- and post-diversion aerial photographs presented as Photographs 3.1 and 3.2, respectively, indicating that much of the land adjacent to New Post Creek has been affected by inundation, flooding and erosion (Beacon, 2010).

Reaches of New Post Creek that are in bedrock have provided a natural base for maintenance of channel alignment and morphology.

Photograph 3.1 Pre-diversion (1947) New Post Creek

Photograph 3.2 Post-diversion (2005) New Post Creek



Based on review of air photos taken in 1971, 1978 and 1994, Parish (1998) reported that channel width has increased by 0.7 to 2.8 times along New Post Creek over the 23 years of coverage, which equates to an erosion rate of approximately 65 cm per year. In addition, channel length has decreased resulting in a lower sinuosity value (Table 3.6). This change was due to the increased flows and erosion of the sandy banks, which have cut-off meander bends, creating numerous oxbow lakes.

Table 3.6 Summary of Changes to Channel Planform for a New Post Creek Reach[1]

Metric	1971	1978	1994
Channel Width (m)	25	31	39
Channel Length (m)	2,265	2.186	1,980
Sinuosity	1.49	1.42	1.15

[1] Source: Parish (1998).

The alignment of present New Post Creek appears to follow closely the northern limit of the Pinard Moraine (see Section 3.2.3). The creek has cut down through the moraine material to form a broad floodplain with associated oxbows and braided channels at a number of locations. Because of the extensive downcutting and the nature of the creek valley, soils along much of the creek are described as being of Alluvial Plain origin.

New Post Creek has exposed shorelines with active toe erosion and scouring of the silt and sand slopes that range from a few metres in height, up to approximately 10 m (KGS Group, 2006).

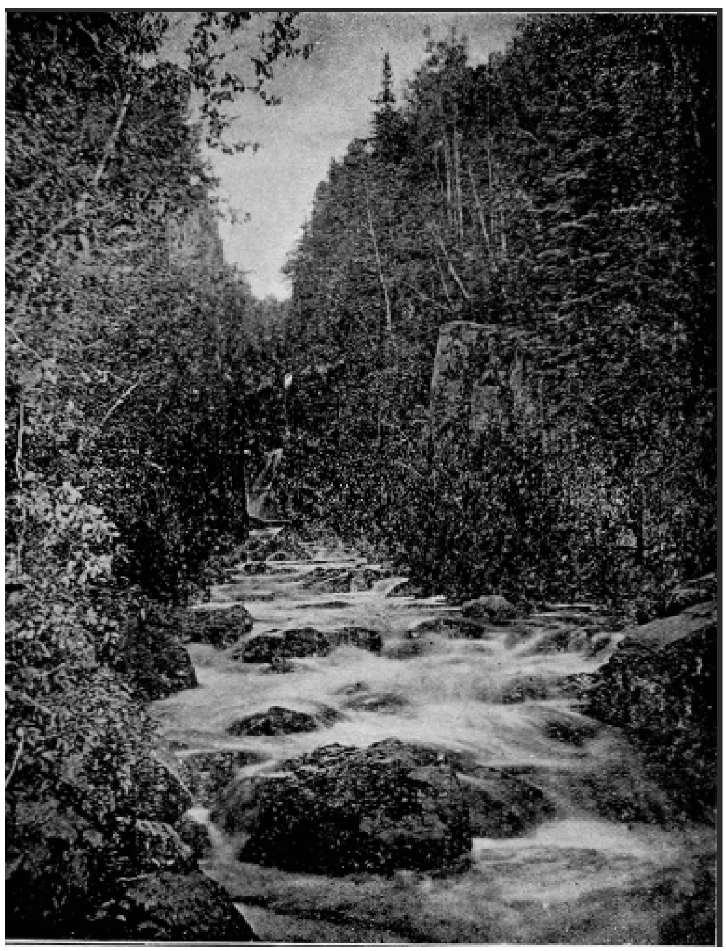
Based on a helicopter survey of the shoreline conditions, ERDE (1998) observed “severe” and “severe/active” (i.e., bank toe erosion or upper bank failure) along 37.025 km (54.8%) of the shoreline and banks within the study area. “Moderate” erosion conditions occurred along 12.915 km (19.1%).

New Post Creek waterfalls consists of a 170 m long stretch of steep rapids at its upstream end, a vertical falls that drops approximately 40 m, an 8 to 19 m wide narrow chute that is 210 m long with several smaller waterfalls, and some very shallow rapids about 140 m long at the downstream end (Coker and Portt, 2013a). Photograph 3.3 depicts the waterfalls on May 26, 2010 when water flow was 30.8 m^3/s.

A reduction of water flowing over New Post Creek waterfalls due to the proposed New Post Creek Project would result in flows more typical of natural conditions as recalled by TTN Elders (P. Archibald Sr., TTN, 2011, pers. comm.). As described by Bell (1904), “an interesting fall is that on the Blue Water river or New Post brook just behind New Post. At this point the small stream enters the Abitibi with an almost vertical fall of ninety feet, flowing directly over the edge of the plateau in a veritable hanging valley”. Photograph 3.4 taken in 1899 shows New Post Creek waterfalls and the rapids at its base prior to flow diversion.

Photograph 3.3 New Post Creek Waterfalls, May 26, 2010, Discharge = 30.8 m^3/s

Photograph 3.4 New Post Creek Waterfalls, 1899 (Bell, 1904)



Photograph 3.5 was taken on October 28, 2009 from approximately the same location as that taken in 1899 (Photograph 3.4) of New Post Creek at the mouth of the rock canyon. Based on comparison of the two photographs, it is evident that the boulders and cobble that can be seen in the streambed in the 1899 photograph foreground have been scoured down by at least 5 m. As indicated by Bell (1904), the vertical falls was approximately 90 feet (30 m) in 1899 compared to approximately 40 m in 2009 (Coker and Portt, 2013a). The shape of the waterfalls in the 1899 photograph suggests that the water level at its base was just below the log wedged on an angle within the canyon shown in the 2009 photograph. Downstream of the wedged log, the additional step falls and the deep channel in the foreground of the 2009 photograph are the result of scouring that has occurred since the diversion in 1963. As a result, the tops of the canyon sides and associated trees appear to be much higher in the 2009 photograph due to the scoured (lower) creek bed.

Photograph 3.5 New Post Creek Waterfalls, October 28, 2009, Discharge = 11.26 m^3/s

A detailed description of New Post Creek morphology and bathymetry from the upstream inundation limit to its confluence with the Abitibi River is provided in Section 3.1.10.1.

3.1.4 Water Quality

Water quality data are available for the Abitibi River near Onakawana approximately 75 km downstream of the proposed Project powerhouse location based on studies undertaken as part of the EA of the proposed lignite mine and power development (Lammers *et al*., 1972; MOE, 1972; EAG, 1981). Water quality surveys of the Moose River system, including the Abitibi River, have also been undertaken by the MNR (Brousseau and Goodchild, 1989).

Based on these studies, water quality in the Abitibi River and Little Abitibi River is relatively good (see Aquatic Environment TSD), reflective of the lack of major contaminant sources in the drainage basin.

The MOE (1972) reported that high turbidity in the Abitibi River due to fine particulate sediment reduced visibility in the water to 15 to 20 cm.

EAG (1981) reported that water quality in the Abitibi River was moderately poor primarily due to fecal bacteria levels and elevated concentrations of dissolved and suspended matter rendering the water unfit for drinking, unless treated.

The MOE requested CRP/OPG to undertake seasonal water quality monitoring in New Post Creek at the proposed Project intake location based on the MOE, Northern Region, "Guidance for Conducting Baseline and Post-Development Monitoring of Water Quality and Fish Tissue for Proposed Waterpower Projects". Water samples were collected from New Post Creek near the proposed Project intake location on four occasions: November 2 and 17, 2011, May 24, 2012 and September 19, 2012. The concentrations of most parameters were below their respective Provincial Water Quality Objectives (PWQOs) or within the range found in uncontaminated waters in northern Ontario (see Table 3.7).

The total phosphorus (TP) concentrations on November 2, 2011 and September 19, 2012 were above the interim PWQO of 0.030 mg/L to avoid excessive plant growth in watercourses. For the November 17, 2011 and May 24, 2012 samples, the analytical detection limit for TP was above the interim PWQO. The elevated TP concentrations are likely due to the decomposition of organic matter. Excessive plant growth is unlikely in New Post Creek due to the elevated turbidity levels. The U.S EPA (1976) reported a maximum desirable TP concentration of 0.10 mg/L in streams or other flowing waters not discharging directly to lakes or impoundments for the prevention of plant nuisances.

The aluminum concentrations were above the PWQO of 0.075 mg/L; however, this PWQO is based on clay-free samples. For cadmium, cobalt, silver, thallium, uranium and vanadium, the analytical detection limits were above the respective PWQO or interim PWQOs. The copper and zinc concentrations on November 17, 2011 were slightly above their respective PWQOs.

Table 3.7 New Post Creek Water Quality Data

Parameter (mg/L unless otherwise indicated)	Nov 2, 2011	Nov 17, 2011	May 24, 2012	Sep 19, 2012	PWQO[1]
pH (units)	7.85	7.65	7.56	8.04	6.5-8.5
Colour (TCU)	153	<5[2]	137	92	-
Turbidity (NTU)	5.5	5.4	3.5	3.1	-[3]
Conductivity (µS/cm)	109	116	95	146	-
Alkalinity (as $CaCO_3$)	62	56	49	78	-[4]
Bicarbonate (as $CaCO_3$)	62	56	49	78	-
Carbonate (as $CaCO_3$)	<5	<5	<5	<5	-
Hydroxide (as $CaCO_3$)	<5	<5	<5	<5	-
Hardness (as $CaCO_3$)	60	67	52	82	-
Total Dissolved Solids	108	100	186	100	-
Total Organic Carbon	19.2	20.4	15.3	11.8	-
Dissolved Organic Carbon	18.1	n/a[5]	12.6	11.8	-
Ammonia (as N)	0.08	0.07	<0.02	0.08	-[6]
Nitrite (as N)	<0.05	<0.05	<0.05	<0.05	-
Nitrate (as N)	<0.05	<0.05	<0.05	<0.05	-
Total Phosphorus	0.07	<0.05	<0.05	0.08	-[7]
Ortho Phosphate (as P)	<0.10	<0.10	<0.10	<0.10	-
Chloride	0.49	0.46	0.39	0.49	-
Fluoride	<0.05	<0.05	<0.05	<0.05	-
Bromide	<0.05	<0.05	<0.05	<0.05	-
Sulphate	1.40	1.94	1.22	1.66	-
Calcium	17.4	19.5	15.4	23.7	-
Magnesium	3.93	4.52	3.38	5.51	-
Potassium	0.45	0.39	0.37	0.51	-
Sodium	1.08	1.10	0.89	1.42	-
Reactive Silica	3.49	4.86	2.91	3.74	-
Aluminum	0.088	0.101	0.189	0.221	0.075[8]
Antimony	<0.003	<0.003	<0.003	<0.003	0.020[9]
Arsenic	<0.003	<0.003	<0.003	<0.003	0.100
Barium	0.005	0.006	0.005	0.008	-
Beryllium	<0.001	<0.001	<0.001	<0.001	0.011
Boron	<0.010	<0.010	<0.010	<0.010	0.200[9]
Cadmium	<0.002	<0.002	<0.002	<0.002	0.0002[9]
Chromium	<0.003	<0.003	<0.003	<0.003	0.100
Cobalt	<0.001	<0.001	<0.001	<0.001	0.0006[9]
Copper	<0.003	0.006	<0.003	<0.003	0.005
Iron	0.168	0.206	0.189	0.181	0.300
Lead	<0.002	<0.002	<0.002	<0.002	0.020
Manganese	0.013	0.015	0.015	0.016	-
Mercury (µg/L)	<0.1	<0.1	<0.1	<0.1	0.2[10]
Molybdenum	<0.002	<0.002	<0.002	<0.002	0.010[9]
Nickel	<0.003	<0.003	<0.003	<0.003	0.025
Selenium	<0.004	<0.004	<0.004	<0.004	0.100

Table 3.7 New Post Creek Water Quality Data (Cont'd)

Parameter (mg/L unless otherwise indicated)	Nov 2, 2011	Nov 17, 2011	May 24, 2012	Sep 19, 2012	PWQO[1]
Silver	<0.002	<0.002	<0.002	<0.002	0.0001
Strontium	0.029	0.034	0.025	0.041	-
Thallium	<0.006	<0.006	<0.006	<0.006	0.0003[9]
Tin	<0.002	<0.002	<0.002	<0.002	-
Titanium	0.004	0.004	0.005	0.007	-
Tungsten	n/a	n/a	n/a	<0.010	0.030[9]
Uranium	<0.002	<0.002	<0.002	<0.002	0.0005[9]
Vanadium	<0.002	<0.002	<0.002	<0.002	0.0007[9]
Zinc	0.025	0.038	0.027	0.025	0.030
Zirconium	n/a	n/a	n/a	<0.004	0.004[9]

[1] PWQO=Provincial Water Quality Objective (MOEE, 1994).
[2] Erroneous analytical result.
[3] Suspended matter should not be added to surface water in concentrations that would change the natural Secchi disc reading by more than 10%.
[4] Alkalinity should not be decreased by more than 25% of the natural concentration.
[5] n/a = not analyzed.
[6] Based on pH and temperature, the total ammonia concentration was below the PWQO of 0.020 mg/L for un-ionized ammonia.
[7] Interim PWQO: to avoid nuisance concentrations of algae in lakes, average TP concentrations for the ice-free period should not exceed 0.020 mg/L. Excessive plant growth in rivers and streams should be eliminated at a TP concentration below 0.030 mg/L.
[8] Based total aluminum measured in clay-free samples.
[9] Interim PWQO.
[10] In a filtered water sample

3.1.5 Sediment Type and Quality

Sediments in the Abitibi River within the Great Clay Belt can be expected to be predominantly silt and clay, particularly in the in-stream lakes and slower moving sections of the river.

Based on four samples, surficial sediment in New Post Creek is predominantly sand comprising 59.2 to 94.5% of the particle size distribution. Clay is a minor component (range of 1.88 to 5.63%).

A more detailed description of substrate type and distribution in New Post Creek and the Abitibi River in the area of the proposed tailrace location is provided in Section 3.1.9.1.

EAG (1981) reported that sediment quality in the Abitibi River near Onakawana was good. Nutrient and metal concentrations were typical for northern watercourses unaffected by anthropogenic activities, with the values varying according to the grain size distribution of the sample.

Based on the good water quality of New Post Creek (see Table 3.7), the sediments can be expected to have low concentrations of contaminants.

3.1.6 Aquatic Vegetation

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

A total of 22 aquatic macrophyte species identified within the proposed New Post Creek Project study area. Of these, 20 are designated by the MNR Natural Heritage Information Centre (NHIC, 2010) as S5, i.e., secure – common, widespread and abundant in the Province; one is designated as S4?, i.e., apparently secure – uncommon but not rare with some cause for long-term concern due to declines or other factors (? indicates rank uncertain); and one is designated as S4S5, i.e., apparently secure to secure. The list of aquatic macrophyte species is provided in the Terrestrial Environment TSD.

No aquatic macrophytes were observed in New Post Creek at the proposed intake weir location (see Photograph 2.1), or in the Abitibi River at the proposed tailrace location (see Photograph 2.2).

3.1.7 Plankton

There are two algal communities in most lotic (fast river) systems: the potamoplankton, or drift plankton, and the periphyton (Aufwuchs), or benthic algae.

Lakes on lotic systems are the major source of potamoplankton, with diatoms almost universally the most important constituents (Williams and Scott, 1962).

However, the periphyton is by far the more important algal community in terms of the ecology and productivity of rivers. This community can be divided into three types (Round, 1973). The epilithic type consists of benthic algae attached to rocks. The epiphytic type is attached larger filamentous algae, bryophytes (mosses) and aquatic macrophytes. The epipelic type is a rich algal flora, mainly composed of diatoms, associated with the bed sediments.

Similarly, lakes are the major source of zooplankton with rotifers the dominant taxon in rivers (Williams, 1966).

3.1.8 Benthic Macroinvertebrates

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

Appendix B of the Aquatic Environment TSD provides a list of the benthic macroinvertebrate taxa recorded in the Abitibi River. The occurrence of numerous species of the relatively more sensitive benthic macroinvertebrate groups, Ephemeroptera (mayfly nymphs), Plecoptera (stonefly nymphs) and Trichoptera (caddisfly larvae), attests to the good water quality of the Abitibi River (see Section 3.1.4).

EAG (1981) reported that the benthic macroinvertebrate communities in the Abitibi River near Onakawana were simple and of low diversity. Community structure suggested good water quality for relatively unproductive northern waters unaffected by anthropogenic activities. Many of the species present are sensitive to water quality deterioration.

Benthic macroinvertebrate samples were collected at six locations in the Abitibi River. The benthic macroinvertebrate community composition is provided in the Aquatic Environment TSD. The low benthic macroinvertebrate densities (43 to 516/m^2), number of taxa (1 to 6) and species diversities (0 to 2.6) reflected the homogeneous, unproductive habitat afforded by the smooth, predominantly sand/clay substrate.

Benthic macroinvertebrate communities were also sampled at 10 locations in New Post Creek upstream of the waterfalls (upstream and downstream of the proposed intake weir location). The benthic macroinvertebrate community composition data are presented in the Aquatic Environment TSD. The benthic macroinvertebrate communities had higher densities, number of taxa and species diversities, reflecting the more diverse habitat conditions and good water quality. Moreover, the greater diversities and densities of the communities are likely important to fish productivity below the waterfalls due to downstream drift. As indicated in Section 7.3, a benthic macroinvertebrate community and drift sampling program will be undertaken in New Post Creek below the waterfalls prior to proposed Project construction initiation to provide a baseline for a subsequent identical sampling program to be undertaken during operation of the proposed GS.

3.1.9 Fisheries Resources

The Abitibi River provides coolwater fish habitat, with Walleye the most important fish species common throughout the river (Seyler, 1997). Northern Pike and White Sucker are also common throughout the river. Lake Sturgeon has also been documented throughout the Abitibi River, whereas Lake Whitefish has been reported in the upper reaches of the Abitibi River. Other relatively common fish species include Goldeye, Mooneye, Longnose Sucker, Shorthead Redhorse, Yellow Perch, Burbot, Mottled Sculpin and various minnows (Cyprinidae).

Seyler (1997) reported the presence of 24 resident fish species in the Abitibi River proper. Based on more recent information (e.g., Hendry and Chang, 2001), OPG *et al*. (2006) identified 26 resident fish species and three species that occur in tributaries and are occasional residents (see Table 3.8). Brook Trout are present in those smaller tributaries that provide coldwater habitat. Brook Trout are also reported to occur in the Little Abitibi River likely originating from its feeder tributaries (Ontario Parks, 2006). Brook Stickleback and Ninespine Stickleback also occur in tributaries and are occasional residents.

Table 3.8 Fish Species Recorded in the Abitibi River[1]

Common Name	Scientific Name	Resident Status	Provincial Status[2]
Lake Sturgeon[3]	*Acipenser fulvescens*	River resident	S3
Goldeye	*Hiodon alosiodes*	River resident	S3
Mooneye	*H. tergisus*	River resident	S4
Lake Chub	*Couesius plumbeus*	River resident	S5
Golden Shiner	*Notemigonus crysoleucas*	River resident	S5
Emerald Shiner	*Notropis atherinoides*	River resident	S5
Spottail Shiner	*N. hudsonius*	River resident	S5
Longnose Dace	*Rhinichthys cataractae*	River resident	S5
Fallfish	*Semotilus corporalis*	River resident, lower reaches only	S4
Pearl Dace	*Margariscus margarita*	River resident	S5
Longnose Sucker	*Catostomus catostomus*	River resident	S5
White Sucker	*C. commersonii*	River resident	S5
Shorthead Redhorse	*Moxostoma macrolepidotum*	River resident	S5
Brown Bullhead	*Ameiurus nebulosis*	River resident	S5
Northern Pike	*Esox lucius*	River resident	S5
Cisco (Lake Herring)	*Coregonus artedii*	River resident	S5
Lake Whitefish	*C. clupeaformis*	River resident	S5
Brook Trout	*Salvelinus fontinalis*	Present in tributaries, occasional residents	S5
Burbot (Ling)	*Lota lota*	River resident	S5
Trout-perch	*Percopsis omiscomaycus*	River resident	S5
Brook Stickleback	*Culaea inconstans*	Present in tributaries, occasional residents	S5
Ninespine Stickleback	*Pungitius pungitius*	Present in tributaries, occasional residents	S5
Mottled Sculpin	*Cottus bairdii*	River resident	S5
Rock Bass	*Ambloplites rupestris*	River resident	S5
Yellow Perch	*Perca flavescens*	River resident	S5
Sauger	*Sander canadensis*	River resident	S4
Walleye	*S. vitreus*	River resident	S5
Johnny Darter	*Etheostoma nigrum*	River resident	S5
Logperch	*Percina caprodes*	River resident	S5

[1] Source: Seyler (1997); OPG *et al*. (2006).
[2] Designated as a species of special concern federally (COSEWIC, 2012) and provincially (MNR, 2013).

Of the 29 species recorded in the Abitibi River, 24 are designated by the NHIC (2010) as S5 (secure), three are designated as S4 (apparently secure) and two are designated as S3, i.e., vulnerable – due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making the species vulnerable to extirpation.

Lake Sturgeon is designated as Special Concern federally (COSEWIC, 2012) and provincially (MNR, 2013). Payne (1987) reported that the Lake Sturgeon population in the Abitibi River between Island Falls and the Abitibi Canyon Dam was robust. The Lake Sturgeon population between Abitibi Canyon Dam and Otter Rapids Dam is isolated and not large, and its available critical habitats are not well understood (C. Chenier, MNR, 2013, pers. comm.).

Some small “grass pike”, i.e., Northern Pike, were present in pre-diversion New Post Creek upstream of the waterfalls, but generally the creek was not a reliable source of fish (P. Archibald Sr., TTN, 2011, pers. comm.).

The TTN did harvest fish below the New Post Creek waterfalls using nets during the spawning period, including Walleye, Lake Sturgeon and suckers (P. Archibald Sr., TTN, 2011, pers. comm.). There were also “a lot of Mooneye and the odd Lake Whitefish”. The TTN would sometimes string a line with 1-inch hooks baited with Walleye or sucker across the mouth of the creek to catch Lake Sturgeon.

3.1.9.1 Existing Aquatic Habitat

Aquatic habitat mapping and assessment were undertaken of the Abitibi River in the vicinity of the proposed Project tailrace location and of New Post Creek from downstream of the waterfalls to the Otter Rapids Road bridge (Coker and Portt, 2013a). Aquatic habitat mapping and assessment were also undertaken of the lower reaches of accessible New Post Creek tributaries that would be inundated by the proposed headpond upstream of the proposed intake weir location. Aquatic habitat mapping and assessment were also undertaken of the waterbodies to be traversed by the proposed access roads and the transmission line ROW.

Abitibi River

The Abitibi River at the proposed tailrace location is approximately 140 m wide with a maximum depth of about 10.4 m (see Aquatic Environment TSD). The cross-section profile of the Abitibi River at this location is U-shaped. Substrate is dominated by sand and clay with occasional patches of rocks or wood debris.

The Abitibi River at the mouth of New Post Creek is approximately 170 m wide with a maximum depth of about 10 m. The centre of the channel, accounting for approximately 50% of the river width, is relatively flat and deep, and the river bottom then slopes up to each shore in a fairly uniform manner.

Tributaries of the Abitibi River

Two tributaries are traversed by the access road to the proposed GS site (Coker and Portt, 2013b), whereas five tributaries and a small pond are traversed by the proposed transmission line ROW (Coker and Portt, 2013c). Figure 3.2 shows the locations of the Abitibi River tributaries.

Brook Stickleback and Fathead Minnow were captured by electrofishing in Unnamed Tributary (MNR ID#635) at the road crossing. No fish were captured by electrofishing in Unnamed Tributary (MNR ID#589), although some small, resilient fish species may be present in the beaver ponds.

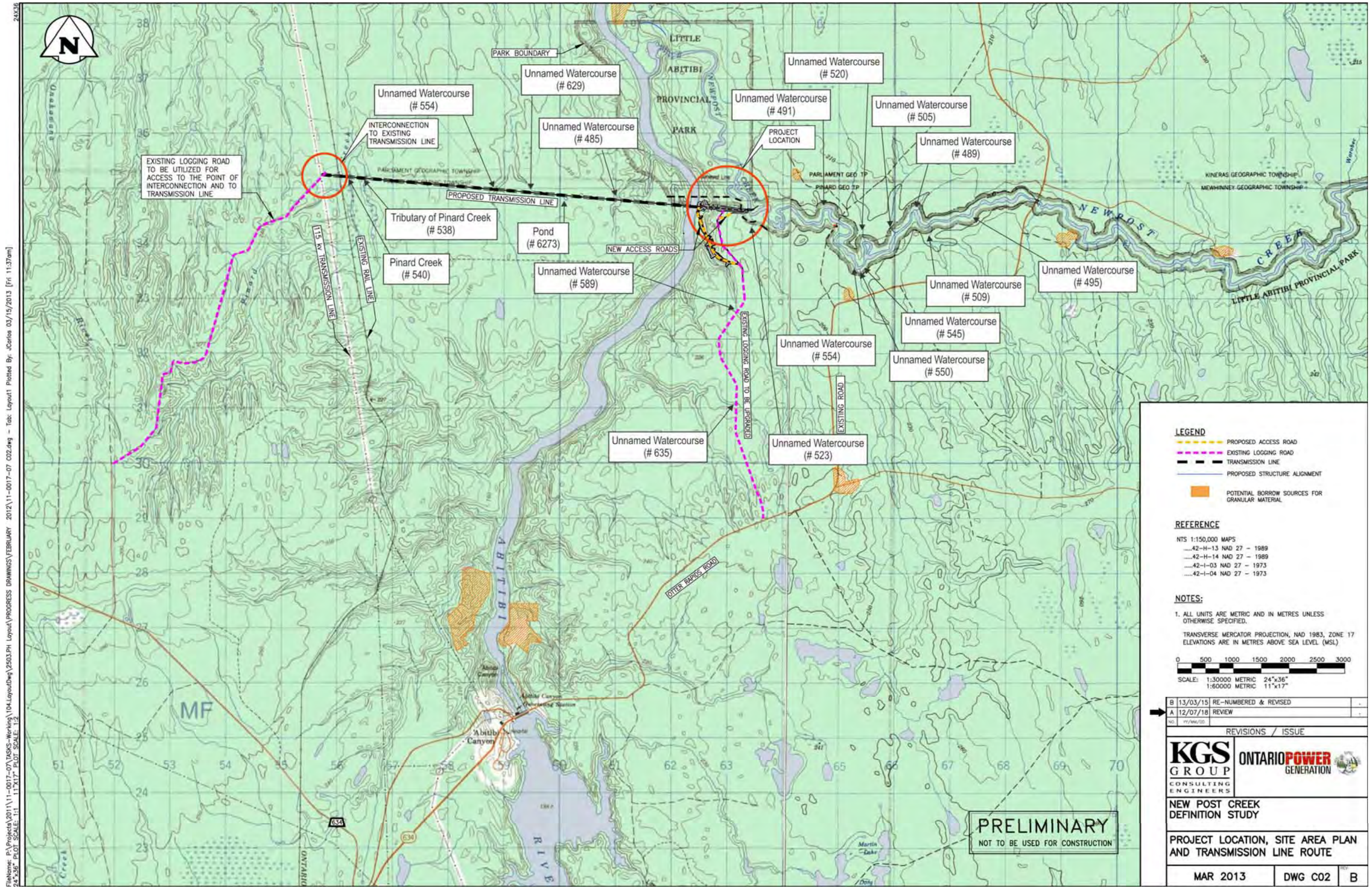
At the first and second crossings by the proposed transmission ROW, Unnamed Tributary (MNR ID#485) is considered to be ephemeral. At the third crossing, this watercourse may support simple fish communities upstream and downstream of the crossing and provide fish habitat on a seasonal basis at the ROW crossing. No fish were observed in Pond (MNR ID#6273). If fish are present, they likely comprise a simple community with one or two species of small bodied fish. Unnamed Tributary (MNR ID#629) is not considered fish habitat at the ROW crossing. Brook Stickleback was captured in the Unnamed Tributary (MNR ID#554), as well as in a small pool approximately 470 m downstream.

Based on electrofishing, Brook Stickleback was abundant and Northern Redbelly Dace was common in the Tributary of Pinard Creek (MNR ID#538). One Finescale Dace was also captured. At the crossing, Pinard Creek (MNR ID#540) is a cold, clear flowing stream with a wide range of flow velocities due to the shallow nature of the channel, and the pockets of aquatic vegetation and woody debris along the channel edge. Brook Trout was the only fish species captured by electrofishing.

New Post Creek

New Post Creek, at its mouth, is approximately 45 m wide and 3 to 4 m deep, and is similar for approximately 330 m upstream from the Abitibi River (Coker and Portt, 2013a). This section of channel is relatively uniform with mainly sand or sand/clay substrates, dropping to depth close to the left shore facing downstream, with a more gentle slope to depth along the right shore. Approximately 330 m upstream of the Abitibi River, the channel widens significantly to a maximum of approximately 230 m near the bottom of the rapids that are situated below the waterfalls (Photograph 3.6). The irregularly wide section of channel downstream of the rapids is approximately 330 m long. The majority of this reach is between 1 and 2.5 m deep, with a maximum depth of about 3.6 m. Substrate is a patchy mixture of clay/sand, sand, gravel, cobble and boulder, with one area of exposed bedrock. Water depth in this reach of New Post Creek is highly dependent upon the water level in the nearby Abitibi River, which varies with the operations of the Abitibi Canyon GS and Otter Rapids GS.

Figure 3.2 Tributaries of the Abitibi River and New Post Creek[1]



[1] It should be noted that Figure 3.2 shows the previous LAPP boundary prior to land deregulation and replacement (see Section 1.1).

Photograph 3.6 View of Rapids below New Post Creek Waterfalls

The New Post Creek waterfalls consists of a 170 m long stretch of steep rapids at its upstream end, a vertical falls that drops approximately 40 m, an 8 to 19 m wide narrow chute that is 210 m long with several smaller waterfalls, and some very shallow rapids about 140 m long with mainly cobble/boulder substrate at the downstream end (Photograph 3.6). The total difference in elevation between the upstream and downstream ends of these waterfalls, determined by GPS, is approximately 56 m.

Upstream of the waterfalls for approximately 1,390 m, New Post Creek is gently sloped (slope = 0.759 m/km) and meandering with high eroding banks throughout much of the reach, with its width ranging between 44 and 63 m. The substrate is mainly a mixture of sand, clay, gravel and cobble. The next 2,036 m upstream has more diverse habitat due to a number of bedrock outcrops that create variation in depth and velocity, with some outcrops creating short sets of rapids and others constricting the channel width, resulting in deeper habitats. While there are a couple of short riffle sections, the creek is otherwise relatively flat having an overall slope of 0.572 m/km. Along this section, stream width ranges from 32 m to 92 m, and substrates are mainly some combination of cobble, gravel and boulder, with occasional patches of bedrock. The next 1,076 m of stream, up to the proposed intake weir location, is relatively steep with a slope of 0.677 m/km. As a result, there is less variation in flow velocity and stream width ranges from 32 to 56 m. A bedrock outcrop occurs at the proposed intake weir location, approximately 4,502 m upstream of the top of the waterfalls (Photograph 2.1).

Upstream of the proposed intake weir location, for approximately 2,380 m, the creek is low gradient (slope = 0.390 m/km) and meandering, and is dominated by fine-grained substrates. A sizable area where woody debris is abundant on the bottom occurs a short distance upstream from the weir location. A couple of low gradient riffles, dominated by gravel and sand and some cobble, are apparent in this area during low flow, e.g., on September 19, 2011, when flow was 9.07 m^3/s. On September 27, 2010, no riffles were apparent at these two locations when flow was 102 m^3/s. Water depth was approximately 3 m deeper in this section of the creek on September 27, 2010, than it was on September 19, 2011. In this section, stream width ranges from 30 to 91 m. At the upstream end of this reach, approximately 2,380 m upstream of the proposed intake, and 6,882 m upstream of the waterfalls, is the first main rapids upstream of the proposed intake. This set of rapids was apparent under all flows observed, and is approximately 135 m long with a broad range of patchy substrates.

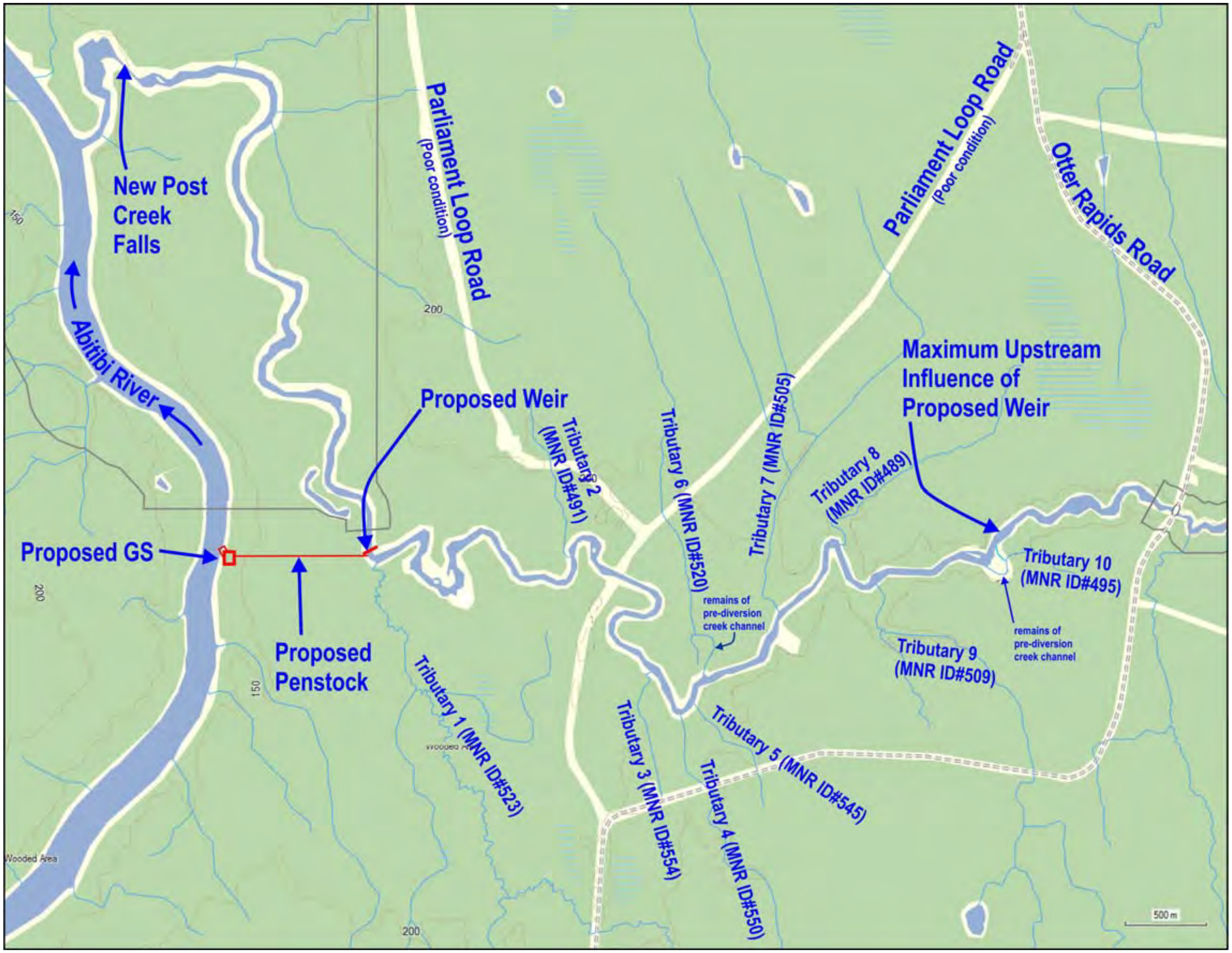
For the next 3,100 m upstream, the creek has a slightly greater gradient (slope = 0.476 m/km) and generally coarser-grained substrates. Riffle sections are slightly more numerous than in the previously described downstream reach, but they remain relatively short and gentle. Width of this reach ranged from 31 to 90 m. Approximately 5,600 m upstream of the proposed intake location, two steep, rocky sets of rapids, separated by a short section of calmer water, was the upstream limit of boat access due to safety concerns at high water, and being too shallow to navigate during low water. Therefore, no depth information was mapped within or upstream of this 448 m long set of rapids. Immediately upstream of these rapids, a flatwater section (371 m in length) has substrates dominated by sand, clay, gravel, and some cobble.

At 6,419 m upstream of the proposed intake weir location, and continuing 2,055 m upstream to the Otter Rapids Road bridge, New Post Creek was more than 50% riffle over its length on September 17, 2012, when streamflow was 7.81 m^3/s. The watercourse slope through this section is 3.407 m/km. Cobble, boulder, and gravel dominated the substrates through the main channel of this reach, although there were significant deposits of finer materials in backwater areas along the shore. The only significant area of aquatic plants observed in New Post Creek occurred in a narrow shoreline band, approximately 270 m long, on the south side of the creek. The estimated upstream extent of influence upon flow velocity and water depth, due to the proposed intake weir and operation of the GS, is expected to extend 7,166 m upstream. An oxbow wetland occurs on the south side of New Post Creek, near the upstream extent of influence from the proposed GS and intake weir.

Tributaries of New Post Creek

There are ten tributaries to New Post Creek between the proposed intake weir location and the upstream extent of backwater effect caused by the weir and the operation of the proposed GS (Figure 3.3). Some of these tributaries are traversed by Parliament Loop Road, potentially used to access the proposed Project from the east side of New Post Creek (Coker and Portt, 2013d). Detailed descriptions of these tributaries are presented in the Aquatic Environment TSD.

Figure 3.3 New Post Creek Tributaries Upstream of the Proposed Project Weir



Tributary 1 (MNR ID#523) is the largest tributary entering New Post Creek within the study area (Figure 3.3). Numerous Slimy Sculpin, which prefers cold water temperatures, and one young-of-the-year (YOY) White Sucker, were collected by electrofishing upstream of New Post Creek. Slimy Sculpin and Brook Stickleback were also captured near Otter Rapids Road.

Tributary 2 (MNR ID#491), Tributary 3 (MNR ID#554), Tributary 5 (MNR ID#545) and Tributary 10 (MNR ID#495) are very small and have small watersheds (Figure 3.3). They likely do not provide habitat for fish (see Aquatic Environment TSD for more details).

Tributary 4 (MNR ID#550) is a relatively long watercourse with numerous beaver dams that occur at a point approximately 1,200 m upstream from New Post Creek. Slimy Sculpin and Pearl Dace were captured by electrofishing upstream of its outlet to New Post Creek, whereas Northern Redbelly Dace and Brook Stickleback were collected upstream of Otter Rapids Road.

Tributary 6 (MNR ID#520) originates in a large wetland approximately 2.8 km upstream from New Post Creek, and flows through a number of beaver ponds between the wetland and its crossing of Parliament Loop Road, approximately 760 m upstream from New Post Creek (Figure 3.3). The last 350 m of this watercourse is a meander loop of the pre-diversion New Post Creek channel that became isolated when the flows diverted from the Little Abitibi River in 1963 eroded a new course for the creek that bypassed this loop (Figure 3.3). At the Parliament Loop Road crossing, there is a large beaver pond with clay substrate and rooted aquatic plants upstream of the road. The beaver dam is perched on the top of the roadbed, and the culvert is blocked, forcing the water to flow over the road. No fish were captured by electrofishing upstream of its outlet to New Post Creek, likely because this portion of channel is dry at times. Northern Redbelly Dace and Brook Stickleback were collected below the beaver dam at Parliament Loop Road.

Tributary 7 (MNR ID#505) begins in a large wetland approximately 3 km upstream from New Post Creek, and flows through a number of beaver ponds and marshy areas up to a point approximately 850 m upstream from New Post Creek (Figure 3.3). Parliament Loop Road is traversed by the main channel of Tributary 7; approximately 1,700 m upstream of New Post Creek, as well as two smaller tributary branches to the west and east (see Figure 3.3). At the main channel crossing, a large beaver dam is perched on the upstream (north) side of the road. The culvert is blocked, with a flow of approximately 4 L/s over the roadbed. No fish were captured in this tributary by electrofishing. Based on its size, Tributary 7 likely supports a simple and sparse fish community in some locations.

Tributary 8 (MNR ID#489) originates in a large wetland approximately 1.7 km upstream from New Post Creek (Figure 3.3). Northern Redbelly Dace was collected by electrofishing.

Parliament Loop Road is traversed by an additional tributary just south of its intersection of Otter Rapids Road. This watercourse has a poorly defined channel with flows of less than and approximately 1 L/s during the two site visits. This watercourse likely discharges into Tributary

8, but may be a tributary of Wacousta Creek, which discharges into the Little Abitibi River. No fish were captured by electrofishing.

Tributary 9 (MNR ID#509) is a relatively long watercourse that begins in a network of beaver ponds and a bog lake, at least 5 km upstream from New Post Creek. A series of active and inactive beaver ponds occur along the main channel closer to New Post Creek. No fish were captured by electrofishing. However, because this watercourse has a diversity of pond habitats at various locations along its length, and habitats observed near New Post Creek are of reasonable quality, a simple fish community is probably present.

3.1.9.2 Fish Migration Barriers

The New Post Creek waterfalls located approximately 800 m upstream of the creek's outlet to the Abitibi River provides a complete barrier to upstream fish migration.

Watercourses affected by diversions such as New Post Creek generally support a low diversity of fish (C. Jorgensen, DFO, 2011, pers. comm.). It is anticipated that when flows were abruptly increased by approximately 10 times due to the diversion, a substantial number of resident fish were initially swept over the waterfalls. As indicated in Section 3.1.9, Northern Pike were present in pre-diversion New Post Creek upstream of the waterfalls, whereas none were captured during the proposed Project fisheries surveys (see Section 3.1.9.3) except for a single YOY captured by drift net at the Otter Rapids Road bridge. With little recruitment from tributaries and severed from downstream habitats and fish communities by New Post Creek waterfalls, the post-diversion fish community in New Post Creek is characterized by low diversity and sparse populations. In addition, there is likely some migration of fish from this creek section downstream over the waterfalls.

3.1.9.3 Fish Community Composition

A number of fisheries resources studies have been undertaken as part of the EA for the proposed New Post Creek Project (see Aquatic Environment TSD).

<u>Abitibi River</u>

In October 2010, Goldeye, Longnose Sucker, Shorthead Redhorse and Walleye were captured by gillnetting in the Abitibi River at the proposed tailrace location (Coker and Portt, 2012a), whereas Lake Sturgeon were netted in the vicinity of the New Post Creek outlet in May 2010 (Coker and Portt, 2012b). In September 2011, Lake Sturgeon, Goldeye, Mooneye, Longnose Sucker and Shorthead Redhorse were captured by gillnetting near the mouth of New Post Creek and adjacent to the boat ramp downstream of the Abitibi Canyon rapids (Coker and Portt, 2013a). White Sucker, Brown Bullhead, Northern Pike, Lake Whitefish, Burbot, Rock Bass, Sauger and Walleye were also captured at the boat ramp location.

Based on river index netting between Abitibi Canyon GS and Otter Rapids GS between September 22 and 26, 2010, the MNR collected seven fish species: Lake Sturgeon, Goldeye, Fallfish, Longnose Sucker, Shorthead Redhorse, Sauger and Walleye (Coker and Portt, 2013a).

Larval drift netting in the Abitibi River below Abitibi Canyon during June 2012 captured embryo and YOY Lake Sturgeon, YOY sucker (Catostomidae), YOY Walleye or Sauger and YOY Northern Pike (Coker and Portt, 2013e). Juvenile or adult Mooneye, Trout-perch and Emerald Shiner were also captured.

Fish species collected in the Abitibi River tributaries are presented in Section 3.1.9.1.

New Post Creek

Fourteen fish species were collected by electrofishing in New Post Creek downstream of the waterfalls in August 2009, May 2010, September 2011 and/or May 2012: Lake Chub, Longnose Dace, Longnose Sucker (juvenile), White Sucker (YOY), Shorthead Redhorse, Burbot (juvenile), Trout-perch, Mottled Sculpin, Slimy Sculpin, Spoonhead Sculpin, Yellow Perch (YOY), Walleye (juvenile), Johnny Darter and Logperch (Coker and Portt, 2013a). In addition, Lake Sturgeon, Mooneye, Longnose Sucker, White Sucker, Shorthead Redhorse, Northern Pike, Lake Whitefish, Burbot, Yellow Perch, Sauger and Walleye were captured during gillnetting and/or hoopnetting surveys in 2009, and gillnetting surveys in 2010, 2011 and/or 2012 in New Post Creek below the waterfalls (Coker and Portt, 2012a, b, c, d, 2013a, e).

In June 2012, drift net catches below the New Post Creek waterfalls were dominated by YOY coregonids, YOY sucker (Catostomidae) and YOY Sculpin (Cottidae), with small numbers of YOY Burbot, YOY Walleye or Sauger, YOY Yellow Perch and YOY Northern Pike (Coker and Portt, 2013e). Based on their deteriorated condition, the YOY coregonids likely originated from the Little Abitibi River upstream of New Post Creek Diversion Dam (see Section 3.1.9.6). A small number of juvenile or adult Trout-perch, Northern Redbelly Dace, Spottail Shiner, Logperch, Johnny Darter, Brook Stickleback and Brown Bullhead were also captured.

No fish were captured by electrofishing or gillnetting near the proposed intake weir location in August and October 2009, respectively, although some Sculpin were observed in August 2009 (Coker and Portt, 2013a). In 2010, low numbers of Mottled or Slimy Sculpin and Burbot (juvenile) were collected by electrofishing near the proposed intake weir location, whereas a decomposed Longnose Sucker was collected by gillnetting.

Despite intensive gillnetting and electroshocking in 2011, low numbers of Longnose Dace, Pearl Dace, Longnose Sucker (juvenile and adult), White Sucker (YOY and adult), Burbot and Sculpin (Mottled or Slimy) and Johnny Darter were captured (Coker and Portt, 2013a).

In June 2012, drift net catches in New Post Creek at the Otter Rapids Road bridge included coregonid YOY in deteriorated condition (see Section 3.1.9.6), YOY sucker (Catostomidae), YOY Sculpin (Cottidae), YOY Burbot and YOY Northern Pike, suggesting that some portion of the drift net catch below the waterfalls may be fish that had been transported from upstream in New Post Creek (Coker and Portt, 2013e). A few juvenile and adult fish were also captured including Northern Redbelly Dace, Lake Chub, Longnose Dace, Spottail Shiner, Blacknose Shiner and Fallfish.

Fish species collected in New Post Creek tributaries are presented in Section 3.1.9.1.

Overall, electrofishing, gillnetting and hoopnetting catches in the Abitibi River and New Post Creek were low. Table 3.9 presents the fish species collected in the Abitibi River, New Post Creek and their tributaries during the course of the proposed Project fisheries studies.

3.1.9.4 Walleye Spawning

Based on field observations in May 2009, 2010 and 2011, Walleye spawning does occur in the lower section of New Post Creek, downstream of the waterfalls (Coker and Portt, 2012c, d).

In May 2009 and 2011, Walleye was not observed during night observations using a 1.5 million candlepower spotlight; however, the water was very turbid which limited the potential to observe Walleye (Coker and Portt, 2012c, d). Two male Walleye in spawning condition and a nearly spent female Walleye were captured by hoopnet and gillnets in May 2009, whereas two male and one female Walleye in spawning condition were captured by gillnets in May 2011.

Walleye were observed along the shoreline during the night observations in 2010 when the flow was unusually low and the water was marginally clear (Coker and Portt, 2012c). Six male Walleye in spawning condition were captured by gillnet. Coker and Portt (2012c) opined that the lower flows (19.5 m^3/s) within New Post Creek in 2010 likely resulted in better habitat conditions for spawning Walleye than the higher flows (174.5 m^3/s) observed in 2009.

Walleye spawning is likely not a concern in the Abitibi River in the vicinity of the proposed Project tailrace (Coker and Portt, 2012c). There does not appear to be suitable spawning habitat at the proposed tailrace location, and habitat that occurs there is common and widespread in this watercourse section.

3.1.9.5 Lake Sturgeon Spawning

The James Bay Lake Sturgeon population is designated as Special Concern federally (COSEWIC, 2012) and provincially (MNR, 2013). The identification of critical Lake Sturgeon habitat, i.e., spawning, migration and nursery areas, through aquatic habitat surveys on the Abitibi River was a priority objective identified in the 1989-2000 MNR Cochrane District Fisheries Management Plan (MNR, 1988a).

Table 3.9 Fish Species Collected in the Abitibi River, New Post Creek and their Tributaries[1]

Common Name	Scientific Name	Abitibi River[2]	New Post Creek Downstream of Falls	New Post Creek Upstream of Falls[3]
Lake Sturgeon[3]	*Acipenser fulvescens*	X	X	
Goldeye	*Hiodon alosiodes*	X		
Mooneye	*H. tergisus*	X	X	
Northern Redbelly Dace	*Chrosomus eos*	X	X	X
Finescale Dace	*C. neogaeus*	X		
Lake Chub	*Couesius plumbeus*		X	X
Pearl Dace	*Margariscus margarita*			X
Emerald Shiner	*Notropis atherinoides*	X		
Blacknose Shiner	*N. heterolepis*			X
Spottail Shiner	*N. hudsonius*		X	X
Fathead Minnow	*Pimephales promelas*	X		
Longnose Dace	*Rhinichthys cataractae*		X	X
Fallfish	*Semotilus corporalis*	X		X
Longnose Sucker	*Catostomus catostomus*	X	X	X
White Sucker	*C. commersonii*	X	X	X
Shorthead Redhorse	*Moxostoma macrolepidotum*	X	X	
Brown Bullhead	*Ameiurus nebulosis*	X	X	
Northern Pike	*Esox lucius*	X	X	X
Cisco (Lake Herring)	*Coregonus artedii*		X[4]	X[4]
Lake Whitefish	*C. clupeaformis*	X	X	
Brook Trout	*Salvelinus fontinalis*	X		
Burbot (Ling)	*Lota lota*	X	X	X
Trout-perch	*Percopsis omiscomaycus*	X	X	
Brook Stickleback	*Culaea inconstans*	X	X	X
Mottled/Slimy Sculpin	*Cottus bairdii/cognatus*		X	X
Spoonhead Sculpin	*C. rice*		X	
Rock Bass	*Ambloplites rupestris*	X		
Yellow Perch	*Perca flavescens*		X	
Sauger	*Sander canadensis*	X	X	
Walleye	*S. vitreus*	X	X	
Johnny Darter	*Etheostoma nigrum*		X	X
Logperch	*Percina caprodes*		X	

1 Coker and Portt (2012a, b, c, d, 2013a, b, c, d, e).
2 Based on gillnetting and larval drift netting in the river and electrofishing and/or dipnetting of its tributaries potentially affected by the proposed Project within the local study area.
3 Based on gillnetting, larval drift netting and electrofishing in New Post Creek and electrofishing of its tributaries potentially affected by the proposed Project within the local study area.
4 Based on deterioration condition, YOY likely originated from the Little Abitibi River upstream of the New Post Creek Diversion Dam.

The rapids below Abitibi Canyon GS on the Abitibi River and the rapids downstream of the New Post Creek waterfalls are the only likely spawning locations for Lake Sturgeon. As a result, an assessment involving gillnetting and egg collection mat deployment (20 mats) in New Post Creek downstream of the waterfalls, as well as gillnetting in the Abitibi River near Abitibi Canyon, was undertaken in May and June 2011 (Coker and Portt, 2013e). A total of 13 Lake Sturgeon were captured in New Post Creek with only one being a recaptured fish and none were ripe. Below Abitibi Canyon, 30 Lake Sturgeon were captured with 12 being recaptured fish and eight were ripe males. None of the Lake Sturgeon captured and marked in either of these two areas were recaptured in the other area during the gillnetting period (May 21 to June 6, 2011).

Very few Lake Sturgeon were captured in gillnets over the first eight days of field work. On the ninth day (May 31), the number of Lake Sturgeon below Abitibi Canyon suddenly spiked to nine individuals, with seven being ripe males, indicating that the spawning run had begun. No corresponding increase in Lake Sturgeon catch, or appearance of ripe fish, occurred in New Post Creek. The spawning run below Abitibi Canyon appeared to be brief, with ripe fish captured for only two days, and the number of Lake Sturgeon captured declining after the initial spike. Although water temperatures were suitable for spawning in New Post Creek, only after the spawning period appeared to end below Abitibi Canyon did Lake Sturgeon begin to occur in greater numbers in New Post Creek. None of these fish in New Post Creek were ripe and most were in post-spawning condition (flaccid), suggesting that spawning did not occur in the creek in 2011.

No Lake Sturgeon eggs were collected in the 20 egg mats deployed in New Post Creek from May 22 to June 5, 2011, also suggesting that Lake Sturgeon spawning did not occur in the creek in 2011. A number of amber coloured eggs, approximately 3 mm in diameter, were recovered from the egg mats when they were initially set, but the number declined over the deployment period. Based on their colour and size, and the season and habitat, these eggs were probably from suckers (Catostomidae). Lake Sturgeon eggs are also approximately 3 mm in diameter, but are black in colour (Becker, 1983).

To further confirm that Lake Sturgeon spawn in the Abitibi River near Abitibi Canyon but not in New Post Creek downstream of the waterfalls, an additional assessment involving gillnetting and egg collection mat deployment were undertaken from May 11 to 23, 2012, as well as larval drift netting between May 30 and June 14, 2012.

A total of 15 Lake Sturgeon were captured in New Post Creek, of which five had been previously captured in 2011, and three of these previously captured below Abitibi Canyon. Below Abitibi Canyon, 32 Lake Sturgeon were captured, with five being recaptured fish marked in 2012 and two being recaptured fish marked in 2011 below Abitibi Canyon. None of the Lake Sturgeon captured and marked in either of these two areas in 2012, were recaptured in the other area during the gillnetting period (May 11 to 23, 2012).

All 15 Lake Sturgeon were caught in New Post Creek during the first five days of gillnetting, with none captured over the remaining seven days. None were ripe or in post-spawning condition, again suggesting that spawning did not occur in New Post Creek in 2012.

As in 2011, relatively few Lake Sturgeon were initially caught in the Abitibi River below Abitibi Canyon. Catches increased on May 19, 2012, coincident with the capture of six ripe males and one in post-spawning condition. Ripe males and females were also captured on May 20, 21 and 22, with catches declining over this period and none captured on May 23.

No Lake Sturgeon eggs were collected in the 40 egg mats deployed in New Post Creek from May 11 to 22, 2012, also suggesting that Lake Sturgeon spawning did not occur in the creek in 2012. As in 2011, a number of eggs were recovered from the egg mats and based on their amber colour, 3 mm size and the collection timing, these were likely catostomid (sucker) eggs.

No YOY Lake Sturgeon were captured in the eight to ten drift nets set in New Post Creek from May 31 to June 14 (Coker and Portt, 2013e). As indicated in Section 3.1.9.3, numerous YOY of other spring spawning fish species were collected.

In contrast, three pre-emergent Lake Sturgeon embryos were collected in the two drift nets set in the Abitibi River below Abitibi Canyon during the June 4 and 5, 2012 lifts (Coker and Portt, 2013e). These embryos were kept alive in jars of river water until they were sufficiently developed to be positively identified as Lake Sturgeon. On June 13 and 14, 2012, one and nine YOY Lake Sturgeon, respectively, were captured in the two drift nets below Abitibi Canyon, indicating that normal emergence from the substrate and drift had commenced. A few other YOY fishes were also captured (see Section 3.1.9.3).

Coker and Portt (2013e) concluded that the studies undertaken have demonstrated that Lake Sturgeon spawn in the Abitibi River below Abitibi Canyon. The study findings also support the conclusion that Lake Sturgeon do not spawn in New Post Creek. Despite the lack of evidence based on the study findings, MNR and DFO have opined that New Post Creek may still be a possible spawning area used occasionally by Lake Sturgeon.

However, Lake Sturgeon were caught in New Post Creek prior to and after the Abitibi Canyon spawning period, suggesting that the watercourse does provide an important habitat function, e.g., availability of higher benthic macroinvertebrate densities for foraging.

As in the case of Walleye, Lake Sturgeon spawning is likely not a concern in the Abitibi River in the vicinity of the proposed Project tailrace (Coker and Portt, 2012b). There does not appear to be suitable spawning habitat at the proposed tailrace location, and habitat that occurs there is common and widespread in this watercourse section.

3.1.9.6 Lake Whitefish Spawning

The Lake Whitefish population in the Abitibi River between Abitibi Canyon and Otter Rapids is apparently small. Low numbers (total of four) of Lake Whitefish were captured by gillnetting in the tailrace of the Abitibi Canyon GS in May and June 1997 (Hendry and Chang, 2001). No Lake Whitefish were captured in 60 overnight gillnet sets during MNR River Index Netting undertaken between September 13 and 17, 2010 between Abitibi Canyon and the Otter Rapids GS. During the proposed Project EA field work, one Lake Whitefish was captured by gillnetting adjacent to the boat ramp below the Abitibi Canyon rapids between September 14 and 20, 2011, and one was captured in New Post Creek downstream of the waterfalls between September 13 and 18, 2011 (Coker and Portt, 2013a).

Lake Whitefish were not captured or observed by underwater video in New Post Creek below the waterfalls during field surveys in October 2009 and 2010 and October - November 2011 (underwater video was not used in 2011), although the habitat appeared suitable for spawning and was accessible from the Abitibi River, with water temperatures within the usual range for Lake Whitefish spawning (Coker and Portt, 2012a).

As indicated in Section 2.2.6.4, drift net catches in New Post Creek from May 31 to June 14, 2012, were dominated by YOY coregonids (*Coregonus* spp.) (Coker and Portt, 2012d). The majority were identified as Cisco, while the remaining could not be identified to species because of their smaller size or poor condition. All coregonids captured were dead and in various states of decomposition. As coregonid spawning had not been observed and was not considered to occur below New Post Creek waterfalls (Coker and Portt, 2012a), and given the late timing of the coregonid drift as well as deteriorated condition of these specimens, it was suspected that they originated from further upstream (Coker and Portt, 2013e). Drift nets set in New Post Creek at the Otter Rapids Road bridge on June 7-8 and 11-12 captured coregonid YOY in a similar deteriorated condition, confirming the suspicion of upstream origin, likely the Little Abitibi River upstream of New Post Creek Diversion Dam.

As in the case of Walleye and Lake Sturgeon, Lake Whitefish spawning is likely not a concern in the Abitibi River in the vicinity of the proposed Project tailrace (Coker and Portt, 2012a). There does not appear to be suitable spawning habitat at the proposed tailrace location, and the habitat that occurs there is common and widespread in this watercourse section.

3.1.9.7 Other Fish Species Spawning

Based on field observations in May 2009, 2010 and 2011, White Sucker and Longnose Sucker spawning also occurs in the lower section of New Post Creek, downstream of the waterfalls.

Two male White Sucker in spawning condition were captured by gillnet in May 2009, whereas nine Longnose Sucker and three White Sucker, with some of the males in spawning condition, were captured in May 2010 (Coker and Portt, 2012c). The one male Longnose Sucker and four male White Sucker captured in May 2011 were also in spawning condition (Coker and Portt, 2012d).

As indicated in Section 3.1.9.3, in addition to YOY coregonids, June 2012 drift net catches in New Post Creek downstream of the waterfalls were also dominated by YOY sucker and YOY sculpin, with smaller number of YOY Burbot, YOY Walleye or Sauger, YOY Yellow Perch and YOY Northern Pike (Coker and Portt, 2013e), suggesting that the area below the New Post Creek waterfalls provides spawning habitat for a number of species. However, YOY sucker, YOY sculpin, YOY Burbot and YOY Northern Pike were also captured in drift nets set in New Post Creek at the Otter Rapids Road bridge, suggesting that some portion of the drift net catch below the waterfalls had originated from upstream sources.

3.1.9.8 Fish Mercury Body Burden

Relatively high total mercury (THg) concentrations in sportfish have been reported throughout the Moose River watershed (Headon and Pope, 1990; Seyler, 1998; Seyler and Kristmanson, 1999). Mean THg concentrations are higher in piscivores (Walleye, Northern Pike), generally exceeding the Health Canada (2007) fish consumption standard of 0.5 µg/g. Fish consumption advisories for Walleye, Northern Pike, Goldeye and White Sucker have been established by the MOE (see below). Mean THg concentrations are lower in benthivores and planktivores (Lake Whitefish, White Sucker), generally below the standard. THg concentrations generally increase with the length (age) of fish due to longer exposure.

Headon and Pope (1990) reported a mean THg concentration of 0.95 µg/g in Walleye with a mean length of 44.6 cm, collected from Lake Abitibi, upstream of the Twin Falls GS, the Iroquois Falls GS tailrace and Moose Lake, which is the headwater of Frederick House River (a tributary of the Abitibi River). Only 8% of Walleye sampled had THg concentrations less than 0.5 µg/g consumption standard, whereas 89% had THg concentrations below the 1.5 µg/g MOE advisory guideline for no consumption. THg concentrations of 40 cm Walleye from Lake Abitibi were 0.86, 0.71 and 0.92 µg/g in 1980, 1984 and 1985, respectively. In 1977, a sample of 15 Walleye with an average length of 47 cm collected from the Iroquois Falls GS tailrace downstream of Lake Abitibi had a mean THg concentration of 1.60 µg/g, which was the highest mean THg concentration reported for any dataset in the Moose River system.

Seyler (1998) reported that THg concentrations exceeding 1.0 µg/g were found in Walleye from 22 of 26 sampling locations within the Abitibi River watershed. THg concentrations exceeding 1.5 µg/g were found at 19 locations including eight natural lakes. Mercury concentrations in 50 cm Walleye, as predicted by regression modelling, in undeveloped portions of the Abitibi River were significantly higher (1.14 µg/g) than in 50 cm Walleye in the Groundhog River (0.64 µg/g) and Missinaibi River (0.74 µg/g).

Seyler and Kristmanson (1999) reported that THg concentrations in 40 cm Walleye from Moose Lake were 0.94 and 0.74 µg/g in 1977 and 1996, respectively, a decline of 0.2 µg/g. Moreover, THg concentrations in Walleye increased at locations where watercourses in the Moose River watershed have been impounded, but decreased immediately downstream.

The historic fish THg body burden data for the Abitibi River between Island Falls and Abitibi Canyon, Abitibi Canyon and Otter Rapids, and Otter Rapids and Onakawana were obtained from the MOE Environmental Monitoring and Reporting Branch (C. Mahon, MOE, 2013, pers. comm.) and are summarized in Table 3.10. The mean THg concentrations in Longnose Sucker, a benthivore, are lower than those in such piscivores as Walleye and Northern Pike. The elevated mean THg concentrations in Lake Sturgeon are due to their greater longevity and therefore their longer exposure to mercury sources.

Table 3.10 Historic Fish THg Body Burden Data for the Abitibi River (Island Falls to Onakawana)[1]

Species/Location	Number of Fish	Mean Length (cm) (Range)	Mean Weight (g) (Range)	Mean Concentration (µg/g) (Range)
Walleye				
Island Falls to Abitibi Canyon (1996)	12	39.6 (27.9 – 55.3)	881 (350 – 2,150)	0.96 (0.47 – 1.40)
Island Falls to Abitibi Canyon (1977)	16	42.7 (29.8 – 60.8)	888 (225 – 2,719)	1.54 (0.18 – 3.60)
Abitibi Canyon to Otter Rapids (1996)	20	38.2 (25.0 – 47.9)	655 (150 – 1,250)	0.51 (0.20 – 1.20)
Otter Rapids to Onakawana (1996)	13	50.1 (39.3 – 72.6)	1,613 (675 – 5,000)	0.90 (0.36 – 1.50)
Northern Pike				
Island Falls to Abitibi Canyon (1977)	15	57.6 (34.7 – 90.6)	1,599 (278 – 5,075	1.14 (0.38 -2.40)
Abitibi Canyon to Otter Rapids (1996)	11	53.2 (34.9 – 60.5)	1,255 (500 -1,800)	0.57 (0.18 – 0.89)
Sauger				
Island Falls to Abitibi Canyon (2010)	12	30.3 (25.2 – 36.5)	238 (120 – 468)	0.48 (0.30 – 0.80)
Lake Sturgeon				
Island Falls to Abitibi Canyon (1984)	10	103.8 (87.5 – 120.0)	7,185 (3,250 – 13,500)	0.95 (0.40 -1.70)
Goldeye				
Island Falls to Abitibi Canyon (1977)	15	34.8 (30.0 – 41.0)	433 (255 – 757)	0.47 (0.20 – 0.71)
Longnose Sucker				
Island Falls to Abitibi Canyon (1976)	15	34.2 (28.7 – 37.2)	592 (450 – 750)	0.26 (0.12 – 0.50)
Otter Rapids to Onakawana (1996)	14	37.0 (24.3 – 45.1)	680 (175 – 1,225)	0.09 (0.03 – 0.22)

[1] Source: C. Mahon, MOE, 2013, pers. comm.

There were no statistically significant relationships between THg concentrations and the length or weight for each of the four Walleye data sets (see Aquatic Environment TSD). Figure 3.4 presents the relationship between Walleye THg concentrations and length and weight for the

Abitibi Canyon to Otter Rapids section based on 1996 collection data. In contrast, statistically significant relationships were determined between THg concentrations and length and weight for both Northern Pike data sets. Figure 3.5 presents the relationship between Northern Pike THg concentrations and length and weight for the Abitibi Canyon to Otter Rapids section based on 1996 collection data. For the remaining species, there were no statistically significant relationships between THg concentrations and length or weight, with the exception of THg concentrations and weight of Longnose Sucker from the Otter Rapids to Onakawana section of the Abitibi River (see Aquatic Environment TSD).

Figure 3.4 Relationships between Walleye THg Concentrations and Length and Weight for the Abitibi Canyon to Otter Rapids Section (1996)

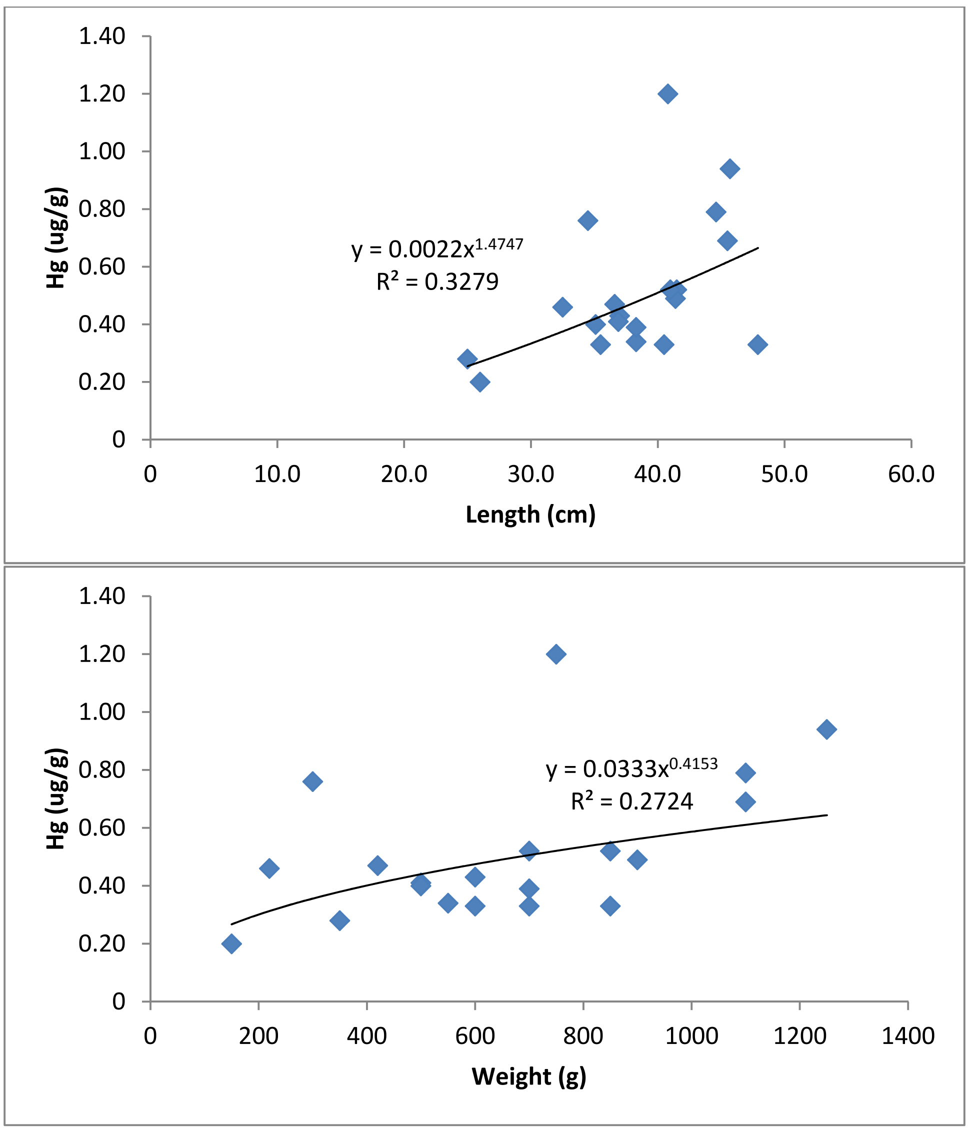
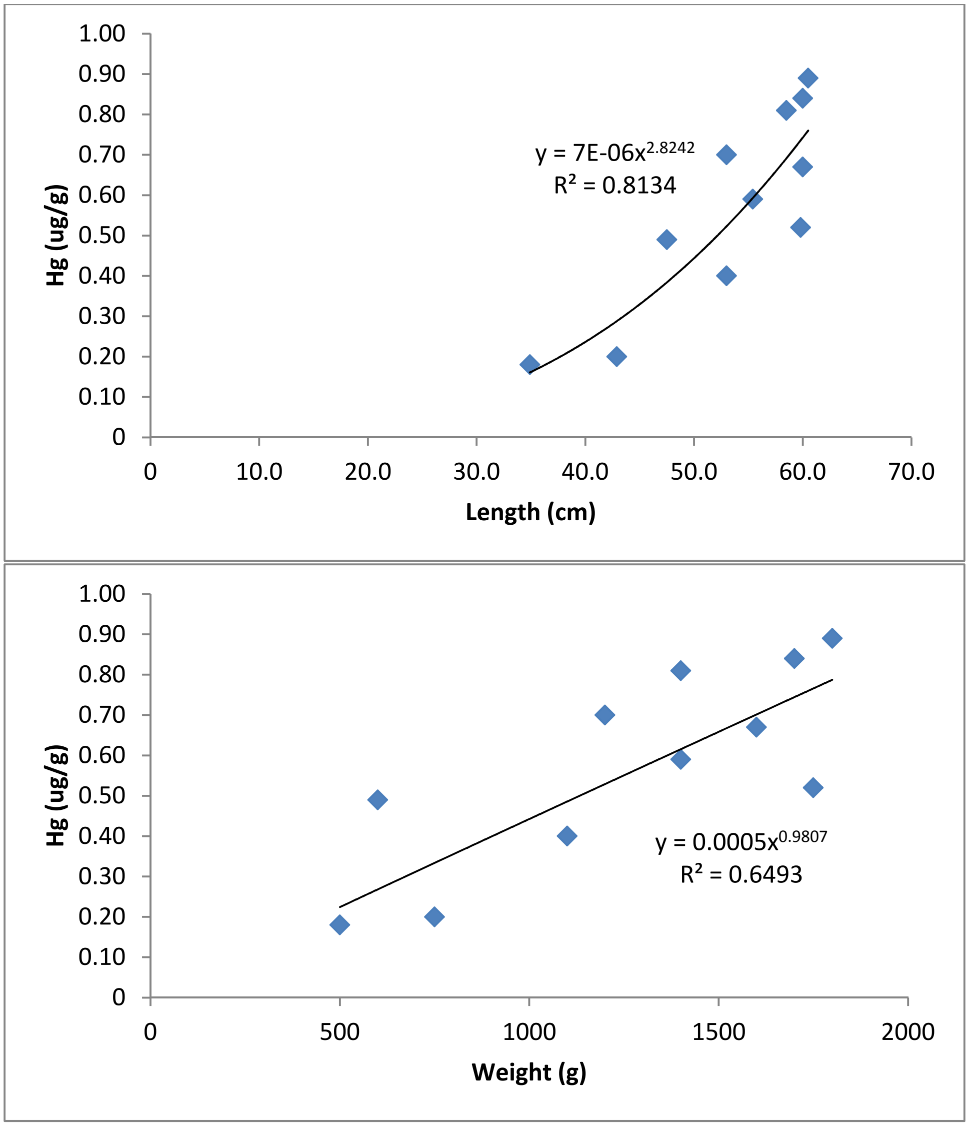


Figure 3.5 Relationships between Northern Pike THg Concentrations and Length and Weight for the Abitibi Canyon to Otter Rapids Section (1996)



There has been a decrease in THg concentrations in 40 cm length Walleye from the Island Falls to Abitibi Canyon section from 1.20 µg/g in 1977 to 0.93 µg/g in 1996. In 1996, the THg concentrations in 40 cm length Walleye in the Abitibi Canyon to Otter Rapids and Otter Rapids to Onakawana sections were 0.51 and 0.64 µg/g, respectively.

The THg concentration in 55 cm length Northern Pike from the Island Falls to Abitibi Canyon section was 1.00 µg/g in 1977. In 1996, the Hg concentration in 55 cm length Northern Pike from the Abitibi Canyon to Otter Rapids section was 0.58 µg/g.

The MOE requested CRP/OPG to analyze THg in Walleye in New Post Creek downstream of the waterfalls, as well as a forage fish at the proposed Project intake location based on the MOE, Northern Region, "Guidance for Conducting Baseline and Post-Development Monitoring of Water Quality and Fish Tissue for Proposed Waterpower Projects". As sufficient Walleye could not be captured in the lower portion of New Post Creek, additional specimens were obtained from the Abitibi River between Abitibi Canyon and the mouth of New Post Creek. Walleye likely move freely between the lower portion of New Post Creek and the Abitibi River.

Table 3.11 presents the THg concentrations in 20 Walleye (muscle tissue) collected below the New Post Creek waterfalls and in the adjacent section of the Abitibi River.

Table 3.11 THg Concentrations in Walleye (Muscle Tissue)

Walleye No.[1]	Length (mm)	Weight (kg)	Sex[2]	THg (µg/g)
1	432	0.87	M	**0.537[3] (0.545)[4]**
2	410	1.32	F	0.475
3	350	0.83	F	0.410
4	410	0.85	M	**0.796 (0.856, 0.828)[5]**
5	314	0.36	M	**0.532**
6	340	0.38	F	0.355
7	335	0.36	F	0.393
8	187	0.08	I	0.083
9	403	0.77	M	0.305
10	430	0.83	F	0.394
11	355	0.51	M	0.371
12	360	0.72	F	0.367
13	415	0.88	F	0.387 (0.391)[4]
14	400	0.77	F	0.405
15	348	0.45	F	0.401
16	445	0.85	F	0.288
17	495	1.41	F	0.389 (0.448)[5]
18	452	1.1	F	0.323
19	423	0.88	F	0.345
20	210	0.1	I	0.114

[1] Walleye 1 to 19 were collected between September 15 and 20, 2011, whereas Walleye 20 was collected on November 1, 2011.
[2] M = male; F = female; I = immature.
[3] Bold and shaded values exceed the Health Canada (2007) fish consumption standard of 0.5 µg/g.
[4] Duplicate sample.
[5] Sample analysis redone.

As indicated above, THg concentrations generally increase with the length (age) of fish due to greater exposure. Figure 3.6 shows good (but not statistically significant) relationships between fish length and weight and THg concentration for the 20 Walleye, possibly reflecting variable exposure to mercury sources in the Abitibi River between Abitibi Canyon GS and Otter Rapids GS.

The predicted THg values of 0.58 µg/g in a standard 50 cm sized Walleye from New Post Creek is significantly lower than the 1.14 µg/g concentration reported by Seyler (1998) for underdeveloped portions of the Abitibi River.

The predicted THg values in a standard 40 cm sized Walleye based on the 2011 collection from New Post Creek and the Abitibi River (0.41 µg/g) and from the Abitibi Canyon to Otter Rapids section of the Abitibi River in 1996 (0.51 µg/g) are compared to 11 other locations in Québec, Manitoba and Ontario in Figure 3.7. The 2011 THg concentration for Walleye in New Post Creek is intermediate compared to the other locations and is lower than that for the earlier (1996) collection between Abitibi Canyon and Otter Rapids.

Table 3.12 presents the THg concentrations in 20 Slimy Sculpin (total of 41 whole fish) collected on November 2, 2011 from the unnamed tributary (Tributary 1; MNR ID#523) discharging into New Post Creek approximately 150 m upstream of the proposed Project intake location (see Figures 3.2 and 3.3). Tributary 1 is the largest watercourse flowing into New Post Creek in the proposed headpond area, and will be affected the most from headpond development due to its proximity to the proposed weir and its low gradient channel, and being subjected to the highest water level increase (see Figure 2.6).

The standard forage fish species used for THg monitoring by the MOE are Spottail Shiner and YOY Yellow Perch. As indicated in Table 3.9, Spottail Shiner was captured in New Post Creek upstream of the waterfalls, but in small numbers insufficient to constitute the requisite composite samples. Yellow Perch were not captured in New Post Creek above the waterfalls.

Table 3.12 THg Concentrations in Slimy Sculpin (Whole Fish)

Composite No.	Number of Fish	Mean Length (Range) (mm)	THg (µg/g)
1	9	46.67 (41-52)	0.0212
2	8	49.0 (39-57)	0.0242 (0.0240)[1]
3	8	47.0 (40-54)	0.0239
4	8	47.38 (33-54)	0.0219
5	8	46.13 (40-51)	0.0205

[1] Duplicate sample.

Figure 3.6 Relationships Between THg Concentrations and Length and Weight for Walleye from New Post Creek and the Abitibi River (2011)

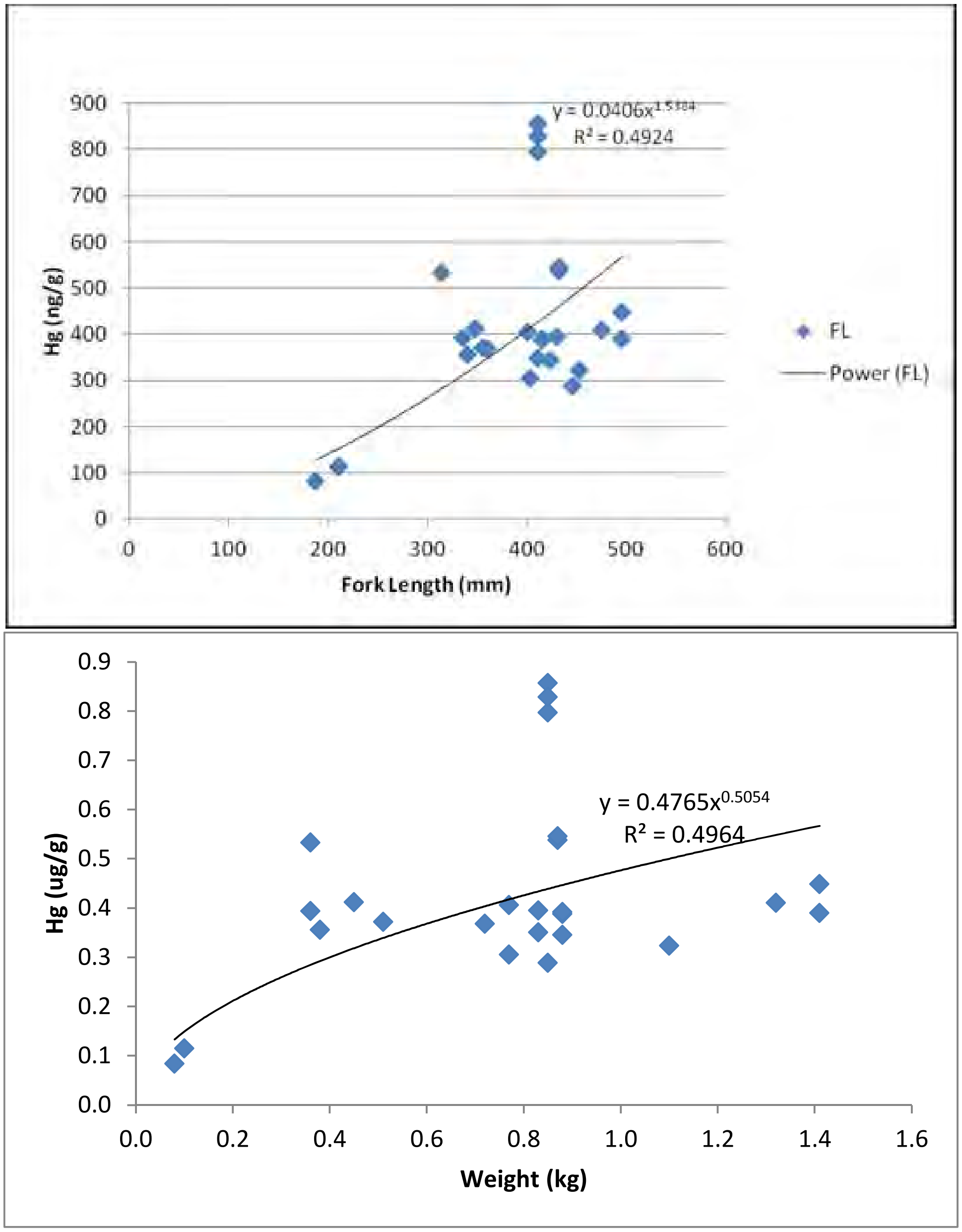
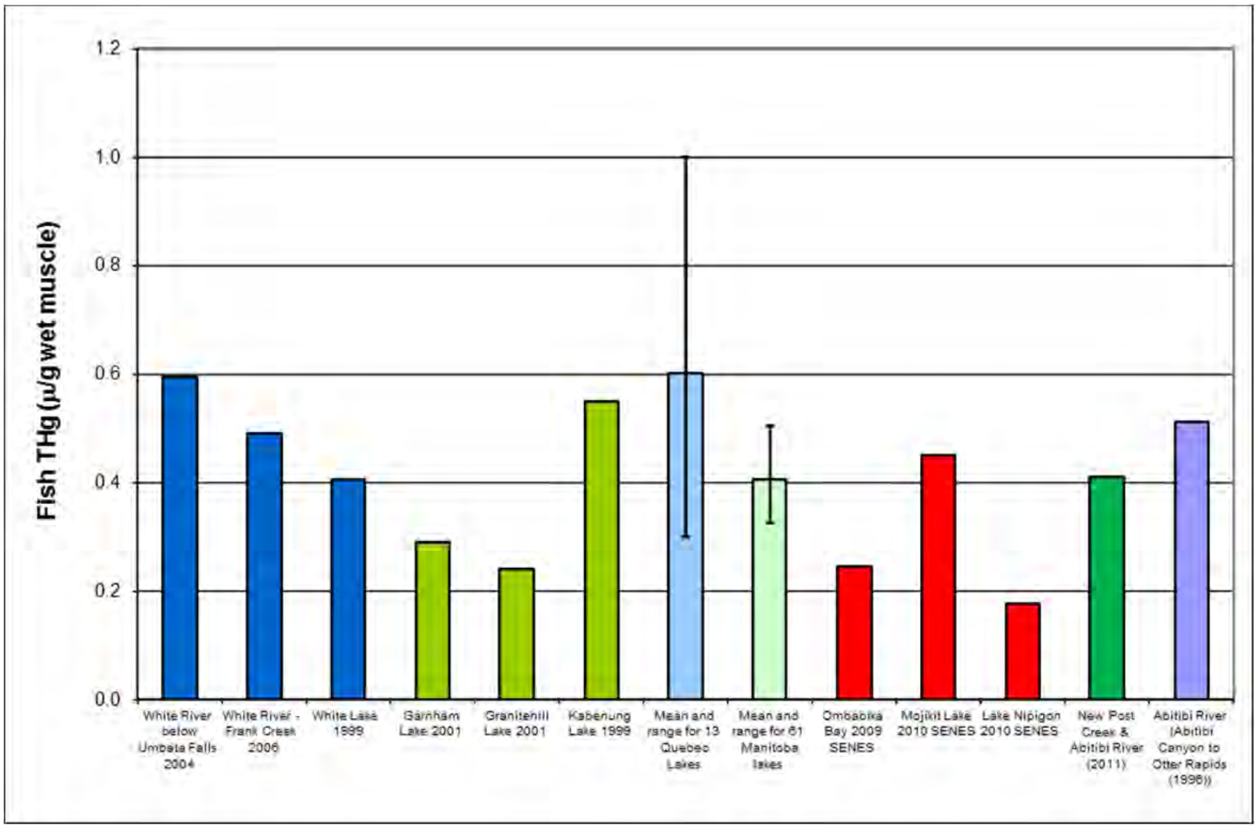


Figure 3.7 Comparison of THg Concentrations in Standard Length of Walleye (40 cm) for Different Locations in Canada[1]



[1] Data for the first eight histogram bars provided by R. Harris, Reed Harris Environmental Ltd., 2009, pers. comm.; data for Ombabika Bay, Mojikit Lake and Lake Nipigon provided in SENES (2011b); data for Abitibi Canyon t Otter Rapids section provided by C. Mahon, MOE, 2013, pers. comm.

THg concentrations in Slimy Sculpin (whole fish) are an order of magnitude lower than those in Walleye (muscle tissue), reflecting their benthivorous feeding habits. It should be noted that the fish were all very small and of similar size, suggesting that they were YOY.

3.1.9.9 Fish Consumption Advisories

As indicated in Section 3.1.9.8, Health Canada (2007) has established a fish consumption standard of 0.5 µg/g for THg in fish. The THg concentrations in three of the 20 Walleye collected from New Post Creek and the Abitibi River in 2011 exceeded the 0.5 µg/g standard.

Provincial fish consumption restrictions have also been developed by the MOE (2011a). For women of child-bearing age and children under 15, partial consumption restrictions for sport fish containing mercury begin at concentrations of 0.26 µg/g with complete restriction advised for concentrations above 0.52 µg/g. For the general population, partial consumption restrictions begin at concentrations above 0.61 µg/g with complete restriction advised for concentrations above 1.84 µg/g. The THg concentrations in 18, three, one and none of the 20 Walleye collected from New Post Creek and the Abitibi River in 2011 exceeded the 0.26 µg/g, 0.52 µg/g, 0.61 µg/g and 1.84 µg/g consumption restrictions, respectively.

Provincial consumption restrictions for standard 40 cm length Walleye and 55 cm length Northern Pike based on the 2011 and historic data (see Tables 3.11 and 3.10, respectively) are presented in Table 3.13.

Table 3.13 Provincial Consumption Restrictions for 40 cm Walleye and 55 cm Northern Pike

Species/ Location	THg Conc. (µg/g)	Sensitive Population	General Population
40 cm Walleye			
New Post Creek and Abitibi River (2011)	0.41	Partial	None
Abitibi Canyon to Otter Rapids (1996)	0.51	Partial	None
Otter Rapids to Onakawana (1996)	0.64	Complete	Partial
Island Falls to Abitibi Canyon (1996)	0.93	Complete	Partial
Island Falls to Abitibi Canyon (1977)	1.20	Complete	Partial
55 cm Northern Pike			
Abitibi Canyon to Otter Rapids (1996)	0.58	Complete	None
Island Falls to Abitibi Canyon (1977)	1.00	Complete	Partial

Fish consumption advice, based on a combination of species, fish size and contaminant concentrations, has been provided by the MOE for water bodies throughout Ontario since 1979. A summary of the most recent advisories for the Abitibi River between Abitibi Canyon and Otter Rapids is provided in Table 3.14.

Table 3.14 Summary of Fish Consumption Advisories[1,2]

Fish Species	Fish Length (cm)								
	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65
Northern Pike[3]			8[4] (8)[5]	8(4)	8(4)	8(4)	8(0)	4(0)	4(0)
Walleye[3]	8(4)	8(4)	8(4)	8(0)	4(0)	4(0)	2(0)	0(0)	0(0)
Goldeye[3]		8(4)	8(4)	8(0)	4(0)				
White Sucker[6]			8(4)	8(0)	4(0)	4(0)	4(0)		

[1] Source: MOE (2011a).
[2] Abitibi River below Abitibi Canyon to Otter Rapids.
[3] Based on mercury, other metals, PCBs, mirex/photomirex and pesticides.
[4] Number of meals of that size fish that can be consumed each month by the general population.
[5] Bracketed number of meals of that size that is advised for consumption by women of child-bearing age and children under 15.
[6] Based on mercury, PCBs, mirex/photomirex and pesticides.

For Walleye, the maximum recommended number of meals for the general public is eight per month in the fish size range of 20 to 40 cm, four per month in the range of 40 to 50 cm and two per month in the range of 50 to 55 cm. It is recommended that no Walleye of length greater than 55 cm should be consumed. Since young children and developing fetuses are affected by mercury and other contaminants at lower concentrations than the general population, children under 15 and women of child-bearing age are advised to consume only four meals per month in the size range of 20 to 35 cm and no meals of larger Walleye.

3.1.10 Aquatic Avifauna

The proposed New Post Creek Project area does not have much importance for breeding or migrating waterfowl due to a lack of suitable breeding habitat or notable flyway (MOE, 1972). Canada Land Inventory (CLI, 1974) mapping for waterfowl production indicates that the Abitibi River between Abitibi Canyon and downstream of the New Post Creek outlet, as well as pre-diversion New Post Creek, are categorized as Class 6 with severe limitations due to adverse topography and free-flowing water conditions. Although the Abitibi River may not be useful for waterfowl production, the watercourse is categorized as Class 3M, i.e., important as a migration or wintering area. The CLI mapping confirms TTN Traditional Knowledge of low geese and duck nesting activity in the proposed Project local study area (W. Ross, TTN, 2012, pers. comm.).

Five aquatic avifauna species are recorded in the Ontario Breeding Bird Atlas as breeding or likely breeding within two 10-km by 10-km square grids (17MR53 and 17MR63) overlapping the proposed Project area (Bird Studies Canada, 2006). Of the six species listed, three are designated by the NHIC (2010) as S5, (secure), i.e., Great Blue Heron, Canada Goose and Common Goldeneye, whereas the other two are S4 (apparently secure), i.e., American Wigeon and Sandhill Crane. Solitary Sandpiper, designated as S4 (apparently secure), was observed during the 2012 site-specific field survey.

3.2 TERRESTRIAL ENVIRONMENT

More detailed information on the existing terrestrial environment baseline conditions is provided in the Terrestrial Environment TSD.

3.2.1 Climate, Air Quality and Environmental Noise

Climate

The proposed New Post Creek Project is located near the southern limit of the Albany Climatic Region which extends north to James Bay (Chapman and Thomas, 1968). The Northern Clay Belt Climatic Region occurs to the south of the Albany Climatic Region. Due to the strong influence of Arctic air masses and the cool temperatures they bring, the growing season of the Albany Climatic Region is relatively short, i.e., 154 days (based on data collected from 1931 to 1960).

Based on the Ecoclimatic Region classification system (Ecoregions Working Group, 1989), the proposed New Post Creek Project occurs near the northern limit of the Humid Mid-Boreal Ecoclimatic Region of the Boreal Ecoclimatic Province, with the Humid High Boreal Ecoclimatic Region extending further north to James Bay. In the Humid Mid-boreal Ecoclimatic Region, summers are warm and rainy, averaging about 100 mm per month from June to September. Winters are cold, with half as much precipitation received as during the summer months. Total annual precipitation is approximately 800 to 900 mm. Mean daily temperatures greater than 0°C occur through about seven months of the year, although frosts are common except from mid-June to early September.

Based on Environment Canada, National Climate Archives, climatic data are available for the meteorological stations located at Smoky Falls, Cochrane and Kapuskasing Airport. Mean annual temperatures at the three stations range from 0.5 to 0.7^{o}C.

In general, precipitation is uniformly distributed throughout the year with no pronounced wet or dry seasons. Summer thunderstorm activity is relatively frequent. Mean monthly precipitation varies between lows of 35.3, 35.9 and 42.4 mm in February at the Kapuskasing Airport, Smoky Falls and Cochrane meteorological stations, respectively, to highs of 99.7 and 109.0 mm in September at the Smoky Falls and Cochrane stations, respectively, and 100.5 mm in July at the Kapuskasing Airport station. Total annual precipitation at the Smoky Falls station is 788.4 mm, with 510.9 mm falling as rain and 277.5 cm falling as snow. For the Cochrane station, total annual precipitation is 880.0 mm with 583.2 mm falling as rain and 296.8 cm falling as snow. For the Kapuskasing Airport station, total annual precipitation is 831.8 mm with 544.6 mm falling as rain and 313.0 cm falling as snow. Highest average snow depth (66 cm) at the Kapuskasing Airport station occurs in February.

Air Quality

Although the average levels for many air pollutants in Ontario have decreased over the last several decades, smog remains an important issue, especially in southern Ontario (MOE, 2005). In northern Ontario, air quality is generally unaffected by anthropogenic activities. For example, the concentrations of ozone, fine particulate matter, nitrogen dioxide, carbon monoxide (CO) and/or sulphur dioxide (SO_2) in North Bay, Sudbury and Sault Ste. Marie in 2010 and 2011 did not exceed their applicable air quality criteria (MOE, 2012, 2013). In 2009, only the 1-hour ozone air quality criterion was exceeded infrequently (one to six times) at the three locations (MOE, 2011b). Due to its pristine setting, air quality at the proposed Project location is expected to be even better than at the three air quality monitoring stations located more than 350 km south of the proposed New Post Creek Project.

Environmental Noise

Environmental noise levels will vary according to a number of factors: intensity, kind and number of noise sources; proximity to the noise sources; topography; presence of barriers and absorbers such as vegetation; and meteorological conditions.

The major sources of noise in the local study area are associated with stream flow (rapids and waterfalls), forestry operations and railway traffic.

3.2.2 Bedrock Geology

The proposed New Post Creek Project site is located within the Quetico Subprovince of the Superior Province of the Canadian Shield (Stockwell *et al*., 1970; Williams, 1991). The Quetico Subprovince extends from Minnesota across Ontario eastward for nearly 1,000 km into Québec with a relatively consistent width of approximately 70 to 100 km. The Quetico Subprovince is dominantly characterized by metasedimentary rock, migmatites, granitized gneisses, and gneissic or massive granitic rocks of approximate granodiorite composition. Bedrock in the local study area consists of Early Precambrian felsic igneous and metamorphic rocks consisting of granitic, metasedimentary and minor metavolcanic migmatite (OGS, 1986). Specifically, the Project site is located within a migmatite – metasedimentary – metavolcanic complex, immediately north of the Fraserdale volcanic gabbro pluton that is present at the Abitibi Canyon GS and west of the Kapuskasing granulite complex (Ontario Hydro, 1982; Golder, 1990). The bedrock in these areas have been intruded by diabase and pegmatite dikes.

The Kapuskasing granulite complex, also designated as the Kapuskasing Structural Zone (Williams, 1991), is a zone of uplift representing exposure of midcrustal rocks which have been subjected to metamorphic pressures (Percival and Card, 1983). Exposed bedrock along New Post Creek within the Kapuskasing Structural Zone are foliate quartzo-feldspathic rocks (Ontario Hydro, 1982). These rocks display a gneissic structure and in parts contain thin mafic bands with minerals such as hornblende, biotite, pyroxene and some garnetiferous bands.

Bedrock of the Fraserdale volcanic gabbro pluton consists largely of fine to medium grained gabbro and brecciated gabbro (Golder, 1990).

Ontario Hydro (1982) reported that exposed bedrock along New Post Creek at and downstream of the proposed outfall location within the migmatite – metasedimentary – metavolcanic complex consists of granite gneiss and hornblende-pyroxene gneiss, gneiss-diabase breccia, diabase and minor pegmatite.

The bedrock outcrop exposed at New Post Creek at the proposed Project intake site consists of granitic gneiss with a few mafic diabase dikes and some pegmatite intrusions, whereas the underlying bedrock encountered in test holes mainly consists of granodioritic gneiss (KGS Group, 2013a, b). No other bedrock outcrops are present at the proposed Project site.

3.2.3 Physiography and Soils

The proposed New Post Creek Project is near the southern limit of the Hudson Bay Lowland Physiographic Division with the Abitibi Upland Physiographic Division to the south (Clayton *et* *al*., 1977). The Hudson Bay Lowland is characterized by a low, swampy, marshy plain with numerous shallow lakes and subdued glacial features.

From a physiographic region standpoint, the proposed Project occurs within the Abitibi Upland Subregion of the James Bay Physiographic Region (Bostock, 1970). Most of the landscape is nearly flat to slightly hummocky. Broad rolling surfaces gently rise from Hudson Bay Lowland in the north to approximately 460 m at the southern limit of the Abitibi Upland Subregion. Organic deposits are common and often extend over large tracts of land in depressional areas. Bedrock outcrops occur infrequently in the wide, but shallow, valleys cut by the larger rivers.

More specifically, the proposed New Post Creek Project is situated within the Great Clay Belt, a flat plain underlain by stratified glaciolacustrine clays and silts deposited by glacial lakes during the waning of Quaternary glaciation, among them glacial Lake Barlow-Ojibway (Hughes, 1965).

Proglacial Lake Ojibway developed about 9,000 years B.P. (before present) resulting in the deposition of lacustrine silts and clays throughout the area. A second glacial advance approximately 8,100 years B.P. resulted in the merging of Lake Barlow and Lake Ojibway to form Lake Barlow-Ojibway and the deposition of a capping layer of clay to silty-clay till over the land surface.

Glaciolacustrine deposits, consisting mainly of varved clays and silts with small areas of lacustrine sands, are very common. The lacustrine clay sediments are very thick resulting in a flat to gently sloping topography.

Glaciofluvial deposits occur in elongated eskers and outwash plains. All eskers are capped with clay. The outwash plains associated with the eskers consist of sand and gravel.

Ground moraines consisting of thick sand and clay tills that are very stony and bouldery are also present. The topography is rolling with numerous flats along the watercourses and adjacent to lakes.

The Pinard Moraine, rising over 50 m, extends eastward over a broad area from the west of the Abitibi River across the New Post Creek area to the east (Ontario Parks, 2006). The Pinard Moraine represents a halt during glacial recession, when the ice margin was situated in juxtaposition with glacial Lake Ojibway (MNR, 2005b). This landform represents one of the largest such features in northeastern Ontario, and consists of weakly broken end moraine and moderately broken ground moraine. The surficial material of this moraine consists of 1 to 3 m of clay or loam till separated by a sharp unconformity from underlying fine sand morainic deposits, some of which are bedded (Boissonneau, 1968).

As indicated above, topography is generally flat. However, numerous faults and fractures are present that affect drainage and topography in some areas. The most significant fault occurs below the 40 m waterfall on New Post Creek approximately 1 km upstream of its confluence with the Abitibi River (Ontario Parks, 2006). This vertical fault includes an 8-m wide canyon which extends for 200 m beyond the waterfalls.

In the proposed New Post Creek Project area, bedrock outcrops have been partially eroded with the underlying bedrock overlain by the glacial clay till, sand and gravel end moraine (Pinard Moraine) that is locally overridden and capped by clay till (KGS Group, 2006, 2013a). More recent deposits include glaciofluvial outwash and alluvial silts and sands.

The overburden deposits encountered at the proposed Project site are highly variable and generally consist of a complex sequence of weakly stratified silt, sandy silt and silty sand materials overlying layers of lacustrine silty clay and till deposits (KGS Group, 2006, 2013a). These surficial deposits are underlain by a basal deposit that consists of a mixture of boulders, cobbles and gravel in a grey silty sand matrix. Based on borehole drilling and seismic refraction findings, overburden depth increases from the rock outcrop intake location on New Post Creek to a depth of up to 15 m at the powerhouse location.

In the local study area, Gray Luvisols occur on the upland clays, whereas Ferro-humic Podzol soils occur on the sandy outwashs and eskers. Organic soils occupy large areas of the lowland portions of the study area, as well as occur in small poorly drained depressions on upland sites. These peat soils consist of a complex of soils developed from organic materials in various stages of disintegration and humification and usually vary in depth from 0.3 to 5 m.

The soils in the proposed New Post Creek Project area are predominantly Gleysols developed on the clay and lacustrine till plains. These fine mineral soils are characterized by poor drainage and are saturated during parts of the year. Extensive organic soil deposits occur to the south of the proposed Project location.

The Canada Land Inventory (CLI, 1972a) categorizes the soils at the proposed Project site as Class 4 with severe limitations for agricultural production due to low fertility and low moisture holding capacity that restrict the range of crops or require special conservation practices or both. It should be noted that, in northern Ontario, the best soils for agriculture are rated as Class 3 with moderate limitations for agricultural production. The cold, moist climate limits the range of crops that can be grown and reduces the production level.

3.2.4 Vegetation

As indicated in Section 2.3, the proposed New Post Creek Project is located near the southern limit of the Hudson Bay Lowlands within a physiographic subdivision delineated by Coombs (1954) as the “Dry Zone”. The southern “Dry Zone” physiographic subdivision has approximately 40% dry land. Although much peatland is present, particularly large patterned fens and conifer swamps, a sizeable portion of the area is well wooded upland vegetation (Sims *et al*., 1979). The drier condition is attributed to the development of a more mature drainage system, although a somewhat milder climate and a longer frost-free period also contribute to the dissipation of soil moisture in this zone (Coombs, 1954).

The proposed New Post Creek Project is located in the Northern Clay Forest Section of the Boreal Forest Region (Rowe, 1977). White Spruce and Black Spruce are characteristic species of the Boreal Forest Region. Other common species are Tamarack, Balsam Fir and Jack Pine.

Although the forests are primarily coniferous, there is a general admixture of broadleaved trees such as White (Paper) Birch, Trembling Aspen and Balsam Poplar, as well as species typical of the more southerly Great Lakes-Saint Lawrence Forest Region, such as Eastern White Pine, Red Pine, Yellow Birch, Sugar Maple, Black Ash and Eastern White Cedar.

The Northern Clay Forest Section is dominated by Black Spruce which forms large stands on both the poorly-drained lowland flats of the clay plain and the gently rising uplands (Rowe, 1972). Tamarack occurs infrequently in these stands. In the wetter areas, Eastern White Cedar grows in association with Black Spruce. Pure hardwood and mixedwoods stands of Trembling Aspen, Balsam Poplar, Balsam Fir, White Spruce and Black Spruce grow in better-drained areas, such as in areas of higher relief and along the margins of lakes and rivers. Balsam Fir is a common component of the forest understory and has increased in abundance by regeneration on cut-over Black Spruce woods. Jack Pine forms extensive stands on dry, sandy areas, while White Birch is also typically found growing in the sandy soils of old beaches, eskers and outwash deposits.

3.2.4.1 Forestry Resources

The CLI (1973) indicates that the lands in the New Post Creek Project area are designated as 70% Class 5 and 20% Class 4, with severe and moderately severe limitations, respectively, to the growth of commercial forests due to low fertility. The remaining 10% of lands are designated as Class 7 having severe limitations due to excess soil wetness that preclude the growth of commercial forests.

Forestry resource plots were used to assess the specific forest stands to be affected by the proposed New Post Creek Project (Fleming, 2012). The cruise plot information was used to assess the accuracy of the Forest Resource Inventory (FRI) and to estimate timber volume loss due to proposed Project. A total of 44 forest resource assessment plots were completed. The forestry resources study methodology and findings are provided in Appendix A of the Terrestrial Environment TSD.

The predominant forest units in the local study area were Spruce Pine Mixedwood, Lowland Black Spruce Pure Rich, Conifer Hardwood Mixedwood, Poplar Pure Rich Sites and Spruce Fir Mixedwood. The main forest units within the site-specific study area were Spruce Pine Mixedwood, Spruce Fir Mixedwood, Poplar Pure Rich Sites, Pine Spruce Mixedwood, Poplar Pure Poor Sites and Lowland Black Spruce Pure Rich.

Typical boreal tree species, such as Black Spruce, White Spruce, Balsam Fir, Eastern White Cedar, Tamarack, Balsam Poplar and White (Paper) Birch, were observed within the proposed Project development area. No unique or rarer tree species were encountered.

More than one-quarter (27%) of the local study area has been disturbed due to harvesting and the construction of access roads to facilitate harvesting. Harvesting depletions were recorded in nine different years: 1980, 1981, 1982, 1984, 1985, 1994, 1995, 1996 and 2006. There are no proposed forestry operations in the current Forest Management Plans (FMPs) within or in the vicinity of the local study area.

3.2.4.2 Vegetation Communities

Comprehensive ground-truthing of the vegetation communities in the proposed Project site-specific study area was undertaken based on the ELC Working Group (2009) Ecosites of Ontario Operational Draft for the Boreal Region. The surveys involved establishing 66 vegetation assessment plots in representative ecosites within the study area during the 2011-2012 field seasons. In addition, 18 plots were previously established in the proposed inundation zone along New Post Creek for the LAPP Ecological Integrity Study (Beacon, 2010). The data from that study were used in this TSD. The vegetation communities study methodology and findings are provided in the Terrestrial Environment TSD.

A total of 137 Ecological Land Classification (ELC) vegetation units were mapped within the proposed Project site-specific study area, which are presented on Figures 3.8a, b, c and d. The maps were produced from a combination of vegetation plot data, air photo interpretation and FRI mapping. Table 3.15 lists the vegetation type for each map unit. Of the 137 vegetation units mapped, a total of 34 distinct ecosites were recorded in the proposed Project site-specific study area based on field investigations (Table 3.16). Descriptive summaries of the 34 distinct ecosites are provided in the Terrestrial Environment TSD.

Brief descriptions of the dominant vegetation types are presented below for each of the individual site-specific study areas.

<u>Proposed Transmission Corridor</u>

Much of proposed transmission line corridor study area consists of areas that have been logged within approximately the last 50 years and were recently replanted with Black Spruce or have regenerated naturally. Areas of natural regeneration consist predominantly of Black Spruce and Trembling Aspen (Map Units 1, 17, 31).

A large, mature relatively undisturbed forest block remains at the centre of the corridor study area (Map Units 18, 19, 21, 22, 26, 27, 28, 29) which is surrounded by recent cutovers and younger mixed forests. The block is approximately 200 ha and consists of bog, fen and conifer swamp. The age of these communities ranges from approximately 100 to 160 years, according to FRI mapping. There are also several smaller patches of remnant mature vegetation within the study corridor, which include forests dominated by Black Spruce and Balsam Fir (Map Units 33, 34, 36, 40), conifer swamp dominated by Black Spruce and/or White Cedar (Map Units 3, 5 7, 8, 9, 11, 12, 13, 14) and bog (Map Unit 10). According to FRI, the age of these communities ranges from approximately 120 to 175 years.

Vegetation along the two watercourses that traverse the eastern portion of this study area (Pinard Creek and its tributary) consists of a complex of open marsh and thicket swamp on peaty phase mineral and organic soils (Map Units 4, 6, 23, 113, 114).

Figure 3.8a ELC Vegetation Type Mapping – Transmission Line Study Area

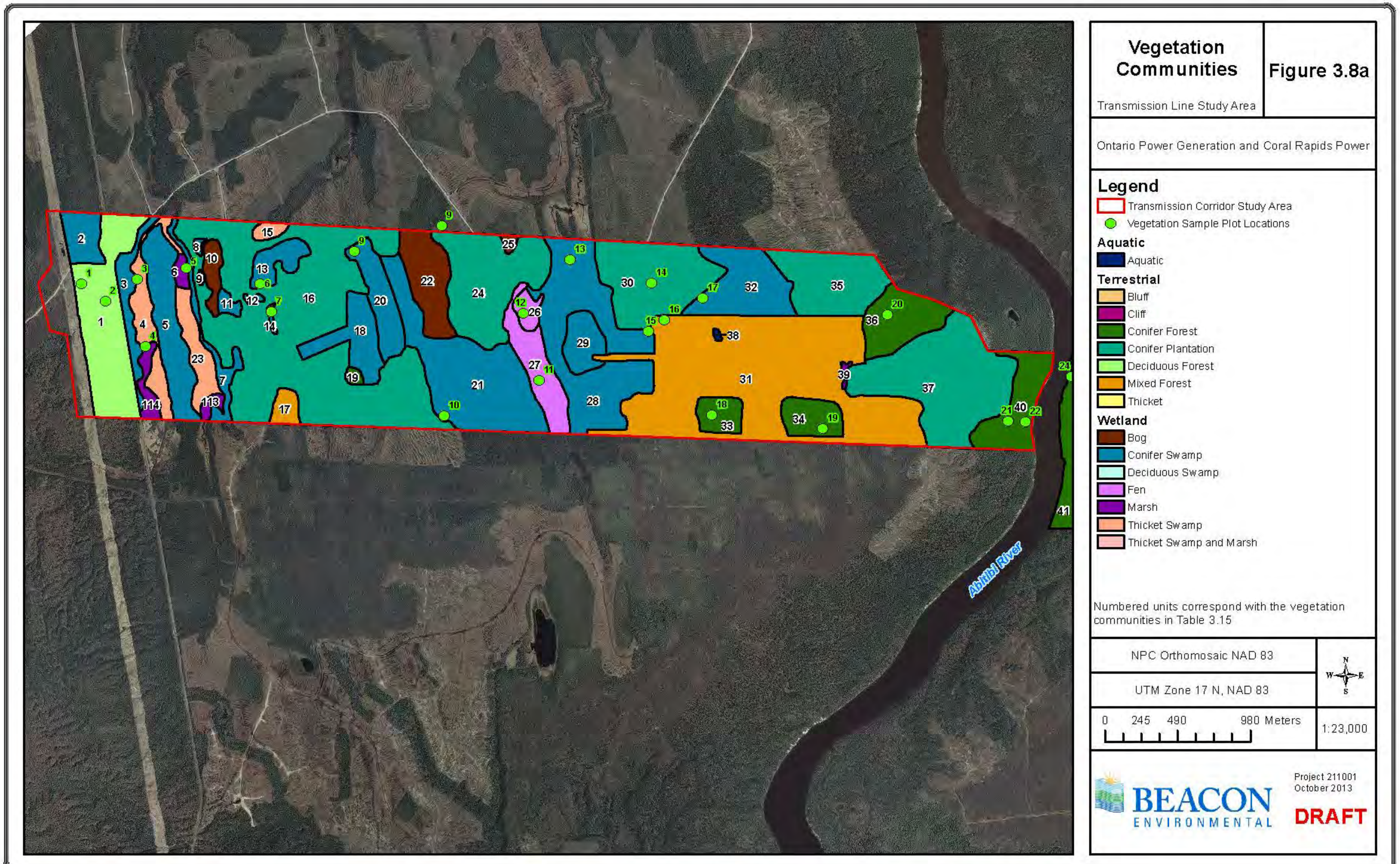


Figure 3.8b ELC Vegetation Type Mapping – Work Area/Laydown Zone and Downstream Riparian Study Areas

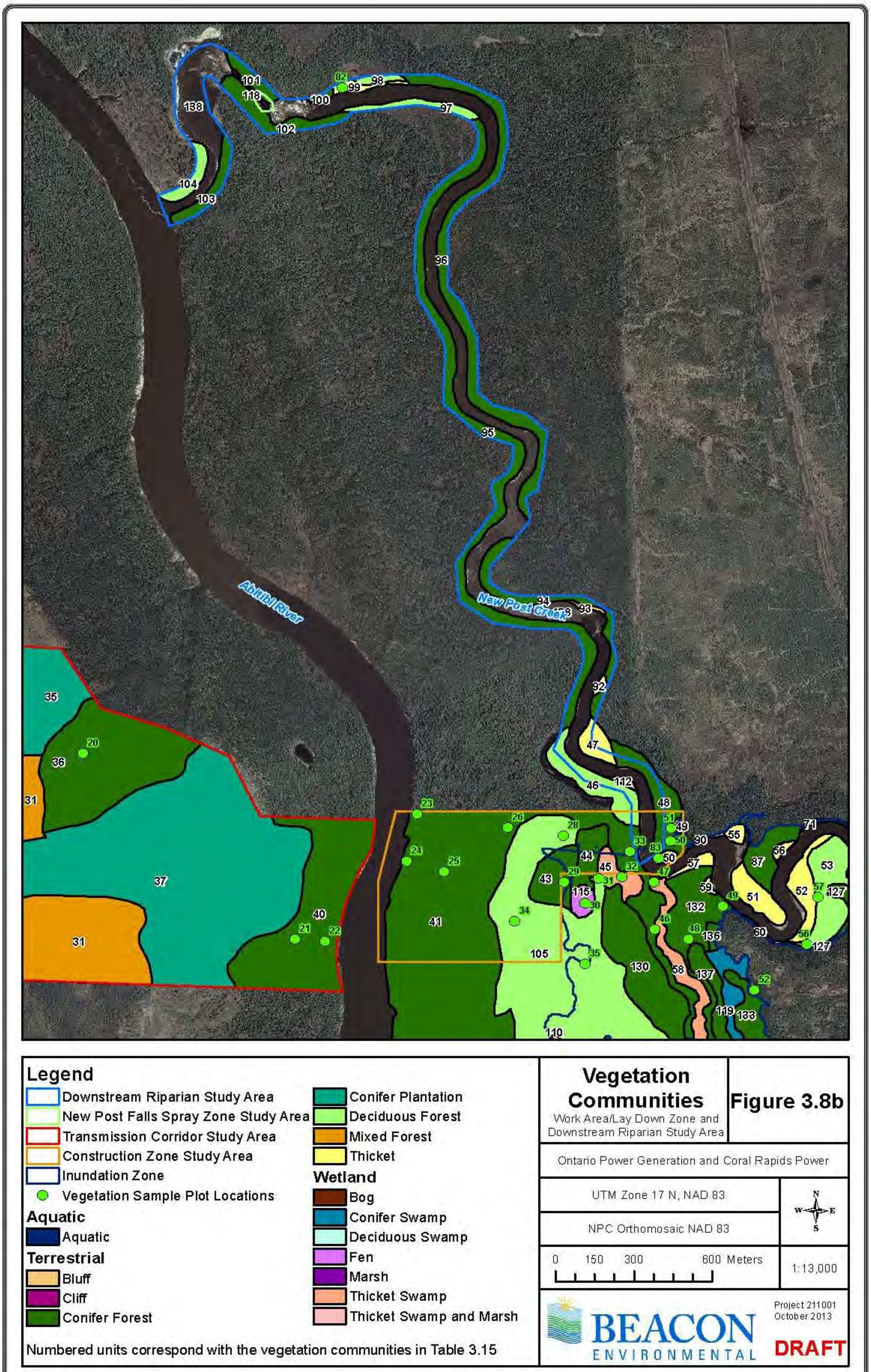


Figure 3.8c ELC Vegetation Type Mapping – Access Road Study Area

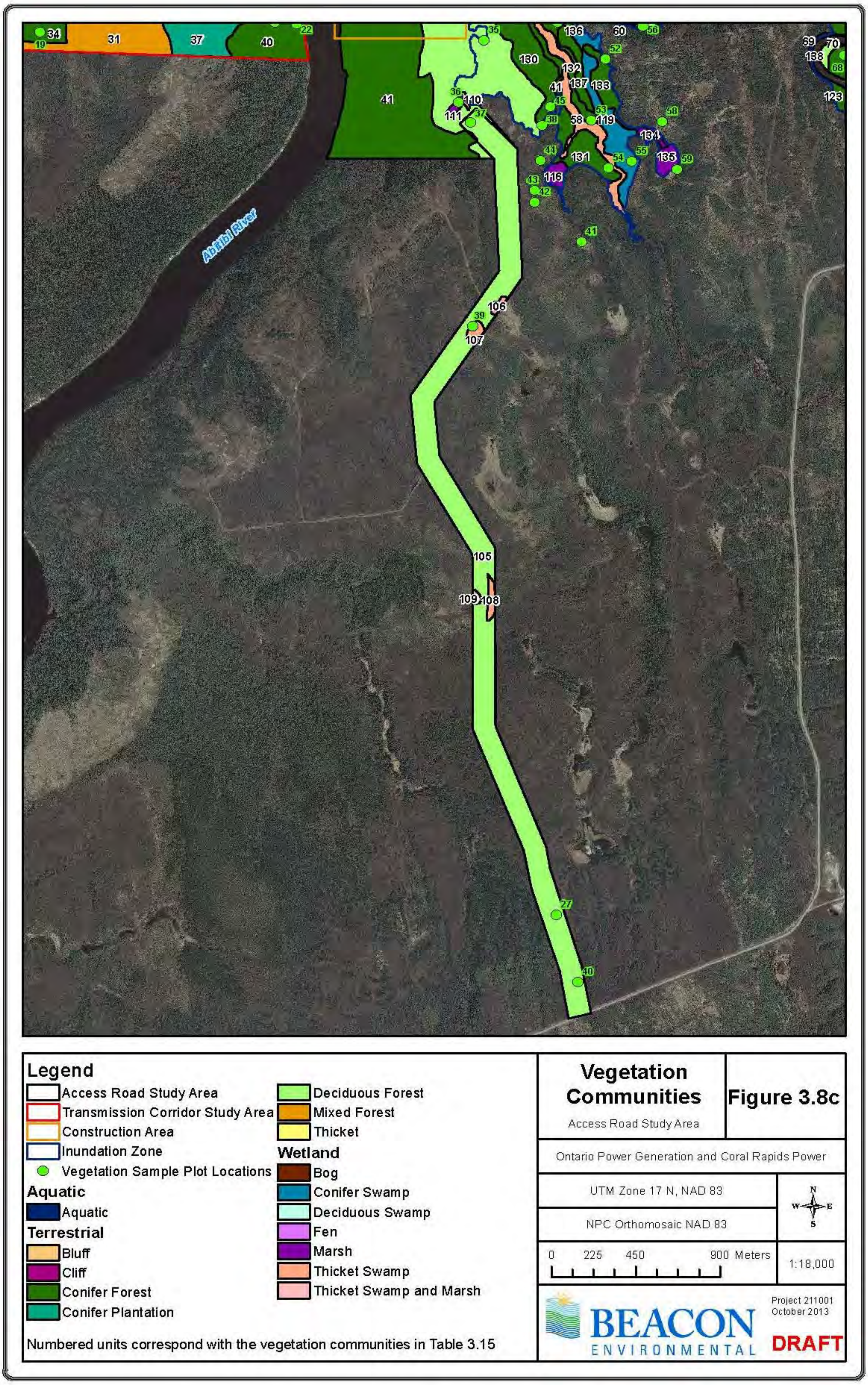


Figure 3.8d ELC Vegetation Type Mapping – Inundation Zone and Upstream Riparian Study Area

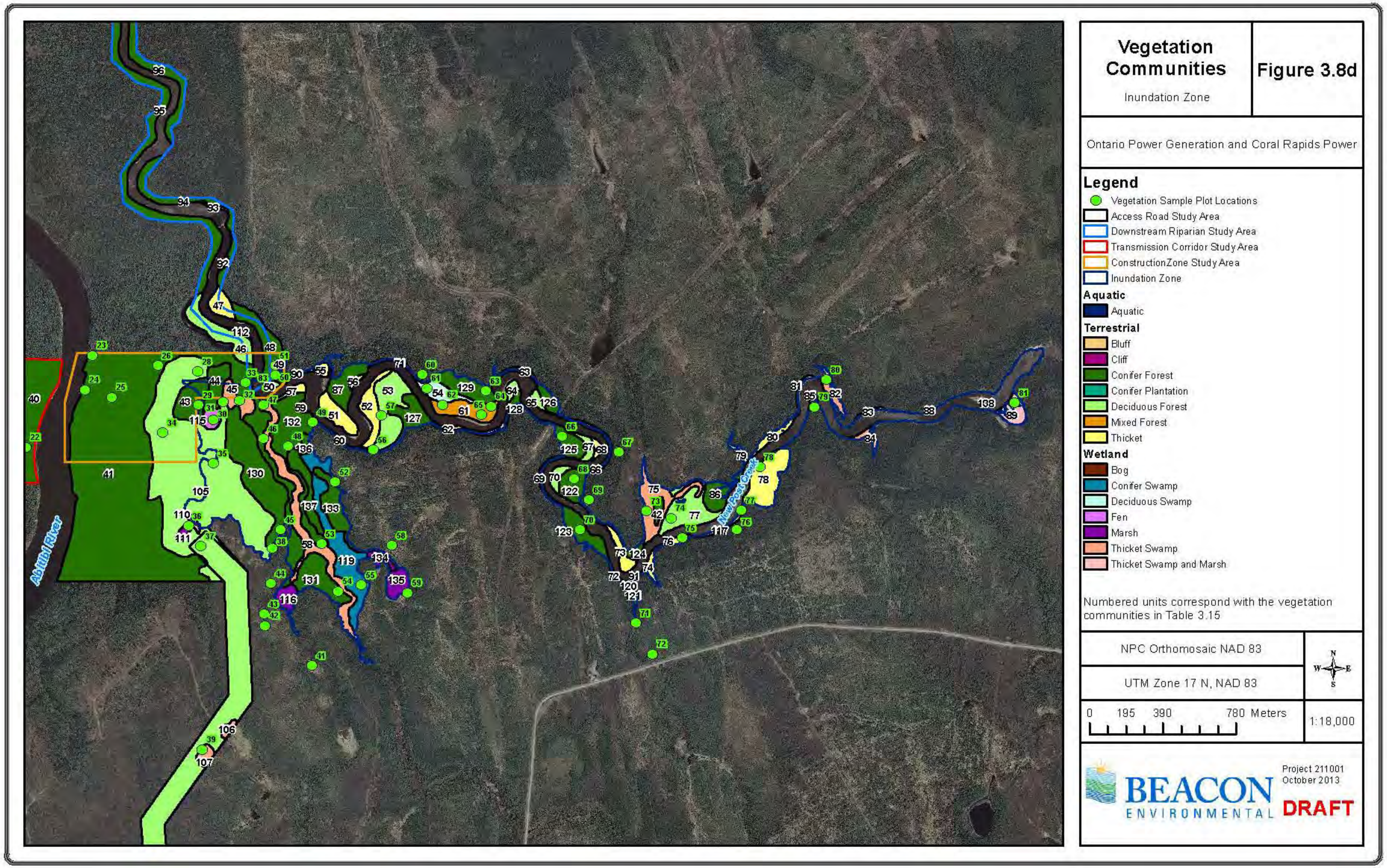


Table 3.15 Map Units and Corresponding Vegetation Types

Map Unit	Ecosite	Vegetation Class	Map Unit	Ecosite	Vegetation Class
1	Fresh, Silty to Fine Loamy: Aspen-Birch Hardwood	Deciduous Forest	2	Poor Conifer Swamp	Conifer Swamp
3	Poor Conifer Swamp	Conifer Swamp	4	Organic Thicket Swamp	Thicket Swamp
5	Poor Conifer Swamp	Conifer Swamp	6	Organic Shallow Marsh	Marsh
7	Poor Conifer Swamp	Conifer Swamp	8	Poor Conifer Swamp	Conifer Swamp
9	Poor Conifer Swamp	Conifer Swamp	10	Sparse Treed Bog	Bog
11	Poor Conifer Swamp	Conifer Swamp	12	Organic Rich Conifer Swamp	Conifer Swamp
13	Organic Rich Conifer Swamp	Conifer Swamp	14	Organic Rich Conifer Swamp	Conifer Swamp
15	Organic Thicket Swamp	Thicket Swamp	16	Spruce-Fir Conifer	Conifer Plantation
17	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Conifer	Mixed Forest	18	Poor Conifer Swamp	Conifer Swamp
19	Spruce-Fir Conifer	Conifer Forest	20	Organic Rich Conifer Swamp	Conifer Swamp
21	Poor Conifer Swamp	Conifer Swamp	22	Sparse Treed Bog	Bog
23	Organic Thicket Swamp	Thicket Swamp	24	Black Spruce Plantation	Conifer Plantation
25	Sparse Treed Bog	Bog	26	Poor Fen	Fen
27	Sparse Treed Fen	Fen	28	Poor Conifer Swamp	Conifer Swamp
29	Organic Rich Conifer Swamp	Conifer Swamp	30	Black Spruce Plantation	Conifer Plantation
31	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Conifer	Mixed Forest	32	Poor Conifer Swamp	Conifer Swamp
33	Moist, Fine: Pine-Black Spruce Conifer	Conifer Forest	34	Moist, Fine: Pine-Black Spruce Conifer	Conifer Forest
35	Black Spruce Plantation	Conifer Plantation	36	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Conifer Forest
37	Black Spruce Plantation	Conifer Plantation	38	Open Water	Aquatic
39	Open Water Marsh: Organic	Marsh	40	Spruce-Fir Conifer	Conifer Forest
41	Pine-Black Spruce Conifer	Conifer Forest	42	Spruce-Fir Conifer	Conifer Forest
43	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest	44	Spruce-Fir Conifer	Conifer Forest
45	Mineral Thicket Swamp	Thicket Swamp	46	Aspen-Birch Hardwood	Deciduous Forest
47	Moist, Coarse: Shrub	Thicket	48	Pine-Black Spruce Conifer	Conifer Forest
49	Mineral Thicket Swamp	Thicket Swamp	50	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
51	Moist, Coarse: Shrub	Thicket	52	Moist, Coarse: Shrub	Thicket
53	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	54	Intolerant Hardwood Swamp	Deciduous Swamp

Table 3.15 Map Units and Corresponding Vegetation Types (Cont'd)

Map Unit	Ecosite	Vegetation Class	Map Unit	Ecosite	Vegetation Class
55	Moist, Coarse: Shrub	Thicket	56	Moist, Coarse: Shrub	Thicket
57	Moist, Coarse: Shrub	Thicket	58	Mineral Thicket Swamp	Thicket Swamp
59	Moist, Coarse: Shrub	Thicket	60	Active Bluff	Bluff
61	Moist, Coarse: Aspen-Birch Hardwood; Moist, Coarse: Spruce-Fir Conifer	Mixed Forest	62	Active Bluff	Bluff
63	Active Bluff	Bluff	64	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
65	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	66	Active Bluff	Bluff
67	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	68	Moist, Coarse: Shrub	Thicket
69	Active Bluff	Bluff	70	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
71	Active Bluff	Bluff	72	Active Bluff	Bluff
73	Moist, Coarse: Shrub	Thicket	74	Moist, Coarse: Shrub	Thicket
75	Mineral Thicket Swamp	Thicket Swamp	76	Moist, Coarse: Shrub	Thicket
77	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	78	Moist, Coarse: Shrub	Thicket
79	Moist, Coarse: Shrub	Thicket	80	Moist, Coarse: Shrub	Thicket
81	Active Bluff	Bluff	82	Mineral Thicket Swamp	Thicket Swamp
83	Active Bluff	Bluff	84	Mineral Thicket Swamp	Thicket Swamp
85	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Conifer Forest	86	Moist, Coarse: Spruce-Fir Conifer	Conifer Forest
87	Pine-Black Spruce Conifer	Conifer Forest	88	Mineral Thicket Swamp	Thicket Swamp
89	Mineral Thicket Swamp; Mineral Shallow Marsh	Thicket Swamp and Marsh	90	Bluff	Active Bluff
91	Active Bluff	Bluff	92	Moist, Coarse: Shrub	Thicket
93	Active Bluff	Bluff	94	Spruce-Fir Conifer	Conifer Forest
95	Spruce-Fir Conifer	Conifer Forest	96	Spruce-Fir Conifer	Conifer Forest
97	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	98	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
99	Dry-Fresh, Coarse: Shrub	Thicket	100	Spruce-Fir Conifer	Conifer Forest
101	Spruce-Fir Conifer	Conifer Forest	102	Spruce-Fir Conifer	Conifer Forest
103	Spruce-Fir Conifer	Conifer Forest	104	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
105	Aspen-Birch Hardwood	Deciduous Forest	106	Organic Thicket Swamp	Thicket Swamp
107	Organic Thicket Swamp	Thicket Swamp	108	Organic Thicket Swamp	Thicket Swamp
109	Organic Thicket Swamp	Thicket Swamp	110	Organic Thicket Swamp	Thicket Swamp
111	Organic Shallow Marsh	Marsh	112	Organic Thicket Swamp	Thicket
113	Organic Meadow Marsh	Marsh	114	Organic Meadow Marsh	Marsh
115	Sparse Treed Fen	Fen	116	Organic Meadow Marsh	Marsh
117	Active Bluff	Bluff	118	Active Cliff	Cliff

Table 3.15 Map Units and Corresponding Vegetation Types (Cont'd)

Map Unit	Ecosite	Vegetation Class	Map Unit	Ecosite	Vegetation Class
119	Organic Poor Conifer Swamp	Conifer Plantation	120	Mineral Thicket Swamp	Thicket Swamp
121	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest	122	Dry-Fresh, Course: Jack Pine-Black Spruce Dominated	Conifer Forest
123	Moist-Coarse Spruce-Fir Conifer	Conifer Forest	124	Moist-Coarse Spruce-Fir Conifer	Conifer Forest
125	Dry-Fresh, Coarse Spruce-Fir Conifer	Conifer Forest	126	Dry-Fresh, Coarse Spruce-Fir Conifer	Conifer Forest
127	Spruce-Fir Conifer	Conifer Forest	128	Dry-Fresh, Coarse Spruce-Fir Conifer	Conifer Forest
129	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Conifer Forest	130	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Plantation
131	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Forest	132	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Forest
133	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Plantation	134	Open Water Marsh: Organic	Marsh
135	Organic Shallow Marsh	Marsh	136	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Plantation
137	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Plantation	138	New Post Creek	Watercourse

Table 3.16 Ecosites Recorded in Proposed Project Area

Ecosite	Ecosite No.
Active Bluff	2
Active Mineral Shoreline	5
Dry, Sandy Spruce-Fir Conifer	37
Dry to Fresh, Coarse: Shrub	47
Dry to Fresh, Coarse: Jack Pine – Black Spruce Dominated	49
Dry to Fresh, Coarse: Spruce-Fir Conifer	52
Dry to Fresh, Coarse: Aspen-Birch Hardwood	55
Moist, Coarse: Shrub	63
Moist, Coarse: Pine-Black Spruce Conifer	65
Moist, Coarse: Spruce-Fir Conifer	67
Moist, Coarse: Aspen – Birch Hardwood	70
Fresh, Clayey: Jack Pine-Black Spruce Dominated	82
Fresh, Clayey: Spruce-Fir Conifer	85
Fresh, Clayey: Aspen-Birch Hardwood	88

Table 3.16 Ecosites Recorded in Proposed Project Area (Cont'd)

Ecosite	Ecosite No.
Fresh, Silty to Fine Loamy: Shrub	96
Fresh, Silty to Fine Loamy: Pine-Black Spruce Dominated	99
Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	101
Fresh, Silty to Fine Loamy: Aspen – Birch Hardwood	104
Moist, Fine: Pine – Black Spruce Conifer	114
Sparse Treed Bog	126
Organic Poor Conifer Swamp	127
Organic Intermediate Conifer Swamp	128
Organic Rich Conifer Swamp	129
Intolerant Hardwood Swamp	130
Mineral Thicket Swamp	134
Organic Thicket Swamp	135
Sparse Treed Fen	136
Poor Fen	139
Mineral Meadow Marsh	142
Organic Meadow Marsh	144
Organic Shallow Marsh	149
Open Water Marsh: Organic	152
Active Cliff	173
Mineral Poor Conifer Swamp	222

Proposed Access Road

Vegetation along the proposed main access road consists of mid-aged hardwood forests dominated Trembling Aspen and White Birch, occasionally mixed with Balsam Fir and Black Spruce (Map Unit 105). The forests in this area are estimated to be about 40 to 50 years old based on FRI data. There are also several thicket swamps along the existing roadway, which are dominated by willows and Speckled Alder.

The proposed access road to the powerhouse traverses an area of mature conifer forest dominated by Black Spruce with Balsam Fir and a sparse amount of Jack Pine (Map Unit 41). The proposed access road to the intake traverses conifer forest comprised of Black Spruce, White Spruce, Balsam Fir, and Jack Pine (Map Units 41, 43, 44, 45), as well as Aspen-Birch Hardwood forest (Map Unit 105).

Proposed Inundation Zone

The inundation zone encompasses a large area east and south of the proposed intake weir location which will be flooded up to 187.00 m.a.s.l. The zone includes the low-lying riparian area along New Post Creek extending approximately 7,166 m upstream of the proposed intake weir location, as well as a large area of land south of the proposed GS footprint, which includes an unnamed tributary to New Post Creek. The total area of inundation is approximately 170 ha.

The riparian zone along New Post Creek was heavily altered after construction of the diversion dam on the Little Abitibi River in 1963, which redirected flows from the Little Abitibi River into New Post Creek via a diversion channel. The significant increase in flows into this stretch of New Post Creek completely transformed the physical and biological character of the riparian environment, resulting in dramatic changes to the terrestrial and wetland habitats along the creek.

The riparian vegetation zone along New Post Creek is a dynamic area subject to fluctuating water levels and the lateral, meandering movements of New Post Creek. Large, unvegetated, actively eroding bluffs occur on the outside bends of New Post Creek (Map Units 60, 62, 63, 66, 69, 71, 72, 81, 83, 117), while sandy open riparian bars and shrub thickets occur in sediment zones on inside bends.

The vegetation along New Post Creek is generally tolerant of disturbances related to periodic flooding. Dominant vegetation communities within the floodplain include thickets and thicket swamp comprised of Speckled Alder and willow species (Map Units 51, 52, 55, 57, 68, 73, 25, 76, 78, 79, 80, 82, 84, 88, 89), and intolerant hardwood forests dominated by Trembling Aspen and occasionally Balsam Poplar (Map Units 50, 53, 61, 64, 65, 67, 70, 77). Small open water marsh features occur in Map Units 78 and 89, which formed as a result of beaver activity.

The large area of land within the inundation zone south of the proposed intake weir location has been extensively modified by past logging operations and now consists largely of mid-aged secondary growth conifer and hardwood forests. A large portion of Map Unit 105 is situated in the inundation zone. This community is a young to mid-aged hardwood forest dominated by Trembling Aspen intermixed with Black Spruce, White Spruce and Balsam Fir. Alder thicket is interspersed throughout this area.

Several large tracts of mid-aged conifer forest dominated by Black Spruce (Map Unit 132) and Jack Pine (Map Units 130, 133, 136, 137) occur within the inundation zone. These forests evidently regenerated after logging are estimated to be about 40 years old. Map Unit 132 has an open canopy of mid-aged Black Spruce, which occurs on predominantly organic soils (organic accumulations over 40 cm deep). Map Units 133, 136 and 137 have dense canopies of mid-aged planted Jack Pine. Map Unit 130 is also dominated by Jack Pine; however, the canopy cover is open and intermixed with White Spruce and Black Spruce.

In addition to the younger forests and plantations, there are remaining areas of intact, mature conifer forest, which are dominated by Black Spruce intermixed with Balsam Fir and Jack Pine (Map Units 41 and 132). These mature forest communities primarily occur within the riparian corridors along New Post Creek and its tributary. There is also a small sparse treed fen (Map Unit 115) situated just southwest of the proposed spillway.

There are several open marshes within the inundation zone (Map Units 135, 139 and portions of Map Unit 45), which are dominated by sedges and Canada Blue-joint. Soils are peaty phase mineral (10-40 cm organic accumulations) or organic (over 40 cm organic accumulations).

The inundation zone also includes a tributary to New Post Creek. Vegetation along this watercourse is dominated by Alder thicket swamp (Map Unit 58).

Downstream Riparian Zone

The riparian area downstream of the proposed intake location is similar to the upstream environment, consisting of willow and alder shrub thickets and floodplain forest dominated by Trembling Aspen, occasionally mixed with Balsam Fir and Black Spruce. At higher elevations along the creek corridor, the vegetation is dominated by Black Spruce and Balsam Fir, mixed with Trembling Aspen and Jack Pine intermixed.

Proposed Work Area and Laydown Zone

A significant portion of the proposed work area and laydown zone study area consists of young to mid-aged secondary growth hardwood forest dominated by Trembling Aspen, intermixed with Speckled Alder, Black Spruce, White Spruce, and Balsam Fir (Map Units 50 and 105).

A large contiguous block of mature forest dominated by Black Spruce and Balsam Fir, and interspersed with Jack Pine, occupies the western and northern portions of the proposed work area (Map Unit 41). A remnant patch of mature Balsam Fir intermixed with White Spruce (Map Unit 43) is situated on a knoll near the centre of the proposed work area.

The proposed work area and laydown zone study area also contains several wetland communities including thicket swamp (Map Units 45 and 49) and shallow marsh (Map Unit 111). Map Unit 45 is a 1.8 ha complex of meadow marsh and thicket swamp situated just southwest of the proposed intake weir location. This wetland area is dominated by willows and Speckled Alder with more open areas dominated by sedges. Soils are peaty phase mineral with organic accumulations between 10 and 30 cm deep. A small Alder thicket swamp (Map Unit 49) is situated within the proposed construction zone study area on the west side of New Post Creek. Map Unit 111 is a small shallow marsh dominated by Broad-leaf Cattail on deep organic soils (>100 cm accumulation of organics), which is situated in the southern-most portion of the study area.

New Post Creek Waterfalls Spray Zone

The vertical cliff face within the spray zone of the New Post Creek waterfalls is sparsely vegetated with patches of mosses and occasional ferns and grasses, many of which could not be identified due to access limitations. In the spray zone at the top of the waterfalls, the vegetation community consists of a moist, open meadow comprised of mosses and various grasses and forbs. No rare plant species were recorded in this area.

3.2.4.3 Flora

A list was compiled of vascular plants and mosses observed during the vegetation surveys in the proposed Project area.

Of the 196 species recorded, 174 are designated by the MNR Natural Heritage Information Centre (NHIC, 2010) as S5 (secure), eight are designated as S4 or S4? (apparently secure with the ? indicating rank uncertain); and four are designated as S4S5 (apparently secure to secure). The remaining ten species are designated SNA, i.e., not applicable – a conservation status rank is not applicable because the species is not a suitable target for conservation activities. The percentage of exotic (SNA) species (5.1%) is well below the general proportion of non-native plants in the Province, estimated around 25% (e.g., Kaiser, 1983).

In addition to vascular plants, seven moss and 27 lichen species were identified in the proposed Project site-specific study area. All mosses are ranked S5 (secure) by the NHIC (2010). Of the lichens identified, 17 species are ranked S5 (secure), one species is ranked S4 (apparently secure), eight species are ranked S4S5 (apparently secure to secure) and one is ranked SNR (not ranked, conservation status not yet assessed).

A number of plant species considered to be significant by the MNR were listed in the Abitibi River WMP (see Table 2.10 of the Terrestrial Environment TSD). Based on examination of the NHIC (2012) database, none of these species have been recorded within the proposed Project local study area, nor were any documented during the site-specific field investigations.

Table 2.8 of the Terrestrial Environment TSD lists the regional status of the plants observed within the proposed Project area based on "Plants of the Clay Belt of Northern Ontario and Quebec" (Baldwin, 1958) and "Flora of the Hudson Bay Lowlands and its Postglacial Origins" (Riley, 2003). Both sources have limitations. Baldwin (1958) is somewhat dated; therefore, it is possible that the status of some plants species listed may not reflect the current status of the species. Riley (2003) is more recent, but addresses plants of the Hudson Bay Lowlands geographic region. The proposed Project area is situated just south of this region; therefore, the status rankings may not be applicable or suitably applied to some of the species within the area. Nonetheless, given the proximity of the proposed Project area to the Hudson Bay Lowlands region, the rankings provide some measure of the species status within the area.

Based on the status rankings from Baldwin (1998), four plant species are considered regionally rare and one species is considered scarce. Regionally rare plants include: Daisy (Hyssop-leaved) Fleabane (*Erigeron hyssopifolius*), Variegated Horsetail (*Equisetum variegatum* ssp. *variegatum*), Leafy White (Tall White Bog) Orchid (*Platanthera dilatata*) and Nagoonberry (Stemless Raspberry) (*Rubus arcticus* ssp. *acaulis*). All four species are designated by NHIC (2010) as S5 (secure). Dwarf Rattlesnake-plantain (*Goodyera repens*) is listed as scarce and also designated by the NHIC (2010) as S5 (secure). None of these species were ranked as rare by Riley (2003). However, ten species observed in the proposed Project area are considered rare by Riley (2003) including: Beaked Hazelnut (*Corylus cornuta* ssp. *cornuta*), Black (Bear) Sedge (*Carex arctata*), Longstalk (Peduncled) Sedge (*C. pedunculata*), Bracken Fern (*Pteridium aquilinum* var. *latiusculum*), Scouring Rush (*Equisetum hyemale* var. *affine*), American Mountain-ash (*Sorbus americana*), Pussy Willow (*Salix discolor*), Water Dock (*Rumex orbiculatus*), Canada Yew (*Taxus canadensis*) and Kentucky Fescue (*Festuca arundinacea*). The first seven species listed are designated by NHIC (2010) as S5 (secure). Water Dock and Canada Yew are designated as S4S5 (apparently secure to secure) and S4 (apparently secure), respectively. The exotic Kentucky Fescue is designated as SNA (not applicable).

3.2.5 Wetlands and Significant Natural Features

Wetlands and other environmentally sensitive areas provide important habitat for a variety of wildlife and plant species. Further, wetlands provide water storage and control functions which reduce erosion and flooding, and improve water quality. Wetlands also increasingly provide areas for a range of recreational pursuits, including nature appreciation.

As discussed in Section 3.2.4.2, wetlands are located throughout the proposed Project local study area, particularly in the transmission line study area, which include conifer swamp, fen, bog, thicket swamp and open marsh.

LAPP, located proximate to the proposed Project property, provides waterway and natural environment class representation in the Lake Abitibi Ecodistrict (3E-1). The Little Abitibi River – New Post Creek section of the LAPP is considered waterway class, whereas the upstream lake system is natural environment class. LAPP has a number of significant earth and life science features (Ontario Parks, 2006), including the Pinard Moraine, Zinger Lake esker complex, New Post Creek fault and a 300+ years old Red Pine stand (see Section 2.6 of the Terrestrial Environment TSD). The Replacement Lands regulated into LAPP increased park size by approximately 212 ha and enhanced its overall ecological integrity.

Pinard Moraine Conservation Reserve (CR) is located west of the Abitibi River approximately 8 km from the proposed GS location and 30 m west of proposed transmission line interconnection with the existing 115 kV transmission line connecting Otter Rapids GS to Abitibi Canyon GS.

The Fraserdale Wetland Complex CR and the Coral Rapids Wetland CR are located approximately 28 km south and 32 km north of the proposed Project site, respectively.

3.2.6 Mammals

The two big game species of significance in northeastern Ontario are Moose and Black Bear. Moose density was estimated to be 0.03 Moose/km^2 in Wildlife Management Unit (WMU) 26 in 1996-97 (Bisset *et al*., 1997). The MNR has established WMUs across Ontario for the purpose of regulating hunting and more effective wildlife and habitat management.

According to the CLI (1972b) mapping for Moose production, most of the lands encompassing New Post Creek (excluding its headwaters) and the Abitibi River from Abitibi Canyon to downstream of New Post Creek outlet are categorized as Class 4 with moderate limitations due to excessive soil moisture and lack of nutrients in the soil for optimum plant growth. The central portion of the proposed transmission line study area is designated as Class 6 with severe limitations due to excessive soil moisture, lack of nutrients in the soil for optimum plant growth and poor distribution or interspersion of landforms necessary for optimum moose habitat.

Black Bear are considered to be common in this area of northeastern Ontario. The local study area occurs within Bear Management Area (BMA) 26-15.

The proposed Project is located within the "Kesagami Caribou Range" (R. Stewart, MNR, 2011, pers. comm.). Woodland Caribou are reported to be occasionally sighted in LAPP (Ontario Parks, 2006) and have been observed to the north and south of the proposed Project local study area (Beacon, 2010). Based on recorded observations, no Woodland Caribou have been noted within 5 km of the proposed Project GS site (M. Gauthier, MNR, 2011, pers. comm.). This species is designated as Threatened federally (COSEWIC, 2012) and provincially (MNR, 2013). It is unlikely that Woodland Caribou utilize the proposed Project area due to the presence of roads and clearings.

According to the MNR Natural Resources Values Information System (NRVIS) data, there are no seasonal wildlife concentration areas within the proposed Project site-specific study area. However, the NRVIS database indicates a Moose late wintering area approximately 1 km west of the existing Otter Rapids GS/Abitibi Canyon GS transmission line, and Woodland Caribou wintering areas approximately 4 km north and 3 km south of the transmission line study area. Ontario Hydro (1995) reported that there was marginal to poor aquatic feeding habitat for Moose in the local study area due to the paucity of pondweed.

The proposed Project occurs at the northern extent of White-tailed Deer distribution. The bulk of the deer population in northeastern Ontario is concentrated along the agricultural areas of the Great Clay Belt.

The numerous wetlands in the area may provide suitable habitat for a number of aquatic mammals such as Beaver, Northern River Otter and Muskrat. Other furbearers that are relatively abundant throughout the region include Mink, American Marten, Ermine, Fisher, Lynx, Red Fox, Coyote, Northern Gray Wolf and squirrels.

Of the 35 native mammal species likely present in the proposed Project local study area based on distribution maps (Dobbyn, 1994), 30 are ranked by the NHIC (2010) as S5 (secure), four are S4 (apparently secure) and one is S3S4 (vulnerable to apparently secure).

The Little Brown Myotis was recently designated as Endangered federally (COSEWIC, 2012) and provincially (MNR, 2013) due to potential impacts of white-nose syndrome on the population (COSSARO, 2012). As indicated in Section 3.2.9, no bat hibernacula, maternity colonies or migratory stopover areas are identified by MNR NRVIS in the proposed Project local study area. Based on the site-specific field surveys, their occurrence is unlikely.

During the 2011 and 2012 site-specific field investigations, indirect observations were made of Beaver (based on dams and cut trees), Northern Gray Wolf (tracks), Black Bear (tracks, scat) and Moose (tracks and scat).

3.2.7 Terrestrial Avifauna

Few species of terrestrial birds reside in the region year-round, e.g., Pine Grosbeak, Boreal Chickadee, Black-capped Chickadee, Common Raven, American Crow, Ruffed Grouse, Spruce Grouse, Great Horned Owl, Boreal Owl and Northern Saw-whet Owl.

Other passerine and non-passerine species are migratory. The general Project area lies within the Atlantic flyway used by migratory birds which have breeding habitat preferences within the boreal forest (Erskine, 1977). Numerous passerines that are typical boreal species occur in the area of the proposed Project site. In black spruce-dominated forests these include Spruce Grouse, Boreal Chickadee, Gray Jay, Yellow-bellied Flycatcher, Winter Wren, Swainson's Thrush, Ruby-crowned Kinglet, Nashville Warbler, Yellow-rumped Warbler, Magnolia Warbler, Dark-eyed Junco, Chipping Sparrow and White-throated Sparrow (Erskine, 1977). In stands dominated by balsam fir, the Spruce Grouse and Gray Jay are replaced by Ruffed Grouse and Blue Jay, respectively. Jack pine stands support a less diverse avian community. Birds occurring in jack pine communities include American Robin, Hermit Thrush, Swainson's Thrush, Ruby-crowned Kinglet, Blue-headed Vireo, Tennessee Warbler, Nashville Warbler, Chipping Sparrow and White-throated Sparrow.

Of the 63 terrestrial bird species likely or confirmed to be breeding within the two 10-km by 10-km square girds (17MR53 and 17MR63) encompassing the proposed Project local study area (Bird Studies Canada, 2006), 45 are considered by the NHIC (2010) to be S5 (secure) and 18 are S4 (apparently secure).

During the field surveys for the proposed Project, 20 bird species, all ranked as S5 (secure) or S4 (apparently secure), were observed in the local study area. Only the Song Sparrow was determined to be nesting. Bald Eagle, designated as Special Concern provincially (MNR, 2013), but Not At Risk federally (COSEWIC, 2012) was observed foraging along the Abitibi River downstream of the proposed tailrace location.

Based on the MNR NRVIS database, an unknown raptor nest is located approximately 1 km north of the proposed Project site within LAPP along the Abitibi River.

3.2.8 Amphibians and Reptiles

Of the nine amphibian and reptile species likely present in the New Post Creek Project area based on distribution mapping (Ontario Nature, 2010), seven are ranked by the NHIC (2010) as S5 (secure) and two are S4 (apparently secure). The MOE (1972) reported that Eastern Gartersnake and Wood Frog were observed only occasionally in the Onakawana area located approximately 75 km north of the proposed Project site, suggesting low populations of these species. On sunny days, a sizable population of American Toad was observed. An Eastern Gartersnake was observed in June 2008 by Ontario Parks staff in the vicinity of New Post Creek waterfalls (Ontario Parks, 2008). During the summer and fall 2011 site-specific field investigations, a red variation of Eastern Gartersnake and a Wood Frog were observed.

3.2.9 Significant Wildlife Habitat

Significant wildlife habitat includes seasonal wildlife concentrations areas, rare vegetation communities, specialized wildlife habitat, habitat for species of conservation concern (not including Endangered or Threatened species), and animal movement corridors. Table 3.17 provides a list of significant wildlife habitat in Ecoregion 3E and indicates what types of wildlife habitat were identified by MNR NRVIS and by Beacon within the proposed Project local study area, as well as what types of significant wildlife habitat may be present in the area given what is known about its vegetation and physiography.

The review of MNR data did not yield any information regarding significant wildlife habitat in the proposed Project local study area.

Two examples of significant wildlife habitat were confirmed by Beacon during site-specific field investigations, including:

- Cliffs and Talus Slopes (at the New Post Creek waterfalls); and
- Hardwood Swamps (Balsam Poplar community along New Post Creek).

The proposed Project area has the potential to support other types of significant wildlife habitat. However, possibly due to data gaps in NRVIS and limitations of the field investigations in terms of area covered and timing, additional features were not identified.

3.3 SPECIES AT RISK

Undisturbed areas of native vegetation within the proposed New Post Creek Project area have the potential to support plant species which are at risk, i.e., species which are designated with significant status under federal and/or provincial legislation. Federally, species at risk (SAR) are recognized by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2012) and are protected under the *Species at Risk Act* (*SARA*). Provincially these are recognized by the Committee on the Status of Species at Risk in Ontario (COSSARO) under the *Endangered Species Act* (*ESA*), in conjunction with the Species at Risk in Ontario (SARO) List (MNR, 2013). Species listed as provincially Endangered or Threatened and their habitat are afforded protection under the *ESA*.

Table 3.17 Assessment of Significant Wildlife Habitat in the Proposed Project Local Study Area

	Identified by NRVIS	Observed during 2010-2011 Field Investigations	Potential for Habitat in the Proposed Project Local Study Area
Seasonal Concentration Areas			
Moose Late Winter Cover	No; three locations within 5 km of proposed Project area	No	Probable - in areas with high conifer cover
Waterfowl Stopover and Staging Areas (Terrestrial)	No	No	Unlikely - no suitable habitat
Waterfowl Stopover and Staging Areas (Aquatic)	No	No	Possible - several small open water features within proposed transmission line area
Shorebird Migratory Stopover Area	No	No	Unlikely - no suitable habitat
Bat Hibernacula	No	No	Unlikely - no suitable habitat
Bat Maternity Colonies	No	No	Possible, but unlikely given the young age of deciduous forests in the proposed Project study area
Bat Migratory Stopover Area	No	No	Unlikely
Turtle Wintering Areas	No	No	No
Reptile Hibernacula	No	No	Possible
Colonially Nesting Bird Breeding Habitat (Bank and Cliff)	No	No	Possible along New Post Creek bluffs, but Bank Swallow and Cliff Swallow not reported in the area
Colonially Nesting Bird Breeding Habitat (Tree/Shrubs)	No	No	Unlikely
Colonially Nesting Bird Breeding Habitat (Ground)	No	No	Unlikely
Rare Vegetation Communities			
Cliffs and Talus Slopes	No	Yes	Cliffs confirmed at New Post Creek waterfalls
Red and White Pine Community	No	No	Unlikely
Black Ash Community	No	No	Unlikely
Elm Community	No	No	Unlikely
Oak Community	No	No	Unlikely
Red Maple and Sugar Maple Community	No	No	Unlikely
Yellow Birch Community	No	No	Unlikely
Rock Barren	No	No	Unlikely
Sand Dunes	No	No	Not present
American Dune Grass Type	No	No	Not present

Table 3.17 Assessment of Significant Wildlife Habitat in the Proposed Project Local Study Area (Cont'd)

	Identified by NRVIS	Observed during 2010-2011 Field Investigations	Potential for Habitat in the Proposed Project Local Study Area
Great Lakes Arctic-Alpine Shoreline Type	No	No	Not present
Hardwood Swamps	No	Yes	Confirmed, Balsam Poplar community along New Post Creek
Specialized Wildlife Habitat			
Woodland Raptor Nesting Habitat	No; one location along Abitibi River approximately 1 km north of proposed Project footprint[1]	No	Possible, forested habitat
Bald Eagle and Osprey Nesting Habitat	No	No	Possible, along New Post Creek or Abitibi River
Waterfowl Nesting Area	No	No	Possible, in open water features within proposed transmission line area
Turtle Nesting Areas	No	No	No
Seeps and Springs	No	No	Possible
Aquatic Feeding Habitat	No; two locations within 2 km south of proposed Project area	No	Possible, in open water features
Mineral Licks	No	No	Possible
Denning Sites for Mink, Otter, Gray Wolf, Eastern Wolf, Canada Lynx, Marten, Fisher and Black Bear	No	No	Probable for some species such as Mink
Wolf Rendezvous Sites	No	No	Possible - potential habitat exists
Amphibian Breeding Habitat (Wetlands)	No	No	Possible
Amphibian Breeding Habitat (Woodland)	No	No	Possible
Mast Producing Areas	No	No	Possible
Sharp-tailed Grouse Leks	No	No	Unlikely - Sharp-tailed Grouse not reported in area
Habitat for Species of Conservation Concern			
Marsh Bird Breeding Habitat	No	No	Possible - potential habitat exists
Open Country Bird Breeding Habitat	No	No	Unlikely - little potential habitat

Table 3.17 Assessment of Significant Wildlife Habitat in the Proposed Project Local Study Area (Cont'd)

	Identified by NRVIS	Observed during 2010-2011 Field Investigations	Potential for Habitat in the Proposed Project Local Study Area
Habitat for Species of Conservation Concern			
Shrub/Early Successional Bird Breeding Habitat	No	No	Possible - potential habitat exists
Special Concern and Rare Wildlife Species	No	No	Possible
Movement Corridors			
Amphibian Movement Corridors	No	No	Possible, along watercourses
Cervid Movement Corridors	No	No	Possible
Furbearer Movement Corridor	No	No	Possible

[1] Construction zone well beyond buffer area of at least 8 ha recommended around Northern Goshawk nest from 01 March to 30 June (James, 1984).

An updated *ESA* came into effect on June 30, 2008, providing broader protection of SAR and their habitat and a stronger commitment to recovery and effective enforcement. Once a species is designated to be at risk, it is included on the SARO List. All species that are considered Endangered or Threatened and their critical habitats are now legally protected.

None of the flora species identified during the field surveys are designated as SAR by COSEWIC (2012) or COSSARO (MNR, 2013) (see Aquatic and Terrestrial Environment TSDs).

Similarly, based on examination of NHIC (2012) and *SARA* Schedule 1 Species at Risk Web Mapping Application (Environment Canada, CWS, 2010/2011) databases, no plant SAR have been documented within the proposed Project local study area.

As indicated in Section 3.1.9, Lake Sturgeon is designated as Special Concern federally (COSEWIC, 2012) and provincially (MNR, 2013). None of the other aquatic species documented in the proposed Project site-specific study area are considered at risk. Goldeye is designated by the NHIC (2010) as S3 (vulnerable).

Based on the *SARA* Schedule 1 Species at Risk Web Mapping Application (Environment Canada, CWS, 2010/2011), no aquatic SAR have documented occurrences overlapping the proposed New Post Creek Project. Similarly, examination of the NHIC (2012) database indicated that there were no records of significant aquatic species.

As indicated in Section 3.2.6, Woodland Caribou, designated as Threatened federally and provincially, have been reported in the vicinity of the proposed New Post Creek Project. However, their utilization of the site-specific study area is unlikely due to the presence of roads and clearings. No Woodland Caribou has been observed within 5 km of the proposed Project site (M. Gauthier, MNR, 2011, pers. comm.). A Habitat Regulation for Woodland Caribou is currently being developed by the MNR with an approach to habitat protection recently posted on the Environmental Registry (EBR Registry Number: 011-2303). As of June 30, 2013, there will be a general habitat protection for Woodland Caribou under the *ESA* if no habitat regulation yet applies (F. Miklas, MNR Thunder Bay District, 2013, pers. comm.).

As also indicated in Section 3.2.6, the Little Brown Myotis has recently been designated as Endangered federally (COSEWIC, 2012) and provincially (MNR, 2013) due to potential impacts of white-nose syndrome on the population (COSSARO, 2012). As indicated in Section 3.2.9, no bat hibernacula, maternity colonies and migratory stopover areas are identified in the NRVIS database within the proposed Project local study area, and the potential occurrence of this type of habitat is unlikely.

As indicated in Section 3.2.7, Bald Eagle, designated Special Concern provincially (MNR, 2013), but Not At Risk federally (COSEWIC, 2012), was observed in the proposed Project local study area.

Canada Warbler and Rusty Blackbird, with S4 rankings, have been recorded as possibly breeding in the 10-km by 10-km grids overlapping the proposed New Post Creek Project area (see Terrestrial Environment TSD). Canada Warbler is designated as Threatened federally by COSEWIC (2012) and Special Concern provincially by COSSARO (MNR, 2013). Rusty Blackbird is designated as Special Concern federally (COSEWIC, 2012) and Not At Risk provincially (MNR, 2013).

Olive-sided Flycatcher may also be present in the proposed Project area (Beacon, 2010). Olive-sided Flycatcher, which breeds in coniferous or mixedwoods forests adjacent to rivers or wetlands, is designated as Threatened federally (COSEWIC, 2012) and Special Concern provincially (MNR, 2013).

Three additional SAR species have ranges in Ontario overlapping the proposed Project local study area (Environment Canada, CWS, 2010/2011; MNR, 2013). Short-eared Owl, designated Special Concern federally (COSEWIC, 2012) and provincially (MNR, 2013), prefers open habitats, including wetlands (Cadman *et al.*, 2007). Golden Eagle, designated Endangered provincially but considered to be Not At Risk federally, has the potential to be in the general area, particularly in the vicinity of bedrock cliffs along large lakes and rivers (Cadman *et al.*, 2007). Monarch, designated Special Concern federally and provincially, may also be found during the summer months in open habitats with milkweed (Opler, 1992). Milkweed is not present in the proposed Project local study area.

Whip-poor-will, designated Threatened federally and provincially, may also be present in the proposed Project local study area. This crepuscular/nocturnal insectivorous species is very difficult to survey and monitor as it only calls at dusk and on cloudless nights. Most bird surveys are undertaken during daylight.

Examination of the NHIC (2012) database indicated that no SAR, including Monarch, has been recorded within the proposed Project local study area.

3.4 SOCIO-ECONOMIC ENVIRONMENT

More detailed information on the existing socio-economic baseline conditions is provided in the Socio-Economics and Land Use TSD.

3.4.1 Regional and Local Socio-Economic Environment

The proposed New Post Creek Project is located in the District of Cochrane, the most northeastern District in Ontario, approximately 75 km (100 km by road) north of the Town of Smooth Rock Falls. Cochrane District is a large census division with an area of over 141,000 km^2 that stretches from the community of Matheson and the City of Timmins in the south to the Town of Moosonee in the north and from the Québec border to the east to the Town of Hearst to the west. The Towns of Cochrane and Kapuskasing are located over 150 km by road from the proposed Project.

3.4.1.1 Social Composition

Cochrane District

In 2011, the District had a population of 81,122, a decrease of 1.7% from the 2006 population of 82,503 (Statistics Canada, 2012a, b). In 1986, the population was 93,712. Cochrane District is similar to most parts of northern Ontario which have seen a slight population decline over the last 25 years. This stands in contrast to Ontario which has grown from 9.1 million in 1986 to 13.5 million in 2012.

Similar to other parts of northeastern Ontario there is a significant French influence in Cochrane District with approximately 52.4% or 42,010 of the residents being bilingual. In 2006, 9,665 individuals identified themselves as part of the Aboriginal population (Statistics Canada, 2012b).

In 2011, the median age in the District was 42.5 compared to 40.4 for Ontario and 40.6 for Canada. The difference in median age likely demonstrates that the District as a whole is aging with not enough new economic opportunities to retain and attract younger people in the District.

Town of Smooth Rock Falls

Smooth Rock Falls is the closest incorporated municipality to the proposed Project, located approximately 100 km by road to the south.

Smooth Rock Falls has been declining in population for many years. In 2011, Smooth Rock Falls had a population of 1,376, a decrease of 6.6% from the 2006 population of 1,473. The population in 1981 was 2,352 (Keir, 1991). In 2011, the median age was 53.1 compared to 40.4 for Ontario and 40.6 for Canada (Statistics Canada, 2012a). Again, this demonstrates that the population was aging with fewer young people in the community. The major reason for the decline in the population was the closure of the kraft pulp mill in the Town. Most recently, this was owned by Tembec and was permanently closed in late 2006.

Town of Cochrane

Cochrane has a population of 5,340 in 2011 a decrease of 2.7% from the 2006 population of 5,487, with a median age of 43.3 compared to 40.4 for Ontario and 40.6 for Canada (Statistics Canada, 2012a, b). The population in Cochrane has likely stabilized since 2011 and possibly even grown with the development of the Detour Gold Mine and the re-opening of the True North Plywood mill.

Similar to other parts of northeastern Ontario there is a significant French influence in Cochrane with approximately 52.7% or 2,790 of the residents having knowledge of both English and French (Statistics Canada, 2012a).

Cochrane is located over 150 km by road from the proposed Project.

Town of Kapuskasing

Kapuskasing has a population of 8,196 in 2011 a decrease of 3.7% from the 2006 population of 8,509, with a median age of 47.7 compared to 40.4 for Ontario and 40.6 for Canada (Statistics Canada, 2012a, b).

Although Kapuskasing has the most diverse economy for communities along the Highway 11 corridor, the major employer has been the Tembec newsprint and lumber facility. Kapuskasing has also significantly benefited from the recent construction activity in the area associated with hydroelectric projects. Along with the re-development of the Lower Mattagami Complex, Hydromega has also been constructing four small generating stations south of the community.

Local Settlements

Approximately 10 to 15 km southwest of the proposed Project site are the former communities known as Abitibi Canyon and Fraserdale. The community of Abitibi Canyon was originally a small community that housed the families of the individuals that worked at Abitibi Canyon GS and Otter Rapids GS. Abitibi Canyon is located approximately 10 km south of the proposed Project site. In 1982 Ontario Hydro closed the community as a cost-saving measure. OPG maintains a bunkhouse facility at Abitibi Canyon for workers at the Otter Rapids GS and Abitibi Canyon GS. This facility is open during the week.

Fraserdale, is a grouping of a few houses and cabins at a rail siding for the ONR. Fraserdale is located approximately 15 km southwest of the proposed Project site. There are a few houses, cabins and tent frames belonging to TTN and/or Moose Cree First Nation (MCFN) individuals. The dwellings are generally not permanently inhabited.

3.4.1.2 Economy

Northern and northeastern Ontario is a resource based economy driven primarily by the forest products, mining and energy sectors. Tourism which is largely resource-based (e.g., fishing, hunting, and other outdoor recreation) is minor as compared to the industrial resource base, but nevertheless is an important contributor to the economy. Government services whether they be federal, provincial or local are also a major contributor to the economy and employment of people. Most of the other sectors of the northern Ontario economy such as retail and wholesale trade, other manufacturing, construction and services are generally dependent on and strongly impacted by the economic cycles within the resource industries.

According to the Institute for Northern Ontario Research and Development, the unemployment rate in northeastern Ontario was 8.4% in 2011 and 7.0% in 2012 (Robinson, 2012).

Northeastern Ontario's two most important economic sectors, i.e., forestry and mining, which have experienced opposite trends over the last ten years. The forest industry has experienced significant decline with permanent and temporary lumber, board, and pulp and paper mill closures throughout the region. There have been permanent mill closures in Smooth Rock Falls, Timmins, Sault Ste. Marie and Opasatika along with numerous temporary idlings. In contrast, mining has experienced a large boom in northeastern Ontario with various mines being developed and put into operation (i.e., DeBeers Victor Diamond Mine, Lakeshore Gold Mine, Brigus Gold, Detour Gold).

Despite the resurgence of mining in northeastern Ontario, manufacturing now makes up a smaller share of northeastern Ontario's economy. In 1999, manufacturing employment was at 9.6% and by 2011 it had declined to 7.5%. A similar decline occurred in Ontario, i.e., from 18.4% to 11.8% (Di Matteo, 2011).

Energy production, while employing many fewer people than mining or forestry in northern Ontario plays an important role in the northern Ontario economy. For example, the OPG NEPG employs 216 people in its operations centred in Timmins, Dymond, Abitibi Canyon and Kapuskasing.

Timmins is the major economic centre for industry, commerce, distribution and finance for the communities in Cochrane District (City of Timmins, 2006).

3.4.2 Land and Resource Use

3.4.2.1 Land and Resource Use Direction

Existing Land Use, Tenure and Resource Policy Direction

The proposed New Post Creek Project is located in an area that is predominantly Crown land. The proximate LAPP was regulated in 1985 and encompasses, with the addition of the Replacement Lands, a total area of approximately 20,508 ha (Ontario Parks, 2006, 2008). The Park encompasses the Little Abitibi River from the outlet at Harris Lake for a distance of approximately 70 km to the New Post Creek Diversion Dam. From the Dam, the Park encompasses the New Post Creek Diversion Channel and New Post Creek for distances of 4 and 16 km, respectively. Upstream and downstream of the outlet of New Post Creek, LAPP was laid out to include the Abitibi River and adjacent land base to protect the former HBC trading post (New Post). LAPP is a waterway and natural environment class Park with representation in the Lake Abitibi Ecodistrict (3E-1). The Little Abitibi River – New Post Creek section of the Park is managed as waterway class, whereas the Pierre – Montreuil Lakes section is managed as natural environment class (Griffin, 2003)

LAPP is a non-operating provincial park and therefore there are no visitor facilities in the Park but recreational uses such as canoeing, camping, hunting and angling are permitted. Existing commercial fur harvesting (trapping) is also permitted; however, new commercial fur harvesting is not permitted (MNR, 1992, 2000, 2006).

The generation of electricity is not permitted within a Provincial Park as stipulated by the *PPCRA*. As a result, a small area of the proposed Project footprint within LAPP was deregulated accompanied by a concurrent regulation of suitable Replacement Lands. This is explained in more detail in Section 1.1.

MNR (1978) identified the significant historical, natural and recreational values of the “Little Abitibi – Newpost Canoe Route” and provided the justification for the establishment of the “Little Abitibi Waterway Park”. LAPP was regulated in 1985 (O. Reg. 279/85 Schedule 195), 22 years after the construction of the New Post Creek Diversion Dam on the Little Abitibi River. Therefore, the Diversion Dam is a pre-existing, non-conforming resource management activity in LAPP, as new hydroelectric developments have not been permitted in provincial parks by policy and more recently by legislation (i.e., *PPCRA*).

TTN maintains that they were not consulted on the establishment of the Park and that it has negatively impacted on their traditional activities and modern day economic pursuits. It is noted that the protection of aboriginal rights and treaty rights was enshrined in the *Constitution Act* in 1982 with the enactment of section 35. The judiciary has since defined section 35 to require the duty to consult prior to decisions made which could impact aboriginal rights and treaty rights. In 2004, the Supreme Court of Canada, through its landmark decisions in the Haida Nation and

Taku River First Nation cases further refined and clarified what the duty to consult entails. As indicated above, LAPP was regulated in 1985.

As indicated in Ontario Parks (2006), “First Nations have expressed interest in and have shared knowledge of the park and surrounding area. Aboriginal communities may have used the area for hunting, trapping, fishing, gathering and travel. These uses may continue, subject to public safety, conservation and other considerations.” It is further stated that “any communications or cooperation between aboriginal communities and MNR for planning and operations purposes will be done without prejudice to any future discussions or negotiations between the Government of Ontario and aboriginal communities.” The proposed New Post Creek Project is being enabled by extensive consultation with First Nations, Métis peoples and the public to change the Park boundary.

Outside of LAPP, the balance of the lands that are proposed as part of the proposed Project are located within the general Crown land use areas G1745, G1754 and G1762 (MNR, 2007).

G1754 is known as the “Northern Resource and Commercial Recreation Area” and extends over a large area from the Quebec/Ontario border to the Abitibi River. Commercial power development is permitted in this Area and MNR will remain involved in the planning and design of future hydro-electric power proposals. The penstocks, access road, some of the inundation and most of the construction laydown areas will be located in this Area.

G1762 is known as the “Abitibi, Frederickhouse, Driftwood & Onakawana Rivers Area” and includes the Abitibi River and its tributaries north of Highway 11 including 120 m of shoreline on each side. The majority of the land in this area is Crown land. Commercial power development is permitted in this Area. The powerhouse would be located in this area as well as short segments of the penstocks and transmission lines.

G1745 is known as the “Southern Resource Area” and extends over a wide area in Cochrane, Kirkland Lake, Timmins and Hearst Districts. In this area G1745 occurs west of the Abitibi River. Commercial power development is permitted in this Area. The transmission line would be located in this Area.

OPG has an existing Crown Lease for the New Post Creek Diversion Dam located on the Little Abitibi River and a Land Use Permit for the Otter Rapids Road bridge across New Post Creek.

The operation of dams and hydroelectric generating stations within the Abitibi River drainage basin must be in compliance with the Abitibi River WMP (OPG *et al*., 2006).

Provincial Policy Direction

Provincial policy was also considered when examining the proposed New Post Creek Project. Sections 1.8.2 and 1.8.3 of the Provincial Policy Statement (PPS) (OMMAH, 2005) encourage increased energy supply from waterpower resources:

> "Increased energy supply should be promoted by providing opportunities for energy generation facilities to accommodate current and projected needs, and the use of renewable energy systems and alternative energy systems, where feasible."

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

The Growth Plan for Northern Ontario 2011 (MOI and MNDMF, 2011) has been prepared under the *Places to Grow Act, 2005* and it sets out:

> "a strategic framework that will guide decision-making and investment planning in Northern Ontario over the next 25 years. It contains polices to guide decision-making about growth that promote economic prosperity, sound environmental stewardship, and strong, sustainable communities that offer northerners a high quality of life."

Lands within the Growth Plan include all Crown lands in the north. Renewable energy is recognized in the Growth Plan as a priority sector that the Province will focus economic development strategies on (MOI and MNDMF, 2011: p. 9). Furthermore, renewable energy projects involving Aboriginal communities are encouraged (MOI and MNDMF, 2011: p. 15).

The Growth Plan devotes an entire chapter to Aboriginal Peoples recognizing that (MOI and MNDMF, 2011: p. 41):

> "Economic development in Aboriginal communities is a key element of this Plan. Aboriginal communities and the Aboriginal workforce offer unique strengths that can benefit all of Northern Ontario. Many Aboriginal communities have adopted economic development approaches that reflect a connection to the land and a focus on community benefits. There is considerable potential to integrate the economic development planning of Aboriginal communities with other regional efforts. This Plan seeks to involve Aboriginal communities and organizations in economic development, and to improve the capacity of these communities to participate in economic development planning."

In summary, provincial policy currently encourages projects, such as the proposed New Post Creek Hydroelectric Project, especially when First Nations are partners on the projects.

3.4.2.2 Access and Transportation

Access to Abitibi Canyon GS and Fraserdale is via provincial Highway 634 from Smooth Rock Falls. This is a provincially maintained highway.

Access to the proposed Project site from Abitibi Canyon GS is via the Otter Rapids Road at the 6 km mark and then an old clay trace forest industry operational road. OPG has done some limited maintenance on this clay trace road over the last few years to facilitate the EA studies for the proposed Project.

The Otter Rapids Road is used by a diversity of other resource users including the forest industry, trappers, hunters, anglers and other resources users. OPG maintains the Otter Rapids Road. The Otter Rapids Road is an access point for the Wetum winter road which was opened in January 2013. The road is used during the winter by the James Bay people and public to travel to Moosonee and Moose Factory.

Access to the transmission line would be on the west side of the Abitibi River. From Fraserdale the transmission line is accessible via the Little Long Road and then an unnamed forestry road.

In addition to access by Highway 634, the ONR provides passenger and freight services and stops at Fraserdale. The ONR is operated by the Ontario Northland Transportation Commission, a provincial Crown agency.

3.4.2.3 Resource Industries

<u>Forest Operations</u>

Crown lands in the area that are not part of the Province’s protected areas system are part of the recently amalgamated Abitibi River Forest. This Forest consists of the former Cochrane-Moose River, Smooth Rock Falls, Iroquois Falls and Nighthawk Forests. This Forest is managed by Abitibi River Forest Management Inc. (ARFMI) which has a Sustainable Forest Licence (SFL) for it. ARFMI is a co-operative which is comprised by a number of shareholders of which the three largest are Resolute Forest Products with their newsprint mill in Iroquois Falls, Tembec with sawmills in Cochrane and Hearst and a newsprint facility in Kapuskasing, and Georgia Pacific which has an oriented strandboard mill in Englehart.

A Forest Management Plan for the Abitibi River Forest is prepared on a ten-year term. Most of the logging on the Abitibi River Forest is undertaken by two First Nations companies, Island Falls Forestry which is owned by TTN and Wahgoshig Resources which is owned by Wahgoshig First Nation (Wahgoshig).

Much of the forested area immediately around the proposed Project has been harvested. Most of the transmission line area has been harvested within the last 10 to 15 years.

Mining and Prospecting Activities

The local study area is devoid of mineral claims and prospecting activity. Lands associated with the proposed Project have been withdrawn from the mining claims process.

3.4.2.4 Other Land and Resource Uses

Cottaging

There is no cottaging in the immediate area around the proposed Project. A few members of TTN have camps on the TTN Reserve south of the Little Abitibi River, and a MCFN citizen has a trapping camp near the proposed transmission line.

Hunting

Hunting in this area of northern Ontario is typically for moose, bear and small game (e.g., grouse and partridge). Moose hunting is the most popular activity undertaken by both residents and non-residents. Bear hunting is typically undertaken by non-residents of Ontario. Small game hunting is undertaken by both residents and non-residents.

BMAs have been established by the local MNR offices. These BMAs are allocated and licensed to hunting outfitters on Crown lands. Bear hunt camps may be allocated to commercial operators in the area under a Mini-land Use Permit during the open bear season. The proposed New Post Creek Project site occurs within BMA CC-26-015. This commercial BMA operator actively hunts bear at the end of the access road to the proposed intake location. TTN has indicated that few if any members hunt bear as it is considered a sacred animal.

Trapping

Trapping is a common traditional activity in northern Ontario undertaken by both Aboriginal and non-Aboriginal peoples. Today, trapping is perhaps more important as a social, cultural and personal activity than it is as an economic one. Typical furbearer species targeted by trappers in the Abitibi Forest include marten, beaver, mink, muskrat, fox, lynx, fisher, weasel, red squirrel and otter.

All of the traplines in the local study area belong to First Nation individuals and therefore the discussion on the effects of the proposed Project on trapping are discussed in the First Nation and Métis Interests and Consultation TSD. All the traplines belong to TTN members except for one trapline held by a MCFN citizen on the west side of the Abitibi River in the area of the proposed transmission line.

The construction of the proposed Project including the intake, a portion of the headpond, penstocks, powerhouse, and most of the transmission line is wholly contained within a trapline belonging to a TTN member. A small segment of the transmission line would be located within a trapline held by a MCFN citizen. The Replacements Lands for LAPP and a portion of the headpond are located wholly within another TTN member's trapline.

Other Recreational Uses

The only other use that appears to occur at New Post Creek waterfalls is the visits by day trippers. The proposed Project EA field study team has observed the odd person at the waterfalls that appeared to access a trail through LAPP. This was also mentioned by one or two individuals at the Smooth Rock Falls Open House. As the road network to get to the trail is not obvious or maintained, this day use must only occur by local residents (i.e., not tourists) who are familiar with the area.

3.4.3 Watercourse Uses

3.4.3.1 Traditional Uses

New Post Creek, or Cheepilloya Sebee as it is known in Cree (English translation: Great Partridge River), played an important role in the lives of the TTN people, as well as people from other Native groups (P. Archibald Sr., TTN, 2011, pers. comm.). Fed from muskeg and unaffected by clay soil erosion, New Post Creek was the only source of fresh, clear water in the area. The watercourse was also referred to as "Blue Water river" reflecting its potable nature and "New Post brook" reflecting its relatively small size (Bell, 1904). The lands near the confluence of New Post Creek and the Abitibi River were a popular camping location during the summer for TTN families and other Native families from Kesagami Lake and Lawagamau (Kattawagami) Lake further east and the Mattice area to the southwest. These families would disperse in the fall to richer hunting and trapping grounds in the winter and return in the spring to live near the fresh waters of New Post Creek.

The TTN travelled to and from their traditional winter hunting and trapping lands in the Bad River system, a tributary of the Little Abitibi River. As indicated in Section 2.1.4.1, New Post Creek was used as a navigation route during the fall and spring to reach the traditional winter lands. A short portage route was used to bypass the New Post Creek waterfalls and another portage was made from upper New Post Creek to access the Little Abitibi River.

The New Post Creek and surrounding areas have a long history of use by First Nations. These lands have always been integral to the TTN way of life. During the spring, summer and fall, TTN and other First Nation families historically occupied land (New Post site) on the east bank of the Abitibi River, approximately 2 km south of the outlet of New Post Creek and 1 km downstream of the proposed powerhouse tailrace. New Post Creek, fed from muskeg, provided the only source of fresh, clear water in the area. The TTN harvested fish below the New Post Creek waterfalls using nets during the spawning period, including Lake Sturgeon, Walleye and suckers (P. Archibald Sr., TTN, 2011, pers. comm.). There were also a lot of Mooneye and the odd Lake Whitefish. The TTN would sometimes string a line with 1-inch hooks baited with

Walleye or sucker across the creek to catch Lake Sturgeon. The surrounding lands provided opportunities for traditional harvesting (fishing, hunting, trapping).

In the fall, the families would disperse to their traditional winter trapline areas within the Bad River and Little Abitibi River drainage basins to the east and south, respectively, returning to the New Post site in the spring.

A HBC trading post (New Post) was established on the site in 1867 to facilitate fur trading with the First Nations. TTN families continued to occupy the site seasonally throughout the operation of the trading post. Occupation of the site by TTN families decreased upon the closure of the post in 1925 and the establishment of the nearby railway providing access to the south.

As indicated in Section 2.1.4.1, average flow in New Post Creek prior to diversion is estimated to have been less than 4 m^3/s, approximately nine times lower than the current average diverted flow (~35 m^3/s based on 1975 to 2010 data) (KGS Group, 2010). During spring freshet, the maximum width and depth of New Post Creek were approximately 10 m and 0.6 m, respectively (P. Archibald Sr., TTN, 2011, pers. comm.). At other times of the year, New Post Creek was shallow enough to cross by foot when travelling between the Little Abitibi River and New Post IR 69.

Currently, Walleye is the predominant fish species harvested by the TTN throughout the year within their Traditional Territory, followed by Northern Pike and Lake Sturgeon (W. Ross, TTN, 2012, pers. comm.). Lake Whitefish, particularly in the spring, and Brook Trout are also harvested. There is medium fish harvesting activity in the proposed Project site-specific study area.

Geese and ducks are predominantly harvested by the TTN within their Traditional Territory in the spring with the fall also an important harvesting season (W. Ross, TTN, 2012, pers. comm.). Geese and duck hunting use is low in the proposed Project site-specific study area.

3.4.3.2 General Recreation

The CLI (1972c) has categorized the most of the shorelands along New Post Creek as primarily Class 5 with moderately low capability for outdoor recreation. These shorelands provide access to a waterway with significant capability for canoe tripping, water affording opportunity for angling or viewing of sportfish and to viewing rapids. These shorelands also exhibit variety, in topography or land and water relationships, which enhances opportunities for general outdoor recreation such as hiking and nature study or for aesthetic appreciation of the area. At and upstream of the waterfalls, the shorelands are categorized as Class 4 with moderate capability for outdoor recreation with similar opportunities to the Class 5 shorelands. The shorelands from the waterfalls to the confluence with the Abitibi River are categorized as Class 3 with moderately high capability for outdoor recreation capable of supporting organized camping and family beach activities, as well as affording opportunity for angling or viewing of sportfish.

The shorelands on the east and west sides of the Abitibi River are categorized as Class 4 and 3 with moderate and moderately high capabilities for outdoor recreation, respectively, providing access to water affording opportunity for angling or viewing of sportfish and a waterway with significant capability for canoe tripping. The east shorelands also exhibit variety, in topography or land and water relationships, which enhances opportunities for general outdoor recreation such as hiking and nature study or for aesthetic appreciation of the area. The west shorelands are also suited to family or other recreation lodging use.

3.4.3.3 Recreational Boating

Prior to construction of the diversion dam in 1963, New Post Creek was used extensively by the TTN for navigation to facilitate access to traditional trapline areas to the east. However, flows were sufficient for canoeing only during the spring freshet and generally after significant rainfall events in the fall (P. Archibald Sr., TTN, 2011, pers. comm.). The diversion dam substantially altered the flow regime of New Post Creek resulting in the damage to its riparian lands (see Section 3.1.3.2).

During a pre-diversion geological reconnaissance of New Post Creek by canoe, it was reported that it was necessary to traverse much of the creek by wading and/or portaging due to many shallow rapids and in some sections log jams (Ontario Hydro, 1961). As a result, the reconnaissance from Worobec Creek to the outlet of New Post Creek and up the Abitibi River to Abitibi Canyon GS required four days (August 29 to September 1, 1961) to be completed.

LAPP was established by regulation (O. Reg. 279/85) in February 1985. It is classified as waterway and natural environment. The waterway classification covers the Little Abitibi River from the outlet at Harris Lake for approximately 70 km to the New Post Creek Diversion Dam, the 4 km diversion channel to New Post Creek and 16 km of New Post Creek to the confluence with the Abitibi River. At this point, the park boundary expands to include a portion of the Abitibi River and adjacent land base to protect a significant historic site (HBC New Post).

Based on the MNR (2006) Crown Land Use Policy Atlas Policy Report for LAPP, canoeing/ kayaking may be permitted with long-term management direction to be determined through planning. Existing uses may continue in the interim, unless park values are threatened.

A canoe route has been established in LAPP which follows the Little Abitibi River to New Post Creek Diversion Channel, and then west on New Post Creek to the Abitibi River (Ontario Parks, 2006).

The diversion channel and most of New Post Creek from the New Post Creek Diversion Dam to the waterfalls are navigable by canoe (http://www.myccr.com). A portage is required at the

Otter Rapids Road bridge, approximately 7.5 km upstream of the proposed intake location to avoid dangerous hydraulic conditions which set up a large (almost geyser-like) standing wave and rapids. A portage is also required at the waterfalls approximately 4.5 km downstream of the proposed Project intake location.

The Abitibi River is designated as a canoe route (MNR, 1991). However, many of the rapids previously present have been replaced by long stretches of flat water created by the hydroelectric dams at Island Falls, Abitibi Canyon and Otter Rapids. Moreover, from Otter Rapids to approximately the mouth of the Onakawana River (a distance of 60 km), the Abitibi River is unnavigable because of shallow water and dangerous rapids. Portage trails or roads are available to traverse canoes and gear around the generating stations.

3.4.3.4 Outfitter Excursions

The New Post Creek waterfalls has been identified as a tourism destination by the www.northernontario.travel website under Wilderness Heritage Canoe Tours. Two tourism operators located in Smooth Rock Falls (Howling Wolf Expeditions, Northern Spirit Adventures) provide half, full and/or two-day trips to "New Post Falls" and New Post (see Socio-Economics and Land Use TSD for more information).

Three outfitters, including the two mentioned above, in Cochrane service canoe trippers within LAPP: Northern Spirit Adventures, Howling Wolf Expeditions and Polar Bear Outfitters outfit approximately three, two and one canoe trips, respectively, on the Little Abitibi River each year.

3.4.3.5 Fishing

Commercial baitfishing activities are common in the Cochrane area. The MNR Cochrane District office controls and issues baitfishing licences. Baitfish include shiners, chubs, suckers and dace and are usually caught during the summer months.

MNR (1988a) indicated that there were 15 baitfish dealers in MNR Cochrane District with a reported 1986 harvest of 63,000 dozen. It was anticipated that both participation in the baitfish industry and baitfish harvest will increase by the year 2000 with no harm to the resource.

Sportfishing provides recreation, food and tourist dollars for the residents of northern Ontario and is mainly centred on the larger lakes and rivers. The proposed New Post Creek Project occurs within MNR Fisheries Management Zone 8, with specific fishing seasons and catch limits (MNR, 2011). Fishing is conducted by local and other Ontario residents, as well as out-of-province visitors. Walleye has been consistently the most sought after species by anglers on the Abitibi River.

3.4.3.6 Hydropower Facilities

As indicated in Figure 3.9, there are six hydroelectric generating stations and five dams in the Abitibi River watershed (OPG *et al*., 2006). Table 3.18 provides a summary description of these hydroelectric facilities and dam structures.

3.5 CULTURAL RESOURCES

Based on review of site files and catalogued reports at Woodland Heritage Services Ltd. and the offices of the Archaeological Data Coordinator, MTCS, only one archaeological site is registered within the proposed New Post Creek Project study area: the former HBC trading post named New Post (Borden number DlHj-1), located at the end of a former portage linking New Post Creek and the Abitibi River. As indicated in Section 3.4.3.1, New Post was established in 1867 to facilitate fur trading with the First Nations and closed in 1925.

No other registered archaeological sites are located within 10 km of the proposed Project site.

Based on Stage 1 and 2 field assessment, no archaeological or cultural heritage resources or sites were located that would be directly affected by the proposed Project. With the exception of approximately a 1 km section, commercial logging has resulted in the loss of evidence of the lengthy old overland trail/portage that ran south from New Post to the Lobstick portage landing south of Abitibi Canyon (S. Sutherland, TTN, 2012, pers. comm.). The portion of the portage from the New Post site to New Post Creek located approximately 1 km north of the proposed Project was also identified. This logging with associated scarification and aggregate pit development resulted in the loss of other cultural heritage features that may once have been present in the area. Moreover, the diversion of the Little Abitibi River caused the potential destruction of almost all former evidence of human habitation along New Post Creek with the exception of the remnant portages that were located.

The only cultural resources (pre-diversion) located along New Post Creek, approximately 3 km east of the proposed intake location were associated with a remnant of a former portage used before the diversion to by-pass a formerly un-navigable section of New Post Creek. The occurrence of food containers and Culturally Modified Trees indicated the presence of an historic campsite dating to the early 1900s. Although the proposed inundated (headpond) area will extend beyond 3 km upstream of the intake location, this historic archaeological site (DlHi-1 – Borden number pending) will apparently not be affected (see Section 4.7).

More detailed information on the existing cultural resources baseline conditions is provided in the Cultural Resources TSD.

Figure 3.9 Abitibi River Watershed Generating Stations and Dams

Source: OPG *et al*. (2006).

Table 3.18 Summary of Hydroelectric Facilities and Dam Structures in the Abitibi River Watershed[1]

Facility/Dam[2]	Owner/ Operator	Comments
Twin Falls GS	H2O Power Limited Partnership (LP)	Constructed in 1921, this 22.5 MW facility is the most upstream generating station on the Abitibi River system and controls the water level of Lake Abitibi (the largest storage reservoir on the Abitibi River). The station is operated as a peaking facility with water levels controlled within established maximum and minimum levels of 265.39 m and 263.25 m, respectively. Minimum water level from Victoria Day weekend to Thanksgiving Day weekend is 264.20 m for navigational and recreational purposes. During a typical year, the level of Lake Abitibi is drawn down an average of 1.1 m from mid-November to early April to minimize spring flooding on the lake.
Iroquois Falls GS	H2O Power LP	Constructed in 1914, this 29.5 MW facility is located on the Abitibi River at the ACCC mill site in the Town of Iroquois Falls, approximately 17 km downstream of Twin Falls GS. The station is operated as a run-of-the-river facility with water levels controlled within established maximum and minimum levels of 249.11 m and 247.35 m, respectively. A minimum flow of 56 m^3/s is maintained downstream of the Iroquois Falls GS.
Monteith Dam	MNR	Constructed circa 1917 and reconstructed in 1953, this control dam, located in the village of Monteith, controls water levels on the Driftwood River up to Moose Lake approximately 22 km upstream. The dam does not provide appreciable flood control on the Driftwood River. The regulated water level upstream of the dam is targeted at 260.36 m at all times of the year which maintains the water level of Moose Lake at 260.66 m. These historical levels have been shown to provide adequate upstream water supply for recreational uses and ecological functions. There is no established minimum flow constraint; however, minimum flows are discharged from the dam as a result of stop log leakage.
Watabeag Lake Dam	OPG	This control dam, located at the outlet of Watabeag Lake, controls flow from the lake into the Watabeag River and Black River which flow into the Abitibi River upstream of Iroquois Falls GS. The operating range of the dam is between 319.00 m and 321.70 m. Water levels are maintained below 321.70 m to minimize erosion in Watabeag Lake. Water level is maintained between 320.57 m and 320.82 m from Victoria Day weekend to Thanksgiving weekend for recreational and navigational purposes. Maximum discharge of 17 m^3/s is maintained to avoid washing out a bridge located immediately downstream. Winter drawdown target limit is 319.62 m minimum elevation with an absolute minimum of 319.00 m from October to mid-February for Lake Trout spawning. Storage between 321.70 and 322.31 m is used strictly for flood mitigation with MNR permission.
Long Sault GS	Algonquin Power Income Fund	This run-of-the-river generating station, located 19 km north of Cochrane and downstream of the Iroquois Falls GS, has a total generating capacity of 18,000 kW. The headpond water level is maintained between 231.75 m and 232.05 m and is <u>not</u> utilized for storage and peaking purposes. An agreed upon minimum flow of 56.6 m^3/s is maintained to conserve ecological functions.

Table 3.18 Summary of Hydroelectric Facilities and Dam Structures in the Abitibi River Watershed (Cont'd)

Facility/Dam[2]	Owner/ Operator	Comments
Lillabelle Lake Dam	MNR	This control dam, located at the outlet of Lillabelle Lake, was originally constructed in 1948 to raise and maintain lake water levels to allow floatplane dock access. It was reconstructed in 1958 as a concrete weir structure with one operating gate. In 1997, a 16-inch stop log was added to the top of the concrete weir portion of the dam to increase and maintain the lake water level to 245.00 m to allow floatplane access during low water level periods. The gate has not been operated since the early 1990s.
Island Falls GS	H2O Power LP	Constructed in 1925, this 40 MW peaking facility is located on the Abitibi River approximately 133 km downstream of the Iroquois Falls GS. Water levels are controlled within established maximum and minimum levels of 215.54 m and 214.20 m, respectively. During operation of the ferry at Gardiner (i.e., ice-free period), the station is operated to ensure that the upstream water level does not decrease below 214.70 m to maintain navigation. Minimum water level from Victoria Day weekend to Thanksgiving Day weekend is 214.70 m for navigational and recreational purposes. The minimum daily average discharge is 10 m^3/s to protect fisheries.
Frederick House Lake Dam	OPG	Constructed in 1938, this control dam, located on the Frederick House River, stores water in Nighthawk Lake and Frederick House Lake for the benefit of developments on the Abitibi River. The operating range is between 269.60 m and 274.40 m with a flood allowance maximum of 274.65 m. After drawdown, when freshet begins, the lake is allowed to fill with zero discharge to elevation 274.20 m as soon as possible as agreed with Ducks Unlimited to maximize duck nesting habitat. The water level is maintained between 274.10 m and 274.40 m from Victoria Day to Thanksgiving Day Weekend for recreational and navigational purposes.
Abitibi Canyon GS	OPG	Constructed in 1933, this 335 MW peaking facility is located approximately 74 km north of Smooth Rock Falls. The operating range is between 191.50 m and 195.49 m with an absolute minimum of 190.85 m. The winter drawdown elevation is 191.50 m prior to freshet.
Otter Rapids GS	OPG	Constructed in 1961, this 180 MW peaking facility is located approximately 37 km downstream of the Abitibi Canyon GS. The operating range is between 118,80 m and 122.10 m with absolute minimum and maximum of 118.46 m and 122.27 m, respectively. The winter drawdown elevation is 118.80 m prior to freshet.
New Post Creek Diversion Dam	OPG	Constructed in 1963, this diversion dam across the Little Abitibi River facilitates river water diversion by constructed canals from the headpond via Worobec Lake to New Post Creek, which flows into the Abitibi River upstream of Otter Rapids GS. This increases the inflows to Otter Creek GS by approximately 12%. Since 1974, the diversion dam has been operated by leaving the stop logs set at elevation 218.80 m. This allows OPG to maximize the diversion flow while eliminating stop log operations at the dam. When the headwater exceeds the elevation of the stop logs, water spills into the old channel of the Little Abitibi River.

[1] Source: OPG *et al.* (2006).
[2] See Figure 3.9 for facility/dam location.

3.6 FIRST NATIONS AND MÉTIS PEOPLES

3.6.1 Taykwa Tagamou Nation

TTN is a partner on the proposed New Post Creek Project with OPG. CRP is the TTN owned company which pursues hydroelectric projects and is OPG's partner and co-proponent on the proposed Project.

TTN has two reserves. The older Reserve is located approximately 14 km east of the Abitibi Canyon GS (see Figure 1.2). This Reserve was set aside for hunting, trapping and other activities, and has not served as the principal settlement location. A new reserve was created in the early 1980s, approximately 20 km west of Cochrane to provide a settlement location for TTN (TTN, 2012). As of 2012, TTN has a total registered population of 460 individuals with slightly over 120 living on Reserve (AANDC, 2012).

The TTN people are Mushkegowuk Cree, the people of the muskeg, and have lived with and on the lands in what is now known as Ontario for time immemorial. TTN is formerly known as the New Post First Nation. It received this name because the community had been associated with the HBC New Post located on the Abitibi River, approximately 1 km north of the proposed Project. TTN participated actively in trade with the HBC and New Post provided a key location in the trade from the interior of the Moose River Basin to Moosonee on James Bay (TTN, 2012).

The proposed Project lies within the heart of TTN Traditional Territory. Most of the proposed Project occurs in areas held by TTN trappers, except for the extreme western portion of the transmission line which occurs within a MCFN trapline.

3.6.2 Moose Cree First Nation

MCFN is a large First Nation with a population of 4,124 individuals as of January 31, 2013 of which approximately 40% are located on Reserve at Moose Factory Island just south of James Bay on the Moose River. The other approximately 60% of MCFN citizens live throughout Ontario and Canada but substantial numbers live in other communities such as Timmins, Cochrane and Kapuskasing in northeastern Ontario. The MCFN have Homeland Declaration interests on the west side of the Abitibi River.

The MCFN have agreed in writing to support the proposed New Post Creek Project.

3.6.3 Other First Nations

Wahgoshig First Nation

The Wahgoshig Community is located close to the Québec border west of Iroquois Falls. Wahgoshig has a registered population of 285 of which slightly less than half reside on the Reserve (INAC, 2011). Based on CRP/OPG knowledge of Wahgoshig interests, it does not appear that the Wahgoshig Traditional Territory extends as far as the proposed New Post Creek Project site. This was confirmed by Chief Babin.

MoCreebec Council of the Cree Nation

According to the MoCreebec Council of the Cree Nation (MoCreebec) website, the MoCreebec Community is an association of Cree peoples originally from Québec and living in the Moose Factory-Moosonee area for generations. The MoCreebec Association was officially established in 1980.

MoCreebec participated in the Moose River/James Bay Coalition and then subsequently was mentioned in the policy statement around co-planning associated with the Moose River Basin (see First Nation and Métis Interests and Consultation TSD).

To CRP/OPG knowledge, MoCreebec has never had any interests as far south as the area of the proposed Project. MoCreebec has provided TTN with written support for the proposed Project.

3.6.4 Métis Nation of Ontario

The Métis Nation of Ontario (MNO) was formed in 1993 and, as stated in the MNO (2010) “Métis Consultation and Accommodation: A Guide for Government and Industry on Engaging Métis in Ontario”, represents the collective aspirations, rights and interests of Métis people and communities throughout Ontario. The MNO is led by President Gary Lipinski and has a democratic, province-wide governance structure, which ensures the representation of Métis people at the local, regional and provincial levels.

The Northern Lights Métis Council (NLMC) based in Cochrane is the closest MNO Council to the proposed Project. The Region 3 MNO encompasses the NLMC but also includes Community Councils representing the Timmins, Chapleau and Timiskaming areas.

As indicated in Section 3.4.2.4, there are no Métis trappers in the immediate area of the proposed Project. Moreover, the MNO has not identified any traditional uses at the proposed Project site although it is recognized that MNO members widely hunt and fish throughout northeastern Ontario.

4.0 EFFECTS ASSESSMENT AND RECOMMENDED MITIGATION MEASURES

4.1 POTENTIAL ENVIRONMENTAL EFFECTS

The OWA (2012a) Class EA indicates that a proponent should prepare a Potential Effects Identification Matrix that is intended to provide guidance in assessing the relevance of potential impacts and benefits under individual criteria and for a project as a whole. Table 4.1 presents the various criteria outlined in the Class EA document and assigns a potential level of effect without any proposed mitigation measures. The last column is a commentary column on the potential effect on each criterion. The level of effect is scored as: High Negative (-H), Low Negative (-L), Nil, Unknown (UNK), Low Positive (+L) or High Positive (+H).

The criteria listed in the Potential Effects Identification Matrix are for the most part general enough to permit the assessment of transmission/distribution lines. In many cases, potential environmental effects of a hydroelectric facility are similar to those of transmission/distribution lines. However, to ensure completeness, the screening criteria in the Ontario Hydro (1992) “Class Environmental Assessment for Minor Transmission Facilities” were reviewed. This resulted in one new criterion, “Other Resource Industries” under the Land and Resource Use Considerations category and enhanced the assessment of many of the other criteria.

4.2 PROPOSED PROJECT CONSTRUCTION – AQUATIC ENVIRONMENT

The available environmental baseline information and site-specific fisheries resources and benthic macroinvertebrate survey findings provided the basis for an assessment of potential construction and operational effects on the aquatic environment, e.g., due to cofferdam installation/removal, dewatering, blasting, soil erosion and turbidity generation, fish habitat loss/gain, fish entrainment, increased fish mercury body burden, etc.

Recommended mitigation measures for the effects on the aquatic environment considered best industry practices and various sources such as OWA (2012b) “Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction”, relevant government guidelines for proposed hydroelectric power plant development, e.g., MOE “Guidelines for Evaluating Construction Activities Impacting on Water Resources” (Persaud and Jaagumagi, 1995), DFO “Guidelines for Use of Explosives in or near Canadian Fisheries Waters” (Wright and Hopky, 1998) and DFO Ontario Operational Statements, as well as government agency and other organization consultation.

Table 4.1 Potential Environmental Effects

Criteria	Potential Level of Effect						Comments, Rationale (before mitigation)
	-H	**-L**	**NIL**	**Unk**	**+L**	**+H**	
General Natural Environment Considerations							
Air quality		X					• This proposed Project has the potential to have a minor local negative effect on air quality as a result of construction related activities such as the operation of equipment, dust generation and smoke from the burning of slash materials. • There will be no atmospheric emissions from the powerhouse during operation.
Greenhouse gas (GHG) offsets						X	• The proposed Project has the potential for a GHG emissions benefit by being an offset to natural gas and/or coal.
Water quality (surface water)		X					• The proposed Project has the potential for negative effects on water quality during construction due to erosion, sedimentation and incidental spills. • The proposed Project has the potential for negative effects on water quality during operation due to the proposed inundated area and increased sedimentation.
Water quantity (surface water)		X					• The proposed Project does not have the potential to change the overall quantity of water flowing into the Abitibi River; however, water flows downstream of proposed intake weir will be decreased due to diversion through the powerhouse. This may have a negative effect.
Water quality or quantity (groundwater)		X					• The proposed Project has the potential for a negative effect on groundwater quality during construction due to incidental spills (e.g., gasoline, hydraulic fluid). • The proposed Project has the potential for a minor negative effect on local groundwater quantity during construction due to groundwater leakage into excavated areas.
SAR and their habitat	X						• The proposed Project has the potential for negative effect on SAR species including Woodland Caribou although this is considered unlikely as the area has been already subject to recent and significant disturbances such as forest harvesting and presence of roads.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale (before mitigation)
	-H	-L	NIL	Unk	+L	+H	
General Natural Environment Considerations							
Significant earth or life science features			X				• The nearest designated natural area is the Pinard Moraine CR, located west of the Abitibi River approximately 8 km from the proposed GS location and 30 m west of the proposed transmission line interconnection with the existing 115 kV transmission line connecting Otter Rapids GS and Abitibi Canyon GS. Existing roads in the Pinard Moraine CR will be used to access the interconnection.
Land subject to natural or human-made hazards					X		• The proposed Project is unlikely going to have a negative effect on natural or human hazard lands. There may be a positive effect on the eroded slopes in New Post Creek due to headpond creation and less flow downstream of the proposed intake weir location.
Terrestrial wildlife (including numbers, diversity and movement of resident or migratory species)		X					• The proposed Project has the potential for a minor negative effect on terrestrial wildlife. During the construction period the construction activity will produce a localized disturbance effect on the wildlife and may result in the displacement of a few animals. This effect will be temporary. • The proposed Project will result in some clearing of land but this will occur in an area of contiguous forest and where forest harvesting activities have occurred on larger footprints. This is unlikely going to have a negative effect on terrestrial wildlife.
Natural vegetation and terrestrial habitat linkages		X					• The proposed Project will result in some clearing of land that will have a minor negative effect on local vegetation communities.
Soils and sediment quality		X					• The proposed Project could have a negative effect on soils and sediment quality during construction owing to compaction, removal, erosion or the occurrence of incidental spills. This effect would be minor and localized.
Significant natural heritage features and areas			X				• New Post Creek is largely a man-made diversion and therefore there is little potential for the proposed Project to have negative effects on natural heritage features and will result in a restoration of flows closer to the historical norm.
Other (specify)			X				• No other identified.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale (before mitigation)
	-H	-L	NIL	Unk	+L	+H	
Aquatic and Riparian Ecosystem Considerations							
Shoreline dependant species		X					• The proposed Project could have a negative effect on shoreline dependent species along the Abitibi River in the vicinity of the powerhouse and along New Post Creek downstream of the intake weir. Shoreline habitat along the Abitibi River is largely homogenous and therefore any effect is likely to be minimal. The riparian area of New Post Creek has been highly eroded and there may be no negative effect due to the lower flows.
Wetland dependant species		X					• The proposed Project could have a negative effect on wetland dependent species as some wetland areas will be displaced by the inundated area and become more similar to lacustrine habitat.
Fish habitat		X					• The proposed Project could have a negative effect on general or critical (spawning) fish habitat in the vicinity of New Post Creek waterfalls, but spawning habitat for Walleye may be enhanced due to lower flows. • The proposed Project could have a positive effect on fish habitat through new habitat creation.
Fish migration			X				• The proposed Project is not expected to have any negative effect on fish movement as New Post Creek above the waterfalls supports a sparse fish community with low diversity.
Fisheries			X				• The proposed Project could have a positive effect on fisheries specifically Walleye due to lower spring flows at the base of New Post Creek waterfalls. • The proposed Project may have a positive effect on fisheries owing to the creation of a new headpond and the introduction of a tailrace and new habitat in the Abitibi River.
Erosion and sedimentation including for transmission line crossings			X				• The proposed Project may have a negative effect because of erosion and sedimentation associated with construction activities and the creation of the headpond. • The proposed Project may have a positive effect by reducing the frequency and size of high flows downstream of the proposed intake weir location. • The proposed Project may have a positive effect because sediment will be trapped behind the weir and due to the installation of erosion protections. • Transmission line construction could lead to erosion and sedimentation into traversed watercourses if riparian vegetation is not left in place.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale (before mitigation)
	-H	-L	NIL	Unk	+L	+H	
Aquatic and Riparian Ecosystem Considerations							
Fish injury or mortality (impingement and entrainment)		X					• The proposed Project will result in some level of fish entrainment and therefore negatively affect fish populations. Fish populations in New Post Creek upstream of the waterfalls are sparse.
Water levels, flows and movement (surface or groundwater)		X					• The proposed Project has the potential to affect flows downstream of the intake weir which will be reduced due to flow diversion through the powerhouse. This may have a negative effect on fish and use of habitat.
Drainage, flooding and drought patterns			X				• The proposed Project could have the potential to have a minor change on local drainage in the facility construction area. This effect would likely be very limited. • The proposed Project has the potential to better address rapidly changing precipitation and flooding concerns than the existing situation.
Water temperature			X				• The proposed Project is unlikely to have a significant effect on the thermal regime. While there will be a slight increase in lacustrine habitat versus riverine the hydraulic retention time will be very low.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale
	-H	-L	NIL	Unk	+L	+H	
Aboriginal Community Considerations							
First Nation reserves or other Aboriginal communities			X				• The construction and operation of the proposed GS would not have any negative effect on First Nations reserves or Aboriginal communities. The nearest Reserve is the TTN Reserve which is over 10 km away and is not permanently inhabited.
Spiritual, ceremonial, cultural, archaeological, or burial sites		X					• The proposed Project could result in a negative effect on spiritual, ceremonial, archaeological or burial sites, owing to its proximity to the HBC New Post site. However, much of the proposed Project area has been disturbed by logging activities and potential sites along New Post Creek have been destroyed by diversion of the Little Abitibi River.
Traditional land or resources used for harvesting activities		X					• The proposed Project could have a positive or negative minor effect on fishing by local Aboriginal people. • The proposed Project may have a slightly negative effect on hunting by disturbing animals in the immediate area during construction. • The proposed Project is likely to have a negligible negative effect on trapping. Some very small areas of existing traplines will be directly affected by various components of the Project (e.g., transmission line ROW, GS, headpond). • The proposed Project might have a negative effect on trapping during the construction period owing to disturbance.
Employment						X	• The proposed Project would have a positive effect by providing employment opportunities for TTN and possibly other First Nations or Aboriginal peoples.
Lands subject to land claims			X				• The subject lands in which the proposed Project is located are presently not subject to any land claims.
Economic development						X	• The proposed Project could have a very positive effect on economic development for TTN by providing employment, equity, income, contracting opportunities, skills enhancement, enhancing other spin-off projects, etc.
Other (Training and education)						X	• The proposed Project could have a very positive effect on the levels of education and training for the Aboriginal communities by supporting education and training programs.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale
	-H	-L	NIL	Unk	+L	+H	
Land and Resource Use Considerations							
Access to inaccessible areas (land or water)			X				• The area of the proposed Project is already accessible; albeit access is likely going to be improved. This may or may not be beneficial to TTN and other local Aboriginal interests.
Navigation			X				• The proposed Project is unlikely going to have any significant effect on navigation as very few people travel down New Post Creek and CRP/OPG has committed to a portage which would improve on the safety of the existing portage.
Riparian rights or privileges			X				• The proposed Project is not likely going to have a negative effect on riparian rights or privileges. • The proposed Project is wholly located on Crown land with no special riparian rights or privileges other than normal Crown land use.
Recreational use – (land or water)		X					• The proposed Project may have a minor negative effect on the recreational use at New Post Creek waterfalls. Less water will be flowing over the waterfalls and this may diminish visitor experience appreciation value.
Angling and hunting opportunities (crown land, not remote tourism (see below)		X					• The proposed Project might have a very minor negative effect on angling and hunting as these activities might be slightly affected during the Construction Phase of the Project. There is unlikely going to be any negative effect during the Operation Phase of the proposed Project.
Trapping activities			X				• It is believed that the entire area subject to the proposed Project is within trapline areas held by First Nations trappers.
Baitfish harvesting activities					X		• The proposed Project is unlikely going to have a negative effect on baitfish harvesting activities. The slight improvement in access may facilitate use by a baitfish harvester.
Views or aesthetics including for transmission		X					• The proposed Project would likely have a minor negative effect on the aesthetics of the area in terms of both the GS, the transmission line and less water flowing over the waterfalls.
An existing land or resource management plan				X			• The proposed Project is likely not going to have a negative effect on an existing land or resource management plan. • With the exception of a small area within LAPP, the proposed Project is compatible with the existing land-use direction for the area.
An existing water management plan			X				• The proposed Project is not likely going to have a negative effect on the existing WMP (OPG *et al.,* 2006).

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale
	-H	-L	NIL	Unk	+L	+H	
Land and Resource Use Considerations							
Protected areas			X				• Prior to the EA being initiated, OPG, CRP, MNR and Ontario Parks agreed on a process to deregulate lands required for a small area of the proposed Project from LAPP. This involved a land exchange whereby the area of the Park would be increased and overall ecological integrity would be enhanced.
Other resource industries (e.g., forest products, mineral, aggregate)		X					• The proposed Project will result in a minor loss of timber resources from the timber landbase of the Abitibi River Forest but will improve the haul road for access in the area. • The proposed Project will result in a very minor loss of land available for exploration. • The proposed Project would only have a minor negative effect on local aggregate resources for road construction, etc.
Other							• No other identified.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale
	-H	-L	NIL	Unk	+L	+H	
Cultural Heritage Resources Considerations							
Archaeological sites		X					• The proposed Project could result in effects on archaeological sites. However, every effort will be made to mitigate this effect.
Buildings or structures			X				• There are no known cultural heritage buildings or structures in or near the footprint of the proposed Project.
Cultural heritage landscapes			X				• There are no known cultural heritage landscapes in or near the footprint of the proposed Project.
Other (specify)							• No other identified.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale
	-H	-L	NIL	Unk	+L	+H	
Social and Economic Considerations							
The location of people, businesses, institutions, or public facilities			X				• The proposed Project is located in a wilderness area with the closest community (Smooth Rock Falls) approximately 75 km to the south. • The proposed Project will not result in the displacement or disruption of people, businesses, institutions or public facilities.
Community character, enjoyment of property, or local amenities			X				• The operation of the proposed Project would not have any negative effect on community character, enjoyment of property or local amenities as the nearest community is located approximately 75 km to the south. • The Construction Phase of the proposed Project would not have a negative effect on Smooth Rock Falls as the existing road network is capable of sustaining increased traffic and most of the construction workers will be housed in an on-site camp.
Employment						X	• The proposed Project will have a positive economic benefit for employment in northeastern Ontario.
Public health and/or safety		X					• During the construction period there could be the potential for health and safety concerns associated with traffic and the construction site. However, the construction site is located in a remote location with minimal public use.
Local, regional, or provincial economies						X	• The proposed Project will result in a significant amount of local, regional and possibly provincial spending. • The proposed Project will also enhance the ability of northeastern Ontario workers to gain more experience in heavy construction and hydroelectric projects. • The proposed Project will have a major long term economic benefit.
Tourism values		X					• The proposed Project has the potential to have minor negative effects on two part-time tourism operations. • During the Construction Phase negative effects could include aesthetics and noise. • During the Operation Phase negative effects could include reduced flows over New Post Creek waterfalls. • The proposed Project would improve the safety of the existing portage around New Post Creek waterfalls.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale
	-H	-L	NIL	Unk	+L	+H	
Social and Economic Considerations							
Water supply			X				• The proposed Project is unlikely going to have an effect on water supply. • There are no downstream users of water except for the Town of Moosonee and Moose Factory which are situated over 100 km downstream. • The closest user of well water is the OPG Abitibi Canyon facility.
Aesthetic image of the surrounding area		X					• There may be a minor negative effect. • There will be less flow over New Post Creek waterfalls; albeit this lower flow will reflect historic conditions. • There will be public safety signs in the general vicinity of the waterfalls and the proposed GS will be visible from the Abitibi River (however, Abitibi Canyon GS and Otter Rapids GS are located at either end of this river section).
Other							• No other identified.

Table 4.1 Potential Environmental Effects (Cont'd)

Criteria	Potential Level of Effect						Comments, Rationale
	-H	-L	NIL	Unk	+L	+H	
Energy/Electricity Considerations							
Reliability (e.g., voltage support)			X				• Unlikely any effect.
Security (e.g., Black Start)			X				• Unlikely any effect.
Electricity flow patterns			X				• Unlikely any effect.
Other (Pulsing)						X	• Intermittent operation of the proposed GS using water stored in the headpond would mitigate against sudden and potentially frequent flow increases downstream of the intake weir.

The selection and application of measures to mitigate potential effects of proposed transmission line construction and operation on the aquatic environment are based on the following six principles:

1. Avoidance of sensitive areas, where practicable, through siting of towers, e.g., towers will not be located within watercourses or associated riparian vegetation.
2. Avoidance of temporary watercourse crossings, wherever practicable, e.g., by use of an existing nearby crossing, or access to the tower location obtained from either side of the watercourse, or use of off-corridor access.
3. Appropriate timing of construction activities, whenever practicable, to avoid sensitive time periods, e.g., watercourse crossing installation outside of fish spawning and egg incubation periods (DFO, 2010a).
4. Implementation of conventional, proven mitigation measures during construction, e.g., (DFO, 2010b, c, d, e, f, g, h) Ontario Operational Statements for temporary stream crossings, culvert maintenance, clear span bridges, bridge maintenance, isolated or dry open-cut stream crossings, maintenance of riparian vegetation in existing ROWs and overhead line construction; MOE "Guidelines for Evaluating Construction Activities Impacting on Water Resources" (Persaud and Jaagumagi, 1995); MNR (1988b) "Environmental Guidelines for Access Roads and Water Crossings"; EPRI (2002) "Best Management Practices (BMPs) Manual for Access Road Crossings of Wetlands and Waterbodies", OWA (2012b) "Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction" and Hydro One (2008) "Environmental Guidelines for the Construction and Maintenance of Transmission Facilities".
5. Implementation of conventional proven mitigation measures during operation, e.g., EPRI (1999) "Vegetation Dynamics Along Utility Rights-of-Way" and Cieslewicz and Novembri (2004) "Utility Vegetation Management. Trends, Issues, and Practices".
6. Development of environmental enhancement/compensation measures to offset the unavoidable effects of construction and operation.

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

4.2.1 Surface and Groundwater Hydrology

As indicated in Section 3.1.1, no defined watercourses are present within the GS infrastructure footprint of the proposed Project. The existing operational access road to the proposed GS site and the proposed transmission line ROW traverse two and five watercourses, respectively (Coker and Portt, 2013b, c). The transmission line ROW also traverses a small pond. Parliament Loop Road, which may also be used to access the east side of New Post Creek at the proposed weir location, traverses seven small watercourses (Coker and Portt, 2013d). These creeks, pond and other drainage ditches may be affected by sediment loadings due to accelerated soil erosion during construction (see Sections 4.2.2.1 and 4.4.4.1). These creeks, pond and any drainage ditches present in the general area of the construction site should be avoided with generally a 15 m buffer to mitigate potential soil erosion and sedimentation.

For any temporary or permanent crossings of creeks and drainage ditches, standard construction procedures will be followed, including crossing design (ramping, ford or culvert), installation and maintenance. Ontario Operational Statements have been developed by the DFO for:

- construction of temporary stream crossings (DFO, 2010b);
- culvert maintenance (DFO, 2010c);
- construction of clear span bridges (DFO, 2010d);
- bridge maintenance (DFO, 2010e); and
- construction of isolated or dry open-cut stream crossings (DFO, 2010f).

For new permanent crossings or repair/replacement of existing crossings, approvals must be obtained from the MNR.

Upgrading of Parliament Loop Road for access to the eastern side of New Post Creek will also likely necessitate beaver dam removal (see Section 2.4.1). An Operational Statement for beaver dam removal has been prepared by DFO (2010i).

Due to its relatively shallow nature (see Section 3.1.1), groundwater inflows due to any excavation can be expected, including excavation and dewatering in areas of high water table for transmission pole placement. The volume of water would be further enhanced during precipitation/runoff events. Higher inflows may occur if high permeability features are encountered, or if blasting and rock excavation techniques significantly modify the intrinsic hydraulic conductivity of the rock mass. Based on anticipated good water quality, the water may be discharged indirectly to New Post Creek. An energy absorption diffuser should be used to minimize the impact of water on the discharge location. A PTTW will be required under the *OWRA* from the MOE for water discharges that are greater 50,000 L/day. Temporary watercourse diversions to facilitate in-water work at water crossings are also considered to be water takings and may require a PTTW.

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

4.2.2 Water Quality

During construction, water quality in the Abitibi River, New Post Creek and the watercourses identified in Section 3.1.1 may be affected by soil erosion and turbidity generation, in-water construction activities, blasting, acid rock drainage, incidental spills and/or waste material dispersion, and stormwater.

Overall, based on the mitigation measures described below, the effects of the construction of the proposed Project on water quality are expected to be localized, temporary and negligible.

4.2.2.1 Erosion and Sediment Control

As indicated in Section 4.2.1, the watercourses and drainage ditches on the proposed Project site may be affected by sediment loadings due to accelerated soil erosion during construction. These sediment loads would be discharged to the Abitibi River and New Post Creek. Till and gully erosion caused by channelized overland flow can also be a major source of soil erosion to the watercourses. Sheet erosion can be an additional source of sediment.

Erosion and sediment control will be an integral component of the construction planning process. All personnel involved with the proposed works will be briefed on erosion and sediment control including engineers, contractors, inspectors and environmental staff.

Sediment and erosion control measures should be implemented as required prior to work and maintained during the work phase, to prevent entry of sediment into the water. This should include sediment removal from water pumped from within the work areas such as the powerhouse foundation area, draft pit and tailrace excavation. It should also include the use of silt curtains or cofferdams, if appropriate, during any in-water work to prevent deleterious substances from entering fish habitat.

Dredged material should be disposed of on land above the high water level and suitably contained/stabilized to prevent the dredged material from re-entering the water. Potential spoil pile areas are shown on Figure 2.3. Management of dredged material and control of runoff will be addressed by the site-specific Sediment and Erosion Control Plan and Stormwater Management Plan to be prepared by the DBC. The management of dredged material will take into consideration the guidelines and requirements provided in the MOE Handbooks for Dredging and Dredged Material Disposal in Ontario (MOE, 2011c, d, e).

During construction, the removal of natural shoreline vegetation should be minimized, and consideration made to armour potentially affected shoreline proximate to the proposed GS.

In general, the following guidelines will be applied in the development of the Erosion and Sediment Control Plan:

- fitting of proposed works to the terrain (i.e., using the natural topography of the land in the placement and organization of the construction site);
- timing of grading and construction activities to minimize soil exposure;
- retention of existing vegetation where feasible;
- restriction of the use of heavy construction equipment to within the approved work areas to minimize soil disturbance and vegetation destruction;
- storage of stripped soil at upland locations with a minimum of 5 m from the edge of the Abitibi River and New Post Creek and beyond the inundation area;
- implementation of erosion control measures, e.g., rip-rap berms underlain by filter geotextile, straw bales used as filters, silt fencing along the shoreline and/or mulching for interim stabilization;

- diversion of runoff away from exposed areas;
- minimization of the length and steepness of slopes;
- maintenance of low runoff velocities;
- design of drainage works, such as ditches and outfalls, to handle concentrated runoff;
- retention of sediment on site;
- routine inspection and maintenance of erosion and sediment control measures; and
- re-vegetation of disturbed areas by seeding and/or planting following construction as soon as seasonal conditions permit.

Figure 2.3 shows potential areas for settling ponds. The use of settling ponds will require Environmental Compliance Approvals under the *OWRA*. The DBC will be responsible for the final design of the settling ponds, including locations of such works, treatment options, volumes, discharges to the environment, proposed monitoring plans and effluent criteria for parameters of concern (e.g., pH, TSS, turbidity, hydrocarbons, total ammonia).

As indicated in Section 4.4.4.1, site-specific Erosion and Sediment Control Plans, addressing the areas around the proposed Project intake weir, powerhouse and their ancillary infrastructures, the construction laydown and assembly areas, as well as the access roads and transmission line ROW, will be prepared and implemented during construction. The site-specific Erosion and Sediment Control Plans will be part of a broader Environmental Management Plan.

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

4.2.2.2 In-water Construction Activities

As indicated in Section 2.4.1, CRP/OPG intends to minimize all in-water works through the construction of cofferdams at the proposed intake weir and powerhouse locations (see Figures 2.13 and 2.14) and use of natural rock plugs at the intake weir location to hold back water and allow construction to take place in the “dry”. Cofferdam and other in-water work installation will be undertaken outside the designated in-water construction timing restrictions to protect fish spawning areas and egg incubation periods (see Section 4.2.3.1).

The cofferdams will be composed of clean rock fill. Temporary cofferdam construction will require the use of heavy equipment along the shoreline and on the rockfill wall as it is built up around the sites. An impervious geotextile will be placed on the cofferdam face to preclude water ingress. The work will also involve dewatering to the area downstream of the cofferdam and as necessary the placement of erosion control structures. Fish within the area to be dewatered will be collected by electrofishing/netting during drawdown and released to New Post Creek and the Abitibi River under a Fish Scientific Collectors Permit obtained from MNR under the *Fish and Wildlife Conservation Act*.

The use of clean rock fill, the placement of rock fill over similar coarse substrate at the intake weir location and judicious selection of the discharge location and water pressure during dewatering will minimize potential effects of in-water construction activities on water quality in the Abitibi River and New Post Creek. The placement of rockfill over finer substrate in the Abitibi River will result in resuspension of bottom sediments resulting in temporary and localized increased turbidity prior to redeposition. Similarly, the removal of the cofferdam in the Abitibi River will result in temporary and localized increased turbidity.

Cofferdam installation and removal will comply with the conditions of the Work Permit issued by the MNR. An application for a PTTW will be submitted to the MOE if dewatering is expected to be greater than 50,000 L/day.

Water taking requirements for dewatering activities (e.g., types, location, water taking rates and volumes) will be defined in the detailed engineering design prepared by the DBC.

4.2.2.3 Use of Explosives

Blasting will likely be required to facilitate construction of the proposed spillway, intake and upper section of the penstock. Blasting may also be required for grading of any rock outcrops in the proposed material laydown and assembly areas.

Explosives used in construction will be closely controlled, with their use restricted to authorized personnel who have been trained in the use of explosives in a manner so as to minimize impacts on the environment. Appropriate government agencies and local residents will be informed of the blasting schedule in advance of construction, as well as just prior to the detonation program. All necessary permits will be obtained by the DBC, who will also comply with all legal requirements in connection with the use, storage and transportation of explosives, including, but not limited to, the *Canada Explosives Act* and the *Transportation of Dangerous Goods Act*. The DBC will be required to retain a consulting engineer with technical expertise in blasting to provide advice on maximum loading of explosives for all blasting, as well as an engineering report indicating recommended charges and blasting methods to be used at specific locations. All blasting will occur in such a way as to be in compliance with federal regulations and directions.

Blasting could have a potential effect on groundwater quality and flow in the immediate vicinity of the blasting operations. It has been estimated that peak particle velocities produced from blasting operations in excess of 600 mm/s will cause cracks and discontinuities in sedimentary rock up to a 5 m radial distance from the blast using the sophisticated techniques and control measures employed in modern blasting practice (L. McAnuff, VME/Explotech Associates Ltd., 1991, pers. comm.). Damage (seam creation) will be less and more localized in Precambrian rocks. Minimization of the physical effects of blasting will be ensured by following the recommendations of the blasting engineer.

Blasting of bedrock will be required within the dewatered zone at the proposed intake and upper (150 m) penstock locations with the rock fragments removed by backhoe. The DFO has developed a number of Operational Statements on methods and practices which are intended to prevent or avoid the destruction of fish, or any potentially harmful effects to fish habitat that could result from the use of explosives (Wright and Hopky, 1998). The use of temporary cofferdams to permit blasting within the dewatered areas and adherence to the DFO Guidelines and blasting engineer recommendations will avoid the death of fish and/or any permanent alteration to, or destruction of, fish habitat (see Section 3.1.3.2).

4.2.2.4 Acid Rock Drainage Potential

As indicated in Section 4.2.2.3, blasting of bedrock will be required within the dewatered zone at the proposed intake and the upper (150 m) penstock locations.

Acid Base Accounting (ABA) analyses were undertaken on 17 rock samples: 15 from boreholes at depths ranging from 2.0 to 15.0 m and two from bedrock exposed on surface (Table 4.2). The Neutralization Potential to Acid Potential (NP/AP) ratio is commonly used to assess the potential for Acid Rock Drainage (ARD). For rock, a ratio above 3.0, suggests that acid drainage is unlikely.

Table 4.2 Acid Base Accounting Results[1]

Sample ID	Location	Approx. Depth (m)	CO_2 (%)	Total Sulphur (%)	Sulphate Sulphur (%)	Sulphide Sulphur (%)	AP (kg $CaCO_3$/t)	Measured NP (kg $CaCO_3$/t)	Carbonate NP Calculated from CO_2 (kg $CaCO_3$/t)	NP/AP[2]	Carbonate[2] NP/AP
L845855-1	K09-BH01	8.0	0.6	0.1	<0.01	0.1	3.1	26	14	8.4	4.4
L845855-2	K09-BH01	15.0	0.6	0.19	0.02	0.19	5.9	23	14	3.9	2.3
L845855-3	Outcrop	surface	0.3	<0.01	0.02	<0.01	<0.3	12	7	>40.0	>22.7
L845855-4	Outcrop	surface	<0.2	0.14	<0.01	0.14	4.4	8	<5	1.8	<1.0
L845855-5	K09-BH02	10.0	0.2	0.27	0.01	0.26	8.4	12	5	1.4	0.5
TH-Ba	K11-BH13	2.0	0.8	0.25	0.02	0.23	7.8	39	18	5.0	2.3
TH-Bb	K11-BH13	4.0	1.5	0.2	0.01	0.19	6.6	55	34	8.3	5.2
TH-Bc	K11-BH13	6.5	1.3	0.04	0.01	0.03	1.3	51	30	39.2	22.7
TH-Bd	K11-BH13	9.0	1.6	0.17	0.01	0.16	5.3	58	36	10.9	6.9
TH-Ca	K11-BH14	3.0	0.7	0.28	0.02	0.26	8.8	36	16	4.1	1.8
TH-Cb	K11-BH14	4.0	4.8	0.16	0.02	0.14	5.0	175	109	35.0	21.8
TH-Cc	K11-BH14	6.0	0.4	0.17	0.02	0.15	5.3	26	9	4.9	1.7
TH-Cd	K11-BH14	7.6	0.5	0.39	0.1	0.29	12.2	29	11	2.4	0.9
TH-Da	K11-BH15	2.7	0.5	0.3	0.03	0.27	9.4	28	11	3.0	1.2
TH-Db	K11-BH15	4.0	0.3	0.21	0.02	0.19	6.6	20	7	3.0	1.0
TH-Dc	K11-BH15	5.8	0.6	0.33	0.03	0.3	10.3	37	14	3.6	1.3
TH-Dd	K11-BH15	7.5	0.5	0.19	0.03	0.16	5.9	28	11	4.7	1.9

[1] Source: KGS Group (2012b).
[2] Legend

(red)	Potentially Acid Generating
(yellow)	Uncertain potential to generate Acid Rock Drainage
(green)	Low to nil potential to generate Acid Rock Drainage
NP/AP classification based on Price (2009)	

The (NP/AP) ratios are based on two Neutralization Potential (NP) methodologies:

1. Laboratory NP/AP involving the acidification of the sample using hydrochloric acid followed by titration with sodium hydroxide to determine available neutralization.
2. Carbonate NP/AP based on measured carbon dioxide (CO_2) concentrations, assuming CO_2 can be used to calculate the amount of calcium carbonate (calcite) present (this measure is more conservative, only indicating NP available from the most reactive minerals, i.e., carbonates.

Based on the standard laboratory NP/AP ratio, most of the samples have low to nil potential to generate ARD (J. Martin, SENES, 2012, pers. comm.). Sulphide sulphur concentrations in the two samples classified as uncertain were 0.14% and 0.26%, less than 0.3% used as a draft guideline by Price (1997) as having low potential for ARD, unless the rock has elevated metal concentrations and/or the NP levels are low.

Based on the more conservative NP/AP ratio, additional samples are classified as uncertain, whereas two are classified as having the potential to generate ARD (Table 4.2). All of these samples have low sulphide sulphur concentrations, i.e., at or below 0.3%, indicating that if ARD is generated it would be minor. Moreover, any ARD from blasted rock exposed to New Post Creek may be tempered by the moderately buffered water, with pH ranging from 7.56 to 8.04, alkalinity from 49 to 78 mg/L and hardness from 52 to 82 mg/L (see Table 3.7).

In conclusion, based on the ABA analyses, the potential for ARD is minimal. However, although the acid base accounting analysis revealed that ARD at the proposed Project site is unlikely, care should be taken during the placement of waste rock on land to avoid runoff into watercourses. In addition, a plan should be developed by the DBC for placement and monitoring of any waste rock stockpiles, including mitigation measures should ARD be evident.

4.2.2.5 Management and Control of Hazardous Materials, Construction Wastes and Incidental Spills

Management and control of hazardous materials, construction wastes and incidental spills are also described in Section 4.4.4.2 and take into account best industry practices listed in Section 4.2.

In summary, all materials and equipment used for the purpose of site preparation and Project completion should be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, debris, etc.) from entering the water. Incidental spills of oil, gas, diesel fuel and other liquids to the environment could occur during construction. Fuelling and lubrication of construction equipment should be carried out in a manner that minimizes the possibility of releases to the environment. Measures for containment and cleanup of contaminant releases should be followed to minimize contamination of the natural environment, e.g., placement of fuel tanks and generators on an appropriate form of containment where possible, monitoring and other measures documented in the Environmental Management Plan. At all times where spills are a risk, appropriate materials for cleanup and approved disposal locations should be available. Spills or other discharges should be reported to the MOE as required by provincial legislation. Interim sanitary waste collection and availability of treatment facilities should be arranged for the duration of the construction period. All construction waste, washwater and wastewater should be disposed of in accordance with regulatory requirements.

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

A Hazardous Materials Management Plan, Waste Management Plan and a Spills Emergency Preparedness and Response Plan will be developed as part of the broader Environmental Management Plan. The implementation of these pollution prevention plans will obviate or minimize the environmental effects of accidental releases to the natural environment that have the potential to affect surface water and groundwater quality in the proposed Project area.

4.2.2.6 Stormwater Management

As indicated in Section 2.4.1, the final site grading and elevations will be designed to minimize erosion and manage stormwater in accordance with the Stormwater Management Plan prepared by the DBC based on the MOE (2003) report “Stormwater Management Planning and Design Manual” and the conditions of the Environmental Compliance Approval under the *OWRA*.

4.2.3 Aquatic Habitat

As indicated in subsection 2.1.5 of the PPS (OMMAH, 2005), development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements. The following sections present the recommended mitigation measures to be implemented for the proposed New Post Creek Project to meet regulatory requirements.

4.2.3.1 Timing of In-Water Construction

In-water construction activities should be timed to avoid the spawning and egg incubation period of spring spawning fishes, such as Walleye and Lake Sturgeon, which typically excludes in-water work from April 1 to June 30 (DFO, 2010a).

The area within the temporary cofferdam will be dewatered to facilitate proposed intake weir and powerhouse construction. An impervious geotextile will be placed on the cofferdam face to preclude water ingress. As indicated in Section 4.2.2.2, fish within the area to be dewatered will be collected by electrofishing/netting during drawdown and released to New Post Creek and the Abitibi River. The temporary unavailability of this habitat during the construction period will have negligible effect on the local fish populations.

4.2.3.2 Use of Explosives

Blasting of bedrock will be required in the nearshore areas to be excavated. Numerous studies have been undertaken to assess fish mortality due to in-water blasting (e.g., Hubbs and Rechnitzer, 1952; Fry and Cox, 1953; Ferguson, 1962; Foye and Scott, 1965; Chamberlain, 1976, 1979; Teleki and Chamberlain, 1978; McAnuff and Booren, 1989; Keevin *et al.,* 1997). The degree of blasting impact on fish will depend on the type of explosive, type of substrate blasted, blasting technique, fish physiology and timing. Injury to fish from in-water blasting will result from physical abrasion from ejected debris and from pressure changes associated with the blast shock waves.

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

To obviate injury to fish, blasting will be undertaken in the "dry", i.e., after dewatering and removal of fish, and will adhere to the DFO guidelines for use of explosives in or near fish habitat (Wright and Hopky, 1998). The shockwaves (peak particle velocities) produced from blasting using the sophisticated techniques and control measures employed in modern blasting practice will be attenuated rapidly within the bedrock. With the width of the cofferdam and its sufficient distance from the limit of blasting, no injury to fish from pressure changes associated with the blast shockwaves is expected. Moreover, blasting mats will be used to minimize the occurrence of fly-rock.

4.2.3.3 Sediments

Bottom substrate in New Post Creek at the proposed intake weir and spillway locations is predominantly bedrock. As indicated in Section 4.2.2.3, blasting will be required. The potential use of fragmented rock generated by blasting activities for fish habitat enhancement and/or nearshore/shoreline erosion protection will be discussed with DFO. Otherwise, the excess rock will be removed from the dewatered areas behind the temporary cofferdams for suitable upland disposal.

Sediment in the Abitibi River at the proposed tailrace location generally consists of fine material, e.g., sand/clay. As indicated in Section 2.4.1, construction of much of the in-water portion of the tailrace will be undertaken in the "dry" using a cofferdam (see Figure 2.14). The tailrace area will require rip-rap lining to protect against erosion and sloughing of the overburden. Upon completion of tailrace construction, the temporary cofferdam material will be re-used as rip rap.

Portions of the Abitibi River bank in the immediate vicinity of the tailrace area may also require shoreline rip-rap protection to minimize toe erosion due to scouring and lower bank sloughing along the river bank. A concrete stackwall, retaining wall or a tied steel sheet pile wall will extend out from the powerhouse draft tube piers to assist in reducing the excavated quantities.

4.2.4 Plankton and Aquatic Vegetation

Plankton populations will not be affected by construction of the proposed Project. Any plankton confined behind the cofferdams will be returned to the Abitibi River and New Post Creek during dewatering.

No aquatic vegetation will be affected by construction activities.

4.2.5 Benthic Macroinvertebrates

The placement of rock fill may have a localized adverse effect on benthic macroinvertebrate communities on the surface and within the substrate. The extent of disruption depends on the type of bottom substrate, the extent of the disturbed area, any resultant turbidity and sedimentation, and the timing of construction. Substrate in New Post Creek at the proposed cofferdam location is predominantly bedrock. The placement of rock fill on bedrock substrate will have minimal detrimental effect on the benthic macroinvertebrate communities. With the use of the larger-size rockfill, sufficient interstitial spaces will be available for the survival and migration of mobile benthic fauna.

Recovery after cofferdam removal is expected to be rapid. Recovery is defined as the return of aquatic biotypes after disturbance to an abundance and diversity comparable to that in an adjacent undisturbed control area (Rosenberg and Snow, 1977). The principal mechanism of recolonization by invertebrates is drift (Luedtke and Brusven, 1976; Williams and Hynes, 1977), but other mechanisms, such as lateral migration, vertical migration from within the hyporheic zone (i.e., after burial) and larval recruitment from aerial sources are also important (Luedtke and Brusven, 1976; Williams and Hynes, 1977; Griffiths and Walton, 1978; Hirsch *et al*., 1978). The rate of recovery is dependent on ambient environmental conditions, the type of organisms present and the size of the disturbed area. In general, there will be less impact upon benthic communities associated with a naturally variable, high energy environment. The benthic organisms are adapted to the high-energy, unstable conditions, and have life cycles that allow them to better withstand these stresses (Hirsch *et al*., 1978).

In the case of proposed tailrace location in the Abitibi River, the placement of rockfill will occur on top of finer sediments with benthic communities adapted to a low energy environment. In this case, recovery may be somewhat longer. Although no specific data are available on negative effects of finer substrate coverage by rockfill or other material, recovery rates from dredging activities range from six days (McCabe *et al*., 1998), 14 days (Rosenberg and Snow, 1977), three weeks (Diaz, 1994), 38 days (Griffith and Andrews, 1981) and up to one year (Griffiths and Walton, 1978).

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

4.2.6 Site-Specific Fish Habitat Considerations

Coker and Portt (2013a) presents a detailed assessment of the effects of the proposed Project on fish habitat (see Appendix A of the Aquatic Environment TSD). The following provides a summary of the potential construction effects on fish habitat.

Proposed Intake Weir at New Post Creek

The footprint of the diversion weir covers 1,832 m^2 of New Post Creek stream bottom that is typically covered by water during bankfull flow conditions. Almost all of the impacted area is rough bedrock with a small amount of coarser material along the banks and in bedrock pockets. Flow velocity is generally fast through this bedrock chute, but varies in speed and extent with water depth. Electrofishing found a sparse fish community with few species, i.e., White Sucker (YOY), Mottled or Slimy Sculpin, Pearl Dace and Burbot (juvenile), as indicated in Table 5 (sampling location Ef-2) in Coker and Portt (2013a). These were all collected along the shore in the coarser substrate material. No fish were captured on the offshore bedrock. Due to the bedrock substrate, this chute would not provide a significant amount of spawning habitat for any of the fishes found in New Post Creek (Coker and Portt, 2013a). Therefore, the weir footprint is considered to be a loss of 1,832 m^2 of general (feeding or residence) habitat.

Proposed Tailrace at the Abitibi River

The proposed GS tailrace will discharge to the Abitibi River, approximately 2.7 km upstream from the mouth of New Post Creek. Similar to much of the Abitibi River shoreline, the tailrace location appears to be primarily clay and sand, with some rocks of various sizes. The water depth increases rapidly with distance offshore, minimizing the need for alteration to the bed of the Abitibi River and ensuring that the nearshore modifications required will not significantly change the habitat character. Based upon the assumption of a typical 3 m deep tailrace for a GS of this size, approximately 604 m^2 of Abitibi River bottom will require excavation. No unique or critical habitats occur at this location, and it is not used as spawning habitat. The proposed tailrace channel will have an area of approximately 1,832 m^2, and will be lined with rip rap to stabilize its shape. The tailrace channel and rip-rap lining will provide additional aquatic habitat, and add some habitat diversity to this area of the Abitibi River.

Portions of the Abitibi River bank in the immediate vicinity of the tailrace area may also require shoreline rip-rap protection to minimize toe erosion due to scouring and lower bank sloughing along the river bank.

The potential use of fragmented rock generated by blasting activities for additional fish habitat enhancement (likely with a cobble cover) and/or use for nearshore/shoreline erosion protection will be discussed with DFO.

Watercourse Crossings

As indicated in Section 3.1.1, the existing operational access road to the proposed GS site traverses two small watercourses, whereas the proposed transmission line ROW traverses five watercourses and a small pond. Parliament Loop Road, which may be used to access the east side of New Post Creek, traverses seven small watercourses. DFO (2010a, b, c, d, e, f, g, h, i) Ontario Operational Statements and all conditions of MNR water crossing permits will be adhered to for construction of new temporary or permanent crossings and/or repair/replacement of existing crossings to ensure no adverse effect on fish habitat.

As transmission line construction will adhere to the appropriate mitigation measures identified in Sections 4.2, 4.2.1, 4.2.2 and 4.2.3.1, e.g., buffer establishment, erosion and sediment control, and management and control of incidental spills, no adverse effects on fisheries resources or habitat are anticipated. A potential adverse effect on fish habitat and fisheries could be the maintenance of riparian vegetation in a more open state due to vegetation management in the proposed ROW. These effects would be negligible for those watercourses where the riparian habitat is currently dominated by wetlands, thicket swamps and thickets. Riparian vegetation of the watercourses to be traversed by the proposed transmission ROW, including Pinard Creek which supports a brook trout fishery, are dominated by these low plant communities. These communities are expected to remain similar even with vegetation management.

Additional fish habitat loss and gain/enhancement due to the operation of the proposed New Post Creek Project are discussed in Section 4.3.8. Overall fish habitat loss and gain/enhancement due to construction and operation of the proposed Project are presented in Section 4.3.12.

4.2.7 Aquatic Avifauna

As indicated in Section 3.1.10, the proposed New Post Creek Project area does not have much importance for breeding or migrating waterfowl due to a lack of suitable breeding habitat or notable flyway (MOE, 1972). The construction disturbance will be sufficiently local that little displacement of aquatic avifauna will occur. Any resident birds can relocate temporarily to avoid human activity associated with construction activities. Some bird species will habituate to noise and vehicular traffic.

Noise from blasting could have an initial effect on avian startle flight; however, it is anticipated that over time birds will become habituated to the impulse noise. For instance, during the St. Lawrence River crossing by a natural gas pipeline, blasting had no effect on waterfowl in the area (Silver and Fitchko, 1992). Noise effects due to other construction activities can be acceptably mitigated by conventional construction practices and are predicted to be localized, minor and transient. Additional information on noise effects and mitigation measures is provided in Section 4.4.1.3.

4.2.8 Summary of Potential Construction Effects on the Aquatic Environment and Mitigation/Remedial Measures

Table 4.3 summarizes potential construction effects, the recommended mitigation/remedial measures to minimize or obviate these effects and the net effects of the proposed New Post Creek Project on the aquatic environment. With the implementation of the recommended mitigation/remedial measures, no adverse residual effects are anticipated during construction.

Table 4.3 Summary of Potential Construction Effects on the Aquatic Environment and Recommended Mitigation/Remedial Measures

Effect/Activity	Recommended Mitigation/Remedial Measures	Net Effect
Soil erosion	• Adherence to Erosion and Sediment Control Plan	No adverse residual effect
Incidental spills	• Adherence to Spills Emergency Preparedness and Response Plan	No adverse residual effect
Hazardous Materials/Waste	• Adherence to Hazardous Materials Management Plan and Waste Management Plan • Waste disposal in accordance with regulatory requirements	No adverse residual effect
Blasting	• Adherence to DFO guidelines (Wright and Hopky, 1998) and blasting engineer recommendations • Potential use of blast rock for fish habitat enhancement and/or nearshore/shoreline erosion protection, or removal for suitable upland disposal	No adverse residual effect
In-water construction activities	• Use of clean rock fill for cofferdam • Judicious selection of discharge location and water pressure during dewatering • Adherence to in-water construction timing restrictions • Transfer of fish stranded behind cofferdam prior to complete dewatering	No adverse residual effect
Fish habitat	• Potential use of blast rock for fish habitat enhancement to be discussed with DFO	Potential net benefit
Sportfish populations	• As a condition of employment, prohibition of sportfishing by construction workers while at camp	No adverse residual effect

During construction, an Environmental Compliance Monitoring Program will be implemented to ensure that all construction related commitments are met. Details on the Environmental Compliance Monitoring Program are provided in Section 7.2.

4.3 PROPOSED PROJECT OPERATION – AQUATIC ENVIRONMENT

4.3.1 Surface Hydrology

The proposed New Post Creek Project would alter the current flow patterns of New Post Creek due to inundation upstream of the proposed intake weir location and diversion of water to the Abitibi River through the proposed GS. Inundation effects on New Post Creek tributaries are presented in Section 4.3.8.

The operation of the proposed transmission line involves only limited monitoring and maintenance activities. The potential effect of these activities on hydrology is expected to be negligible.

4.3.1.1 Minimum Flow Considerations

Optimization of power production is necessary to ensure the economic feasibility of the proposed New Post Creek Project. However, operation of the Project will be constrained by the mandated minimum flows required in New Post Creek downstream of the intake, particularly during low flow periods, to ensure that the watercourse continues to function as a lotic system.

A number of contending interests have been identified that need to be considered in the establishment of minimum flows in New Post Creek downstream of the proposed Project spillway. A summary discussion of these contending interests based on historic and current flow regimes in New Post Creek is provided below.

<u>Power Production</u>

A balance between power and other interests was considered by CRP/OPG to ensure the economic feasibility of the proposed New Post Creek Project. The base case operating scheme, as outlined in the feasibility update report (KGS Group, 2010), involves the passage of established minimum flows over the spillway and the remaining flow diverted from New Post Creek and passed through the turbine units to generate electricity.

During high flow periods, flow diversion is expected to meet the maximum flow capacity of the turbines most of the time. Plant capacity was estimated to be in the order of 50 m^3/s by KGS Group (2010). During the spring, significant flows will continue downstream of the proposed Project intake, as the average New Post Creek flows for May and June are 131.2 m^3/s and 70.9 m^3/s, respectively. It should be noted that in May and June of 2010, the measured flows were 36.5 and 21.7 m^3/s, respectively, the lowest and second lowest during these two months over the period of record (1975 to 2012) used in flow estimation (January 1975 to October 2009) and measured at the WSC gauge (November 2009 to December 2012) (see Table 2.4).

When the diverted creek flows are less than the lowest plant operating flow of the smallest turbine unit (typically 40% of the unit capacity for a Francis turbine), diversion through the intake would have to be shut down and all of the creek flow would continue downstream over the waterfalls. For two equal sized turbine units with a capacity of 25 m^3/s each, the plant would have to cease generation at diverted flows of approximately 10 m^3/s, typically in February and March (KGS Group, 2010). Under these circumstances, plant shutdown would occur on average about 17% of the year (G. McPhail, KGS Group, 2011, pers. comm.), occurring primarily during the low flow months of February and March, but also during the summer.

However, as indicated in Section 2.4.2.1, pulsed operation will be undertaken, using the limited storage available in the forebay to operate one turbine unit for several hours as flows permit during a day thereby generating additional energy during a period when the proposed GS would normally be shut down.

Fish Spawning and Egg Incubation below the Waterfalls

As indicated in Sections 3.1.9.4 and 3.1.9.7, field studies have confirmed that the rapids below the waterfalls provide spawning habitat for at least three fish species. Walleye, White Sucker and Longnose Sucker spawn in early to mid-May, with egg incubation taking approximately two weeks and fry dispersal two weeks after hatching. Walleye and catostomid eggs are demersal and adhesive, falling into crevices in the substrate and adhering to the substrate.

Based on the available flow dataset, the averages of the mean monthly flows in New Post Creek between 1975 and 2012 were 131.2 and 70.9 m^3/s in May and June, respectively (Table 3.4). Walleye, Longnose Sucker and White Sucker were found to be in spawning condition in early May 2010 (Coker and Portt, 2012c), when the flow was approximately 32 m^3/s. The average flow for May 2010 was 36.5 m^3/s, the lowest on record. Coker and Portt (2012c) opined that the lower flows in New Post Creek in 2010 likely resulted in better habitat conditions for spawning Walleye than the higher flows (195.7 m^3/s) observed in 2009.

Maintenance of Fish Habitat in New Post Creek

As indicated in Section 3.1.3.1, New Post Creek was historically a minor tributary of the Abitibi River, with an estimated average flow of less than 4 m^3/s, approximately nine times lower than the current average diverted flow (~35 m^3/s based on 1975 to 2010 data) (KGS Group, 2010).

It is the position of MNR, Cochrane District, that since New Post Creek has always been a lotic system, it should continue to function as such. As indicated in Section 3.1.3.1, for the ten non-freshet months, the overall average monthly pre-diversion flow in New Post Creek was approximately 3.1 m^3/s. This flow was sufficient to maintain fish habitat upstream and downstream of the waterfalls. It could be proposed that a minimum flow of 3 m^3/s be used as a minimum flow during the operation of the proposed Project in the non-freshet period (July to April).

Restoration of Historic Flow Regime

Restoration of historic flow regime in New Post Creek is of interest to the TTN. This interest would apply to the watercourse downstream of the proposed Project intake weir location including the waterfalls.

Restoration of historic flow regime would affect navigable waters downstream of the proposed Project intake location and possibly waterfalls aesthetics.

As indicated in Section 3.1.3.2, there has been a dramatic reconfiguration of the New Post Creek waterfalls and the channel downstream of the waterfalls due to the increased flows since the diversion. As a result, the original fish habitat has also been significantly altered to its current characteristics. Restoration of the historic flow regimes may also affect current fish habitat and therefore was not acceptable by the MNR.

Navigable Waters and Public Safety

As indicated in Section 3.4.3.3, LAPP is designated as a waterway/natural environment class park. Maintenance of navigable waters within LAPP downstream of the proposed Project intake location is of interest to Ontario Parks.

Based on the MNR (2006) Crown Land Use Policy Atlas – Policy Report for LAPP, canoeing/kayaking may be permitted with long-term management direction to be determined through planning. Existing uses may continue in the interim, unless park values are threatened.

As indicated in Section 3.4.3.3, the diversion channel and most of New Post Creek are navigable by canoe from the New Post Creek Diversion Dam to the waterfalls (http://www.myccr.com). A portage is currently required at the Otter Rapids Road bridge, approximately 7.5 km upstream of the proposed intake location. A portage is also currently required at the waterfalls approximately 4.5 km downstream of the proposed intake weir location.

Although New Post Creek was not navigable during the summer prior to flow diversion, sufficient flows may be available during proposed Project operation to facilitate canoeing during this period within LAPP downstream of the proposed intake weir location. This would necessitate the establishment of a portage around the proposed Project intake weir in order to continue downstream to the portage around the waterfalls. This portage at the waterfalls occurs along a poorly marked upper trail with significant blowdown obstructions and a very steep and slippery trail down to the base of the waterfalls. This portage has been designated as difficult (http://www.myccr.com).

Alternatively, a portage trail approximately 1 km long could be provided to the south of the proposed Project site from New Post Creek to the Abitibi River to facilitate further access for canoeists to LAPP. This alternative would enhance public safety by precluding the need to portage around the proposed Project intake weir on the east side of New Post Creek, and to locate and access the difficult portage around the waterfalls.

Prior to initiation of construction of the proposed Project, the DBC will identify disembark/launch locations (with appropriate signage) for canoeists to access the new portage trail between New Post Creek and the Abitibi River during the construction period. A map showing the proposed location of the new portage trail will be provided to Ontario Parks and MNR for review and approval. The disembark/launch location on New Post Creek will subsequently likely need to be relocated due to the proposed inundation and the final portage trail location between New Post Creek and the Abitibi River will be discussed with Ontario Parks during the construction phase.

Waterfalls Aesthetics

As indicated in Section 3.4.3.4, the New Post Creek waterfalls has been identified as a tourism destination by the www.northernontario.travel website under Wilderness Heritage Canoe Tours. Two tourism operators located in Cochrane (Howling Wolf Expeditions, Northern Spirit Adventures) provide half, full and/or two-day trips to “New Post Falls” and New Post. Reduction of flows over the waterfalls to historic levels may diminish visitor experience appreciation value.

4.3.1.2 Minimum Flow Establishment Process

During the EA process, discussions on the proposed Project operating regime and in particular minimum flow requirements have been ongoing between OPG, CRP, MNR, Ontario Parks and DFO. All parties have been working towards an operating regime that:

- continues to provide important ecological functions;
- ensures that the proposed Project is economically viable;
- respects TTN’s historic and modern day interests;
- ensures and enhances public safety; and
- ensures continual flow in New Post Creek and over the waterfalls to maintain aesthetic value.

As a pre-condition, it was agreed that the proposed Project will not change the total volume of water flowing into the Abitibi River, or the operating considerations for Abitibi Canyon GS and Otter Rapids GS. Moreover, to simplify proposed New Post Creek Project operation, the OPG NEPG requested that the number of minimum flow requirements throughout the year be limited, e.g., if possible, a minimum flow to sustain fish spawning in the spring and a minimum flow for the remainder of the year.

As indicated above, the rapids below the waterfalls provide spawning habitat for at least three fish species during the spring freshet: Walleye, White Sucker and Longnose Sucker. Field studies have determined that Lake Sturgeon and Lake Whitefish do not utilize this habitat for spawning in the spring and fall, respectively (see Sections 3.1.9.5 and 3.1.9.7). As indicated in Section 3.1.9.4, Coker and Portt (2012c) opined that the lower flows (32 m^3/s) within New Post Creek in 2010 likely resulted in better habitat conditions for spawning Walleye than the higher flows (195.7 m^3/s) observed in 2009. This was confirmed by hydraulic/habitat modelling (see below).

A meeting of the five parties was held on October 20, 2011 to initiate formal discussions on minimum flow requirements for the proposed New Post Creek Project. During the meeting, MNR indicated that application of the Q_{80} approach to minimal flow for the proposed Project would be acceptable. However, it was noted by CRP/OPG that this approach would effectively terminate the proposed Project since the Q_{80} approach uses the flow that is exceeded 80% of the time as a target In-stream Flow Need (IFN). Some agencies apply this approach over the entire year, whereas others apply it only for defined periods, e.g., low flow periods. If used on a monthly basis for the proposed Project, the Q_{80} would exceed the minimum flows typically observed in New Post Creek in the winter (see Table 3.4).

At the meeting, it was agreed that a 2D hydraulic/Habitat Suitability (HSI) model would be used to assess habitat at various flow conditions in New Post Creek in order to define minimum flow requirements.

To provide data necessary to develop the River2D hydraulic model used, a field survey was conducted by KGS Group to obtain bathymetric, substrate and flow/velocity/water level information for New Post Creek from the base of the waterfalls to its confluence with the Abitibi River (Coker and Portt, 2012e; see Appendix C of the Aquatic Environment TSD). The hydraulic model results were used with the HSI model to simulate a range of potential in-stream flows, including Spring IFNs and Summer/Fall/Winter IFNs, and quantify fish habitat over this range of flows. The spawning period for Walleye was selected as the key life stage and target fish species for this study. Potential IFNs were assessed with the model for the period of May and June (spawning and egg incubation period) and from July to April.

As indicated in Section 3.1.9.5, there was still uncertainty with respect to Lake Sturgeon spawning in New Post Creek based on the 2010 findings. As a result, potential IFNs of Lake Sturgeon during the spawning period were also assessed with the model. Subsequent more comprehensive field studies undertaken in 2011 and 2012 have indicated that there is no evidence of Lake Sturgeon spawning in New Post Creek.

<u>Minimum Flows Proposed by CRP/OPG for the Spring Spawning Period (May – June)</u>

A large number of model runs were executed, using stream flows ranging from 1 to 144 m^3/s. The model results for Walleye spawning suitability at 10 and 30 m^3/s are presented in Figures 4.1, 4.2, 4.3, 4.4 and 4.5. The small red ellipse at the top end of the Walleye spawning suitability mapping in Figure 4.5 indicates the location of Walleye observed at night during the 2010 spawning run (Coker and Portt, 2012c).

Figure 4.1 Principal Walleye Spawning Habitat Parameters of Water Depth, Water Velocity at 10 m^3/s and Substrate

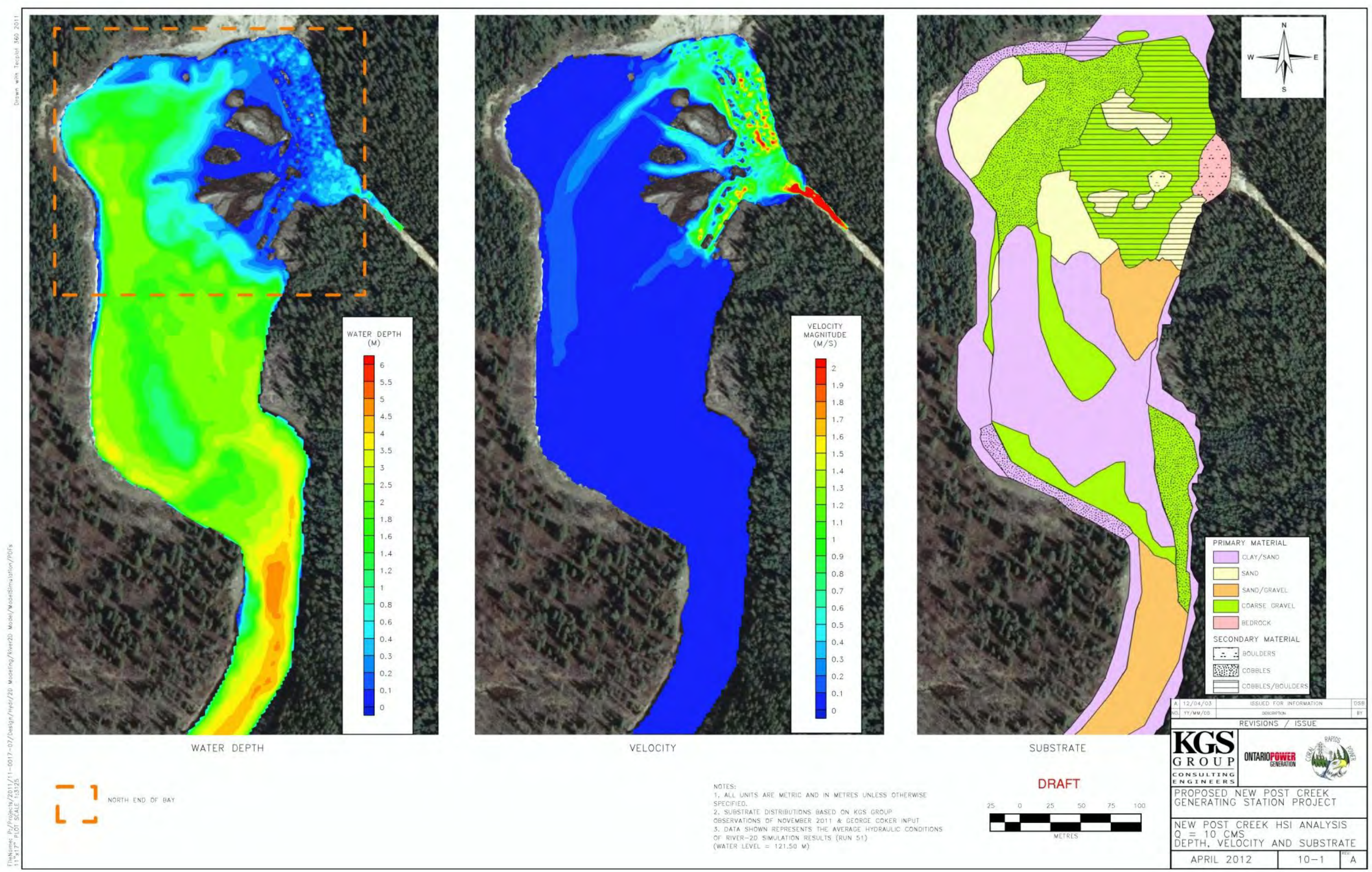


Figure 4.2 The Spatial Extent of Suitable Water Depth, Water Velocity and Substrate Type Required by Walleye for Spawning at Flow of 10 m³/s

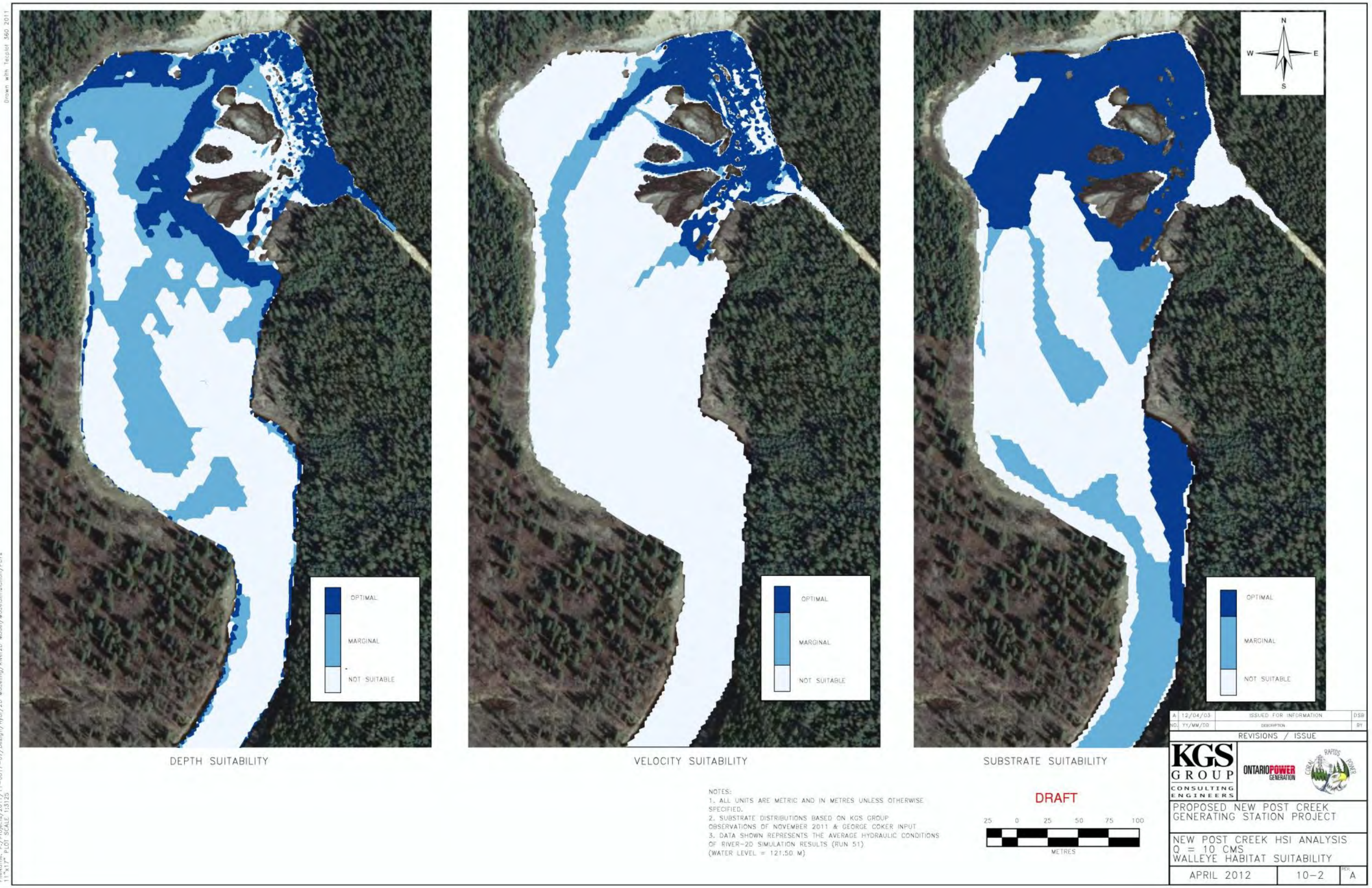


Figure 4.3 Principal Walleye Spawning Habitat Parameters of Water Depth, Water Velocity at 30 m^3/s and Substrate

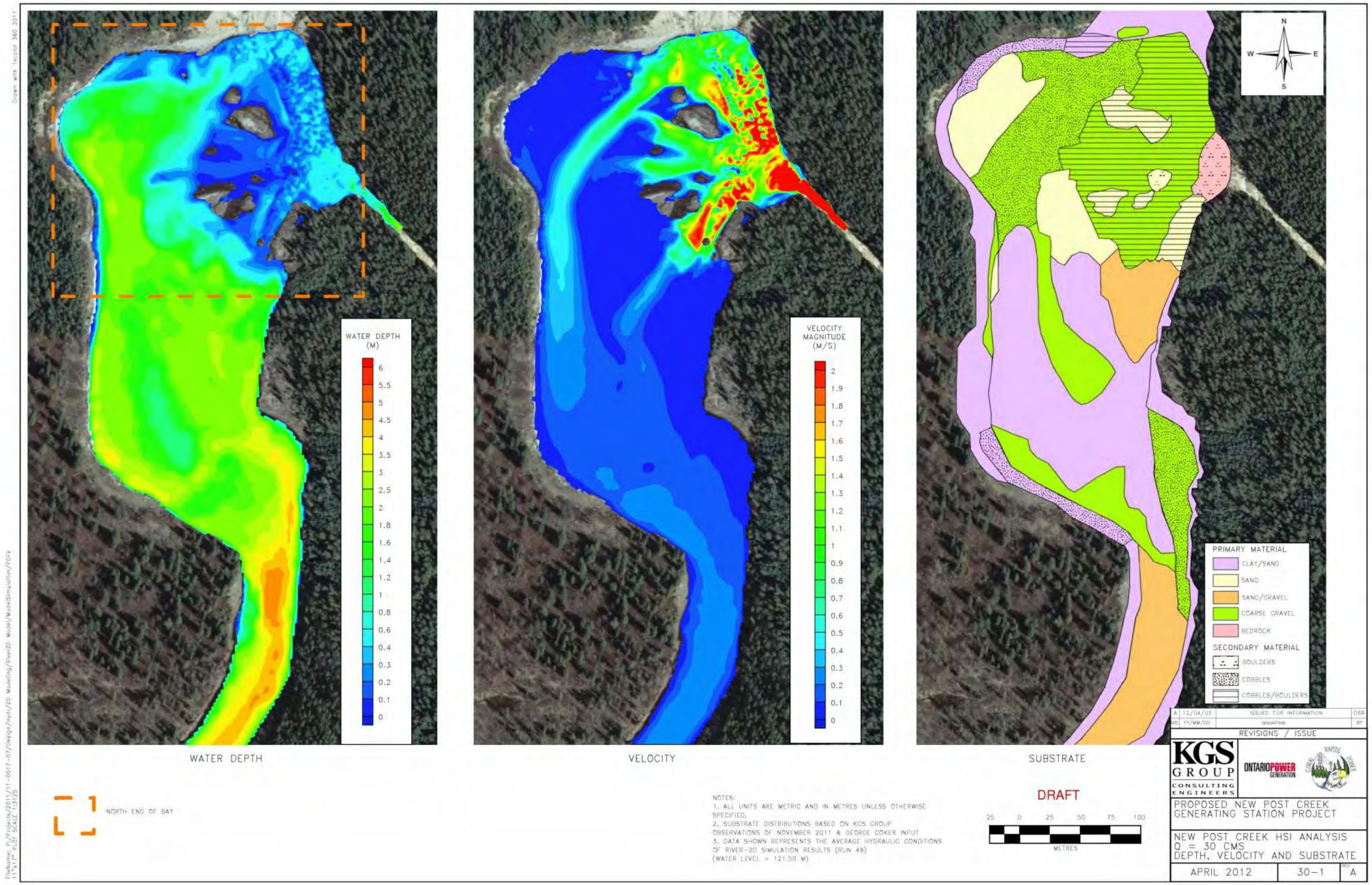


Figure 4.4 The Spatial Extent of Suitable Water Depth, Water Velocity and Substrate Type Required by Walleye for Spawning at Flow of 30 m^3/s

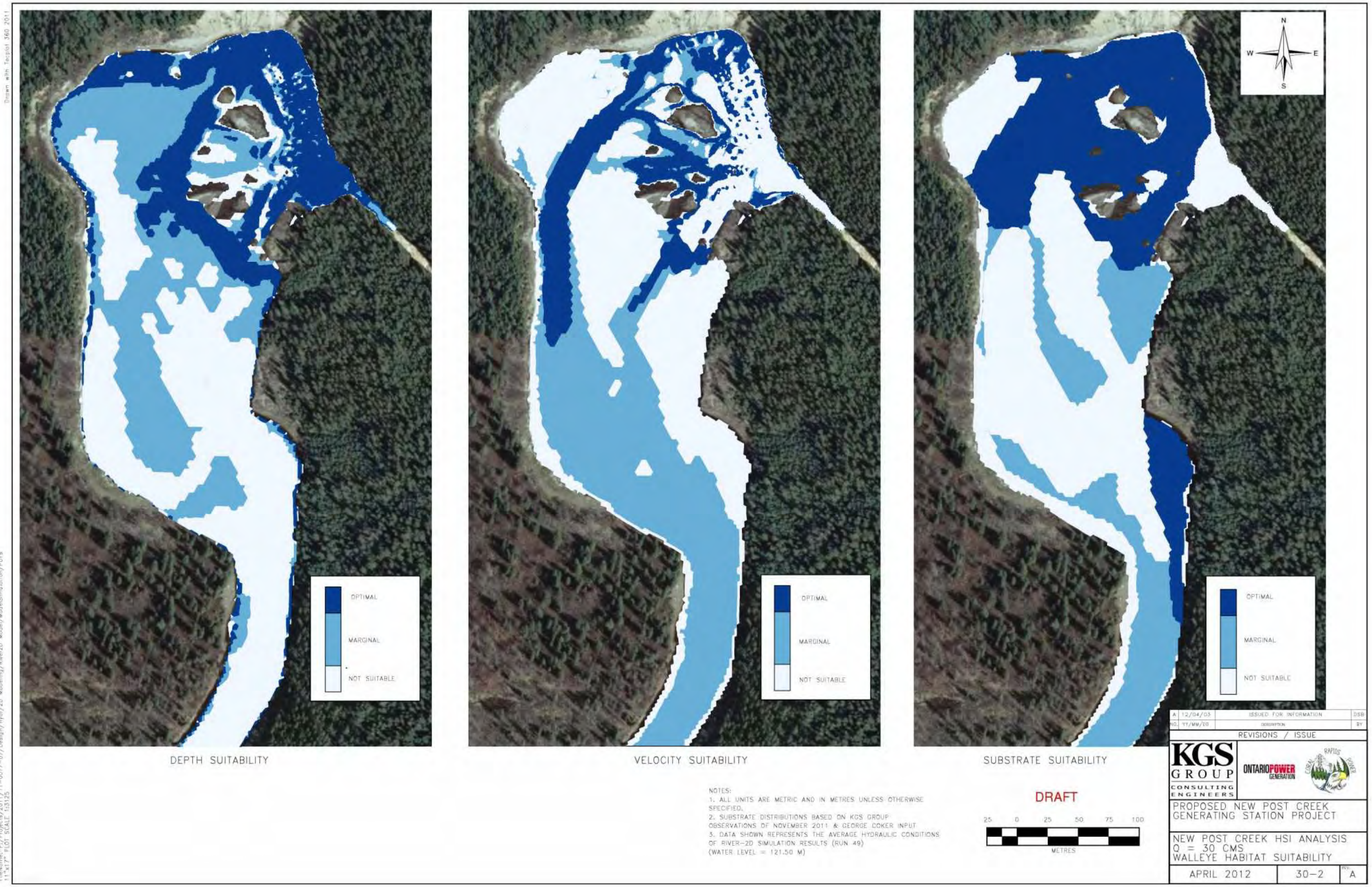
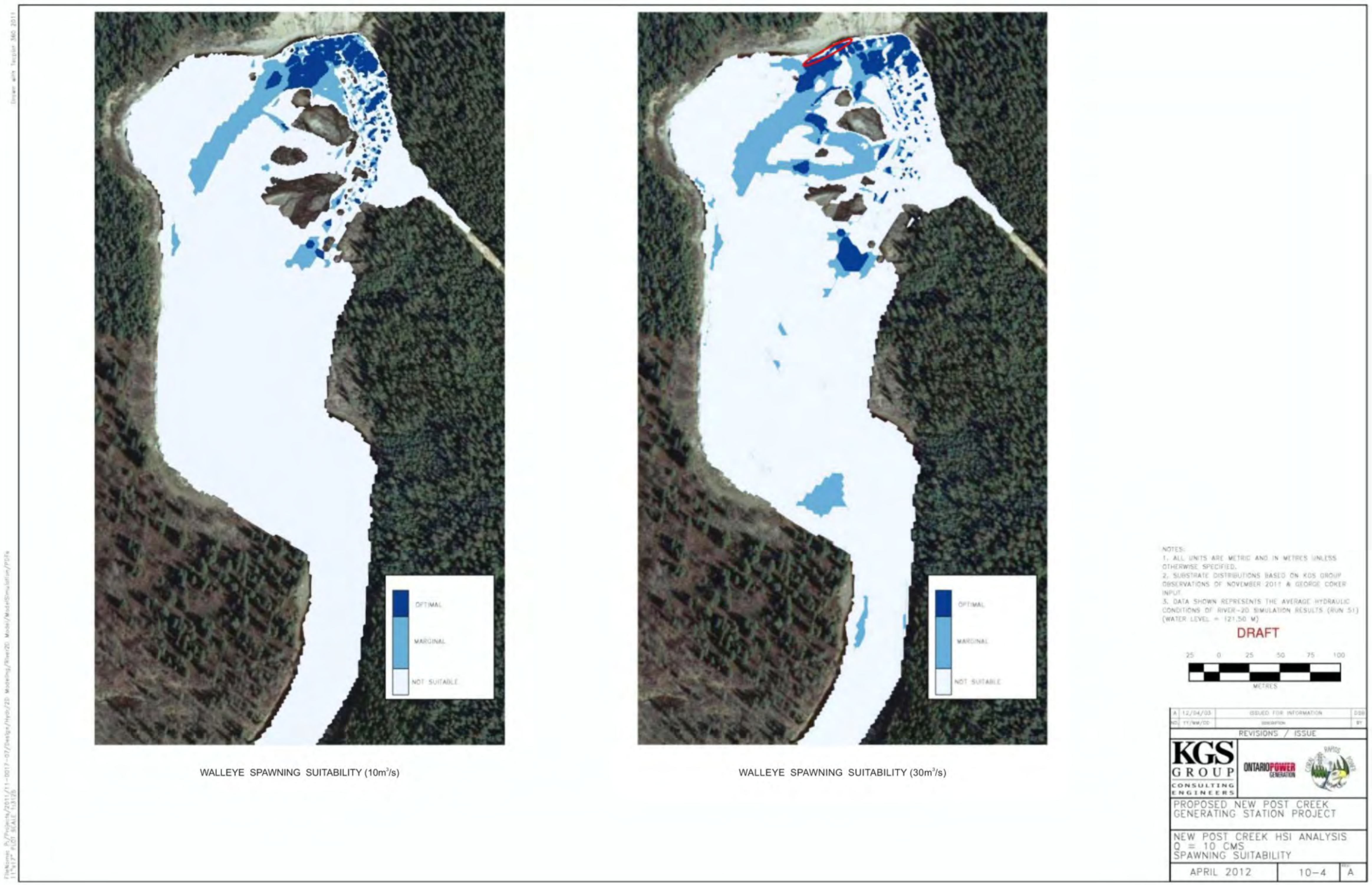
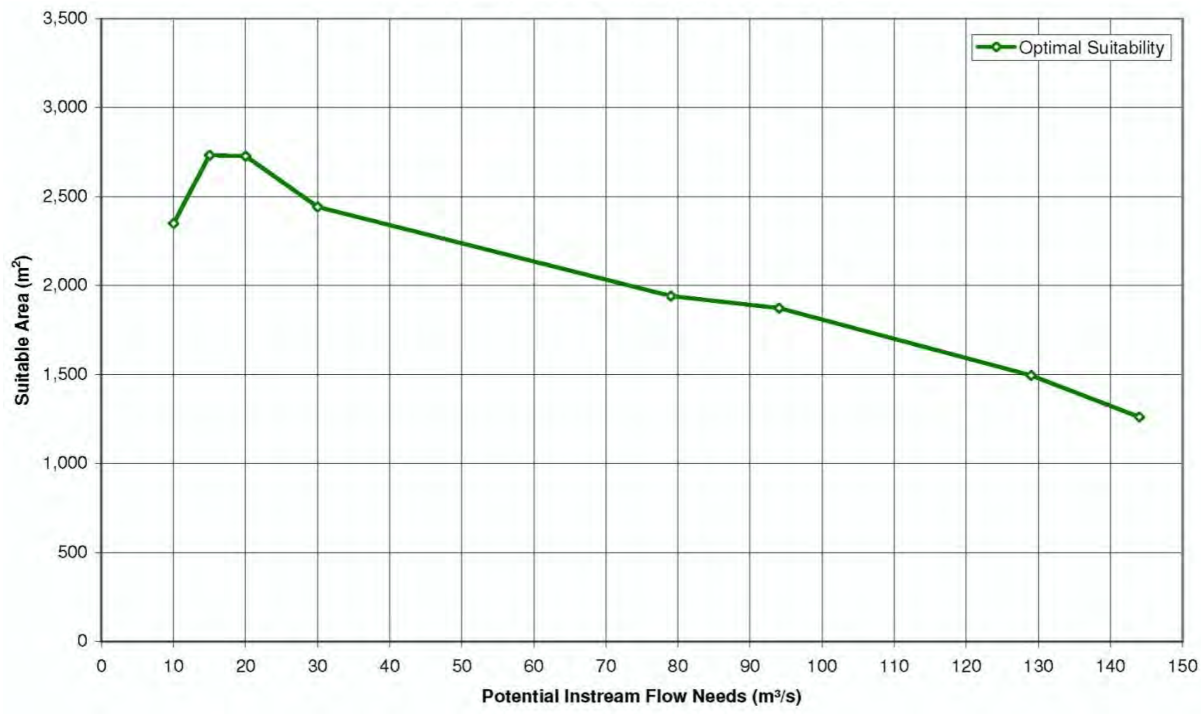


Figure 4.5 The Spatial Extent at 10 and 30 m³/s of Potential Walleye Spawning Habitat, where Suitable Flow Velocities, Water Depths and Substrate Types Overlap



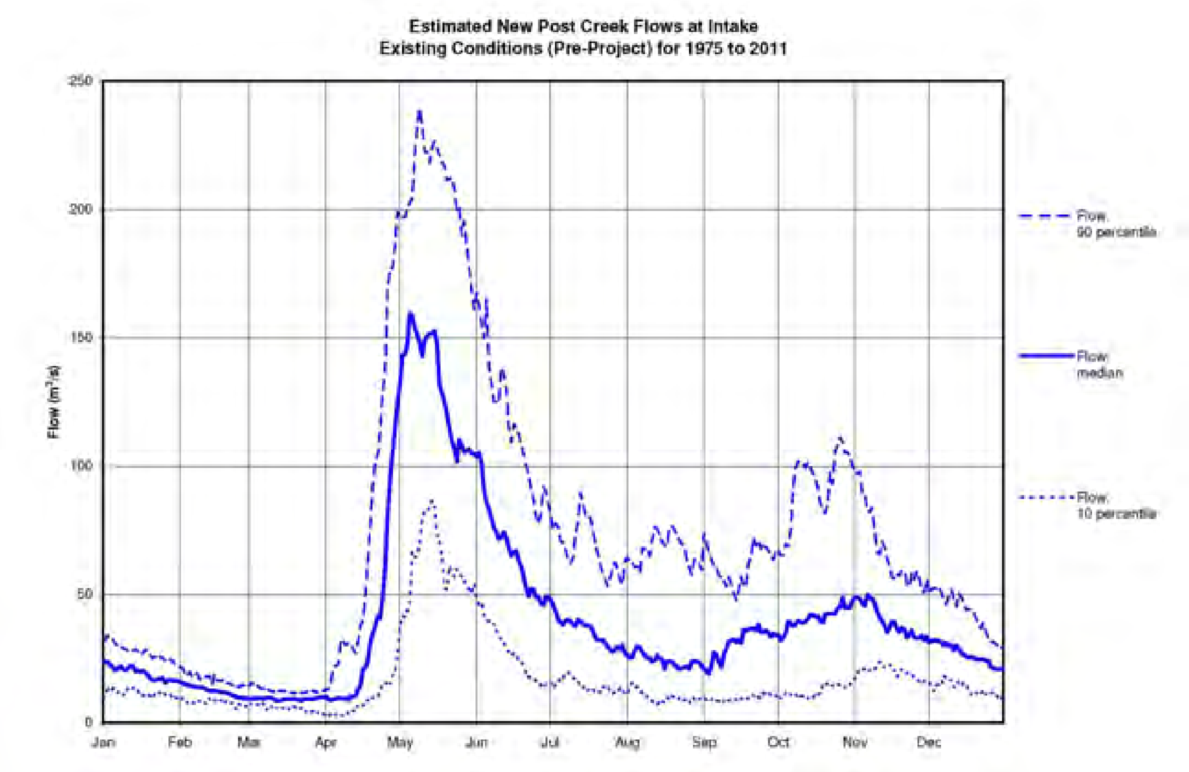
Besides the two example habitat runs provided above, the results of additional optimal Walleye spawning habitat model runs at a range of flows are presented in Figure 4.6.

Figure 4.6 Graph of Potential Optimal Walleye Spawning Habitat Area versus Flow



As indicated in Figure 4.6, the area of potential optimal Walleye spawning habitat is highest at flows of 10 to 30 m^3/s, compared to reduced areas of potential optimal spawning habitat at flows greater than 80 m^3/s that typically occur during the spring spawning period. As indicated in Figure 4.7, New Post Creek flows during the spring spawning period are historically much higher than the optimal spawning flows. With the proposed Project reducing flows by up to approximately 50 m^3/s due to flow diversion through the proposed GS, the likelihood of flows occurring in a more optimal zone for spawning downstream of the waterfalls increase significantly.

Figure 4.7 Median New Post Creek Flows



The relationship of suitable spawning habitat to flow in any river will approximately follow a bell-shaped distribution, with its exact shape and the position of the peak determined by the morphology of the channel. In the case of habitat below the waterfalls in New Post Creek, a limited area of suitable depth for Walleye spawning becomes increasingly unavailable as flow and flow velocity increase, whereas in rivers where suitable depth is widespread, the area of suitable spawning habitat may remain high or increase as flow increases towards the capacity of the channel. For New Post Creek, the potential Walleye spawning habitat area is greater at flows that are considerably less than what occurs during the typical period of Walleye spawning. Therefore, the projected overall decrease in flow that will occur below the waterfalls (i.e., ~50 m^3/s) as a result of the proposed Project, will provide more optimal Walleye spawning habitat compared to current conditions.

While the peak spawning habitat suitability occurs between approximately 15 to 20 m^3/s (Figure 4.6), a minimum flow of 10 m^3/s was recommended because it provides a significant improvement in Walleye spawning conditions over existing conditions, while not limiting the proposed Project viability. In terms of energy impact, current data estimate that for every 1 m^3/s increase in minimum flow during this period there would be a loss of annual energy production of 0.25 GWh.

This minimum flow of 10 m^3/s represents a targeted minimum flow and is not expected to be required every year. This minimum flow will be required approximately 1 in 10 years during the typical Walleye spawning period, rising to approximately 1 in 4 years by the end of the typical Walleye fry dispersal period.

This recommended minimum flow of 10 m^3/s should not affect other spring spawning fish species. Longnose Sucker spawn at about the same time as Walleye (being often observed together during nighttime observations) and generally use the same habitats. White Sucker usually spawn immediately following Walleye and can utilize a broader range of spawning habitats than Walleye. Shorthead Redhorse may start to spawn immediately after Walleye, but over a wider range of temperature and probably in slower water velocities and somewhat deeper water in large rivers. No Shorthead Redhorse have been caught in New Post Creek during the short-term gillnet sets to confirm Walleye spawning in 2009, 2010 and 2011 (Coker and Portt, 2012c, d).

Details on the fieldwork and modelling used to quantify Walleye and Lake Sturgeon spawning habitat in New Post Creek downstream of the waterfalls, as well as the rationale for the proposed minimum flow of 10 m^3/s during the Walleye spawning and egg incubation period, is provided by Coker and Portt (2012e). This report is provided in Appendix C of the Aquatic Environment TSD.

Minimum Flows Proposed by CRP/OPG for the Summer Period (July – September)

Coker and Portt (2012e) proposed a minimum flow of 3 m^3/s in New Post Creek to maintain basic ecological function from the end of spring to the end of September, i.e., during the more active production phase of fish and benthic macroinvertebrates.

As indicated in Section 3.1.9.2, the post-diversion fish community in New Post Creek upstream of the waterfalls is characterized by low diversity and small populations. Based on habitat observations and due to channel morphology, the proposed minimum flow of 3 m^3/s should be sufficient to maintain summer ecological function between the proposed intake weir location and the waterfalls. The majority of wetted habitat will be maintained, although some minor losses will occur along the shoreline of flatwater sections, with somewhat greater losses of area at the three localized flow control points in this section of New Post Creek. Aquatic habitats will remain productive, although the lower water levels throughout and the generally lower flow velocities may result in shifts in benthic macroinvertebrate and fish communities. Given the sparse nature of the fish community and the existing barrier of the waterfalls that prevents fish from moving upstream to utilize these habitats, any effects on the local fish community will have little significance, and broader effects to downstream and upstream fish communities will be insignificant. The seasonal losses of habitat area downstream of the proposed intake weir due to the proposed minimum summer flow of 3 m^3/s will probably be more than offset by the area of habitat gained due to the higher water levels that will be maintained upstream of the proposed intake weir.

As indicated in Section 3.1.9.3, the fish community in the shallow water and rapids of New Post Creek downstream of the waterfalls is fairly typical of this type of habitat but sparse.

The projected reduction in the area of rapids habitat below the waterfalls at the proposed minimum flow of 3 m^3/s will probably result in a reduction in local benthic macroinvertebrate production; however, the effect on local fish productivity is unknown given the existing low fish densities observed in the creek. The habitat in New Post Creek below the waterfalls is illustrated in Figure 4.8). Below the waterfalls, flow passes over the alluvial fan via three main routes. Most of the flow passes along the north side and then down the west side (solid line), with the remaining flow split between two other routes (dashed lines). Habitat quality does not appear to decrease appreciably within the primary channel (solid line in Figure 4.8), because as flow is reduced it is initially at the expense of the two minor channels (dashed lines in Figure 4.8). Based on hydraulic modeling, almost all flow would pass down the primary channel at approximately 3 m^3/s. Although habitat area would be decreased, and therefore assumed to represent a loss in productivity, the habitat components in this area at higher flows are still present at a flow of 3 m^3/s. The resultant habitat changes in the summer are considered a local adverse effect rather than affecting the broader aquatic community in the downstream habitats of New Post Creek and the Abitibi River. Moreover, the tailrace area of the proposed GS will provide flowing-water habitat with coarse substrate that does not currently exist, providing some compensation for the loss of similar habitat in New Post Creek below the waterfalls.

Figure 4.8 Primary (solid line) and Secondary (dashed lines) Flows in New Post Creek Channels Below the Waterfalls

Details on the fieldwork and modelling used to assess effects of the recommended minimum flow of 3 m^3/s on aquatic habitat in New Post Creek upstream and downstream of the waterfalls during the summer period is provided in Appendix C of the Aquatic Environment TSD.

Minimum Flows Proposed by CRP/OPG for the Winter Period (October - April)

Coker and Portt (2012e) proposed a minimum flow of 1 m^3/s in New Post Creek to maintain basic ecological function during the winter.

Based on habitat observations and due to channel morphology, the proposed minimum flow of 1 m^3/s should be sufficient to maintain winter ecological function between the proposed intake weir location and the waterfalls. Water temperatures will be at or close to 0^oC, and most fish and benthic macroinvertebrates will be in a state of minimal activity. The majority of wetted habitat upstream of the waterfalls will be maintained, although some minor losses will occur along the shoreline of flatwater sections, with somewhat greater losses of area at the three localized flow control points. Aquatic habitats will remain productive, although the lower water levels and flow velocities will likely result in shifts in benthic macroinvertebrate and fish communities.

The majority of wetted habitat area in New Post Creek downstream of the waterfalls will be maintained, because water levels downstream of the alluvial fan are controlled by the Abitibi River. However, although riffle habitats of similar quality will be maintained in the alluvial fan, they will be reduced in area. Given the sparse nature of the fish community and the low winter activity of most fish and benthic invertebrates in New Post Creek, any effects on the local fish community will have little significance and broader effects to downstream fish communities will be insignificant. Transition from the 3 m^3/s summer flow to 1 m^3/s winter flow should occur at the end of September when fish and benthic macroinvertebrates are still active. As a result, no further dewatering of habitat will occur after they take up their overwintering positions.

Details on the fieldwork and modelling used to assess effects of the recommended minimum flow of 1 m^3/s on aquatic habitat in New Post Creek upstream and downstream of the waterfalls during the winter period is provided in Appendix C of the Aquatic Environment TSD.

Q_{95} Approach to Minimum Flow Proposed by MNR

The minimum flow assessment findings and the proposed minimum flows of 10 m^3/s for the spring spawning period (May and June), 3 m^3/s for the summer period (July to September) and 1 m^3/s for the winter period (October to April) were presented to MNR, Ontario Parks, DFO and MOE at a meeting on April 11, 2012. A report on the minimum flow assessment findings and the proposed minimum flows was subsequently prepared by Coker and Portt (2012e) and provided to the agencies in July 2012.

After the meeting and prior to receipt of the Coker and Portt (2012e) report, the MNR proposed a Q_{95} approach (flows equal to or exceeded 95% of the time) and defined as low flow or extreme low flow as presented below:

- 19.8 m^3/s for the spring spawning period of May and June, compared to 10.0 m^3/s proposed by CRP/OPG (it should be noted that at the time of this proposal there was uncertainty regarding Lake Sturgeon spawning in New Post Creek);
- 7.5 m^3/s for the summer period of July, August and September, compared to 3.0 m^3/s proposed by CRP/OPG;
- 9.8 m^3/s for the fall period of October and November, compared to 1.0 m^3/s proposed by CRP/OPG; and
- 5.0 m^3/s for the winter period of December to April, compared to 1.0 m^3/s proposed by CRP/OPG.

During a subsequent meeting on October 30, 2012, the MNR reiterated their position that the Q_{95} approach is scientifically defensible as an extreme low flow. However, the MNR did present revised (minimum acceptable) low flows and their rationale. These are presented in Table 4.4.

Table 4.4 Revised MNR Flow Requirements for New Post Creek

	Minimum Flow (m^3/s)			
	Spring	**Summer**	**Fall**	**Winter**
Q_{95}	19.8	7.5	9.8	5.0
Minimum Acceptable	15	7.5	3.0	3.0
Difference from Q_{95}	-4.8	0	-6.8	-2.0
Pulsing	No	Yes (0.5 m)	Yes (0.5 m)	Yes (0.5 m)

The minimum flow of 15 m^3/s during the spring (May 1 to June 30) was considered to adequately protect aquatic values below the waterfalls. Based on the fisheries information and habitat modeling provided, MNR determined that it was acceptable to depart from the preferred Q_{95} value. However, MNR was not convinced that Lake Sturgeon do not spawn below the waterfalls.

The minimum flow of 7.5 m^3/s during the summer (July 1 to September 30) is defensible as a required low flow. It may or may not fully meet the summer aesthetics flow requirements. However, as the Q_{95}, a minimum flow of 7.5 m^3/s in the summer avoids the question of a net negative change in the ecological integrity of LAPP. A net negative change in ecological integrity would trigger an Ontario Parks review/compensation process that could be lengthy.

MNR agreed that the fall minimum flow should serve as a cap for winter flows and therefore proposed an increase of the low flow requirement during the months of October and November from 1 m^3/s to 3 m^3/s to correspond with that for the winter months (see below).

Being significantly less than the Q_{95}, MNR was uncertain that a minimum flow of 1 m^3/s during the winter (December 1 to April 30) would be sufficient to adequately protect aquatic values, particularly the provision of sufficient overwintering refuge above the waterfalls for benthic macroinvertebrate and fish communities to protect them from freezing and desiccation. However, MNR is also sensitive to the strategic importance the winter season has with respect to power production and proposed Project viability. Therefore, a moderate departure from the Q_{95} to a minimum flow of 3 m^3/s provides a balanced approach that meets both environmental protection and proposed Project viability objectives.

4.3.1.3 Minimum Flows Proposed by MNR and Ontario Parks

Based on further feed-back and deliberations with MNR, Ontario Parks, DFO and MOE, the following minimum flows were proposed by MNR and Ontario Parks for New Post Creek during proposed Project operation.

Proposed Minimum Flow during the Spring Walleye Spawning Period

A minimum flow of 15 m^3/s is proposed for the spring Walleye spawning period (approximately May 1 to mid-June). Based on the modeling results, peak Walleye spawning habitat suitability occurs between 15 and 20 m^3/s (see Figure 4.6). The duration of minimum flow adherence will be dependent on water temperatures encompassing the initiation of Walleye spawning and completion of fry emergence.

Figure 4.9 presents a histogram of historical flows in New Post Creek, ranked in order of lowest to highest, during the typical start of Walleye spawning in early May. The proposed spring minimum flow of 15 m^3/s is represented by the green bar portions. The blue bar portions represent the expected flow diversion of up to 50 m^3/s through the proposed GS, and the red bar portions represent the additional flow downstream of the proposed intake weir location on New Post Creek. For the 32 years of recordings, flow in New Post Creek was low enough during only 3 years that some curtailing of flow diversion to the proposed GS would have been required in order to provide the proposed spring minimum flow of 15 m^3/s.

Figure 4.9 also indicates that reducing flows downstream of the waterfalls by the proposed GS flow of 50 m^3/s will increase the amount of optimal Walleye spawning habitat (see Figure 4.6). For example, under the current flow regime, flow in New Post Creek was below of 50 m^3/s for only 2 of the 32 years. With the operation of the proposed GS, flow below of 50 m^3/s would have occurred during the spring of 8 years. Therefore, an overall reduction of 50 m^3/s will provide a greater amount of optimal Walleye spawning habitat than what currently becomes available under typical spring flows.

Figure 4.10 presents a histogram of historical flows in New Post Creek, ranked in order of lowest to highest, during the typical end of Walleye fry emergence in early June. As in Figure 4.9, the green bar portions represent the proposed minimum flow of 15 m^3/s, the blue bar portions represent the expected flow diversion of up to 50 m^3/s through the proposed GS, and the red bar portions represent the additional flow downstream of the proposed intake weir location on New Post Creek.

Figure 4.9 Histogram of Flow Redistribution during the Walleye Spawning Period due to Flow Diversion and Minimal Flow Adherence

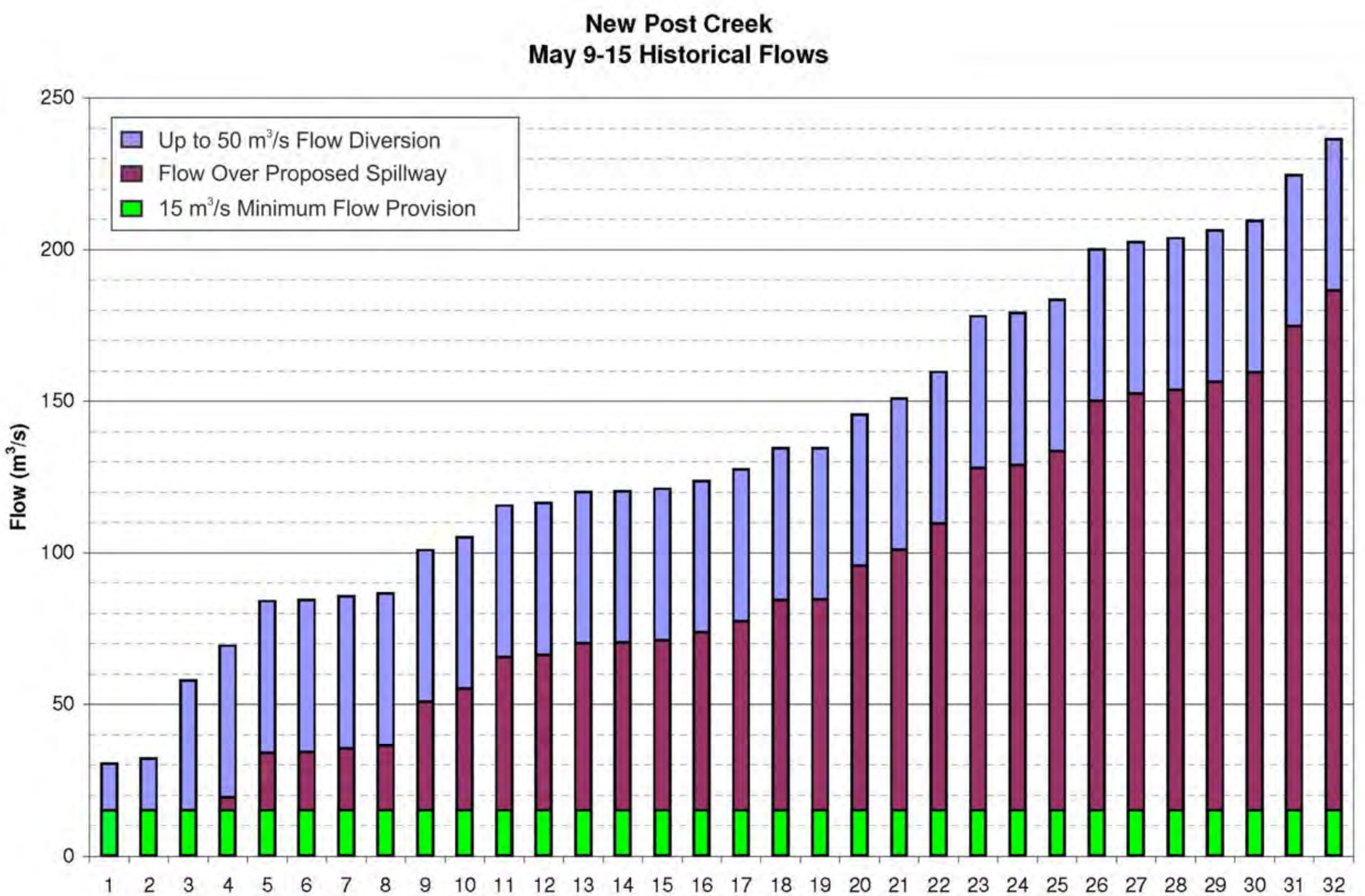
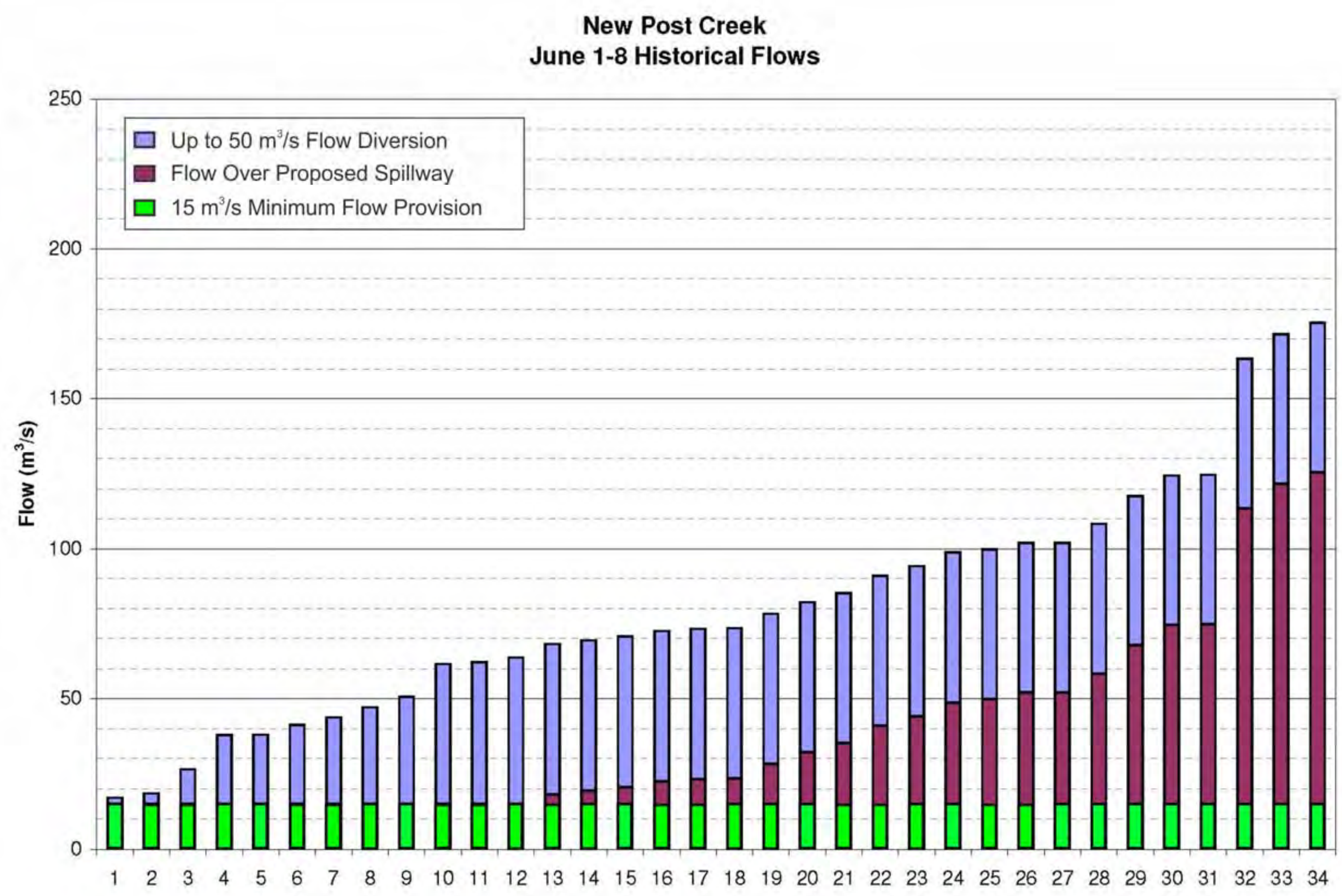


Figure 4.10 Histogram of Flow Redistribution during the Walleye Fry Emergence Period due to Flow Diversion and Minimal Flow Adherence



For the 34 years of recordings, flow in New Post Creek was low enough during the spring of 12 years that some curtailing of flow diversion to the proposed GS would have been required in order to provide the proposed spring minimum flow of 15 m^3/s. Moreover, the range of flows over the spring spawning period will be compressed due to the flow diversion of 50 m^3/s and maintaining a minimal flow of 15 m^3/s. This will reduce the range of flow reduction that typically occurs over the Walleye spawning and egg incubation period, and therefore, reduce the potential for Walleye eggs becoming dewatered when flows decrease during the incubation period.

In summary, the diversion of 50 m^3/s through the proposed GS and the proposed minimum flow of 15 m^3/s will provide more good quality Walleye spawning habitat than typical spring flows. The proposed minimum flow of 15 m^3/s will be required approximately 1 in 10 years during the spawning period, rising to about 1 in 3 years by the end of the fry dispersal period. The maintenance of a target minimum flow will reduce the range of flows that typically occur during Walleye spawning, potentially improving embryo survival.

As indicated in Section 3.1.9.7, White Sucker and Longnose Sucker spawning also occurs in New Post Creek downstream of the waterfalls, generally after Walleye spawning. Although the focus had been on Walleye spawning, the timing window for minimum flow maintenance will account for suitable conditions for catostomid spawning and egg incubation. Therefore, a minimum flow of 15 m^3/s will be maintained for the spring spawning and egg incubation period, approximately May 1 to mid-June. As indicated in Section 3.1.9.5, study findings support the conclusion that Lake Sturgeon do not spawn in New Post Creek. However, if spawning is demonstrated in New Post Creek, the timing window would be expanded to include the Lake Sturgeon spawning and egg incubation period.

<u>Proposed Minimum Flow during the Summer Period (mid-June – September 1)</u>

A brief transitional flow from 15 to 7.5 m^3/s will be permitted from the end of fry emergence (based on thermal units accumulated) with the rampdown rate (m^3/s per day) to be determined in consultation with the MNR and DFO. A minimum flow of 7.5 m^3/s will be maintained between approximately mid-June and September 1 to ensure sufficient flow over the New Post Creek waterfalls to not diminish visitor (tourist) experience appreciation value.

No visual record of the waterfalls is available for a 7.5 m^3/s flow; however, Photograph 4.1 shows the waterfalls on September 17, 2011 when average daily flow was 9.17 m^3/s.

Photograph 4.1 New Post Creek Waterfalls, September 17, 2011, Average Daily Flow of 9.17 m^3/s

The minimum flow of 7.5 m^3/s is approximately four to five times lower than the mean post-diversion flows recorded in New Post Creek in July and August, but is generally comparable to (albeit lower than) the minimum flows recorded (see Table 3.4). Moreover, the minimum flow of 7.5 m^3/s is approximately two and seven times higher than the mean and minimum pre-diversion flows in New Post Creek, respectively (see Table 3.3).

<u>Proposed Minimum Flow during September</u>

A minimum flow of 5 m^3/s will be maintained from September 1 to 30.

The minimum flow of 5 m^3/s is approximately seven times lower than the mean post-diversion flow recorded in New Post Creek in September, but 1.5 times higher than the minimum flow recorded (see Table 3.4). Moreover, the minimum flow of 5 m^3/s is approximately 1.4 and 12 times higher than the mean and minimum pre-diversion flows in New Post Creek, respectively (see Table 3.3).

<u>Proposed Minimum Flow during the Winter Period (October 1 – Walleye Spawning Initiation)</u>

A minimum flow of 2 m^3/s will be maintained from October 1 to the start of the Walleye spawning period. This minimum flow would provide for ongoing flow in the secondary channels below the waterfalls (see Figure 4.8). The modeling results for a minimum flow of 2 m^3/s are presented in

Figure 23 of the Coker and Portt (2012e) report (see Appendix C of the Aquatic Environment TSD).

The minimum flow of 2 m^3/s is approximately 14 times lower than the mean post-diversion flow recorded in New Post Creek during the October – April period, and below the minimum flow range of 4.5 to 9.6 m^3/s recorded between October and April (see Table 3.4). Moreover, the minimum flow of 2 m^3/s is within the range of mean pre-diversion flows (1.1 to 4.8 m^3/s) and above the range of minimum flows (0.5 to 1.0 m^3/s) in the creek (see Table 3.3).

Proposed Minimum Flows Summary

The minimum flows proposed by MNR and Ontario Parks are summarized below:

- 15 m^3/s for the spring spawning and egg incubation period, approximately May 1 to mid-June (to be expanded to include Lake Sturgeon spawning and egg incubation period if spawning occurrence is demonstrated);
- brief transition of flows from 15 to 7.5 m^3/s from the end of egg incubation (based on thermal units accumulated) with the rampdown rate (m^3/s per day) to be determined in consultation with the MNR and DFO;
- 7.5 m^3/s during the summer period (mid-June to August 31);
- 5 m^3/s for September 1-30; and
- 2 m^3/s during the winter period (October 1 to approximately April 30 with timing dependant on Walleye spawning initiation).

As indicated in Section 2.4.2.2, pulsing will be permitted at any time of the year within the operating range of 0.5 m provided minimum flows are directed over the spillway and no negative effects due to pulsing, that cannot be otherwise mitigated, are observed (G. Funnell, MNR, 2013, pers. comm.).

This proposed operating regime is subject to further discussions with key stakeholders on ecological, economic and social concerns prior to and during proposed Project operation. Adaptive management will be a key principle moving forward.

4.3.2 Groundwater Hydrology

No effects on groundwater hydrology are anticipated as a result of the operation of the proposed GS; therefore, no mitigation is required.

4.3.3 Water Quality

During proposed Project operation, a proportion of water from New Post Creek will be diverted to the Abitibi River approximately 2.8 km upstream of the New Post Creek outlet. This water diversion will not have a measurable effect on overall Abitibi River water quality or water quality in New Post Creek downstream of the proposed Project spillway.

As indicated in Section 2.3.1, normal operation of the proposed New Post Creek Project will increase the water level in New Post Creek at the proposed intake weir location by approximately 6.5 m, i.e., from a natural creek level of approximately 180.50 m.a.s.l. to a FSL of 187.00 m.a.s.l. The resultant total reservoir would be approximately 170 ha (see Figure 2.6). Much of the inundation would occur immediately upstream and to the west encompassing the drainage basin of the permanent unnamed tributary that discharges into New Post Creek approximately 150 m upstream of the proposed Project intake location. The upstream extent of the inundated areas is limited by the rather steep gradient at the upstream limit. As indicated in Figure 2.6, the inundated area would occur within a total park area of approximately 197 ha upstream of the proposed Project intake weir.

Due to the expanded inundation surface area, higher surface water temperatures can be expected during the summer due to solar radiation.

Temporary water quality alteration may occur due to the inundation of adjacent forested riparian areas and wetlands. Although CRP/OPG is proposing to clear the reservoir (flooded) area (see Section 4.3.10), a subsequent period of localized trophic surge can be expected due to the residual organic material present in the substrate. The trophic surge effect (higher nutrient concentrations due to decomposition of organic material) is expected to be greatest in the first year, with a rapid return to background. Ontario Hydro (1988) undertook water quality simulations for a proposed inundation area of approximately 4,400 ha and determined that the trophic surge effect would last three to five years. Since the proposed Project headpond is smaller in area (170 ha) and with a much faster flushing rate, a more rapid return to background water quality can be expected, within two years of proposed headpond creation.

The inundation of adjacent wetland and cleared forested areas is expected to result in increased mercury concentrations in fish resident in the reservoir but not in Walleye or other fish species downstream of the New Post Creek waterfalls (see Section 4.3.10).

Clearing of the reservoir (flooded) area will also result in the disturbance and exposure of soil with potential for increased erosion and resuspension in the water column. Stumps are to remain in the ground so as to maintain root mat, limit soil disturbance and lower the risk of erosion and total suspended solids (TSS) released to the reservoir. It is anticipated that increases in TSS will be temporary (see below).

After the anticipated trophic surge, water quality is expected to be similar to pre-inundation baseline conditions, even with water-level fluctuations due to the proposed seasonal mode of operation. When an oligotrophic lake in northwestern Ontario was subjected to experimental fluctuations of water levels, Turner *et al*. (2005) determined that changes in water quality were minimal. Although there were differences between pre- and post-drawdown water chemistry, these changes were generally small and did not alter the basic nutrient characterization of the oligotrophic lake. After three years of drawdown of 2 to 3 m, conductivity levels and concentrations of TSS, cations and macronutrients such as nitrogen and phosphorus remained extremely low. As water-level fluctuations in the proposed headpond will range only up to 0.5 m, it is anticipated that water quality will not be affected.

Flow diversion will result in lower flows in New Post Creek from the proposed Project spillway location to its outlet, resulting in diminution of bank erosion and consequent turbidity levels (see Section 4.3.4).

As indicated in Section 2.3.1, the actual need to clear the sediment trap would be with a frequency in the order of years if not decades. However, CRP/OPG has considered this issue and is suggesting that a yearly flushing occur during near the start of the freshet, i.e., mid-April. This timing will avoid amphibian breeding and fish spawning periods. A yearly flushing would reduce the severity of a sudden increase in TSS concentrations due to a larger less frequent (e.g., every 10 years) flushing event and may also help in providing sediment bank stabilization for the by-pass reach that otherwise may be starved of sediment. The TSS concentrations resulting from this evacuation operation will be well below the sub-lethal effects threshold of 1,000 mg/L for fish for short-term exposures, i.e., 4 to 14 h (Fitchko *et al.*, 2008) and will be of short duration (less than 1 h). As indicated in Section 7.3, TSS concentrations will be measured during the initial two sediment evacuation events.

During operation, the plowing of roads to the proposed GS site and transmission ROW will avoid snow disposal into watercourses.

The limited monitoring and maintenance activities will have a negligible effect on water quality of the water bodies traversed by the access roads and transmission line.

4.3.4 Sediment Erosion and Transport

As indicated in Section 3.1.3.2, the diversion of the Little Abitibi River has significantly increased the flow of New Post Creek, resulting in a dramatic impact on channel morphology and accelerated rate of erosion along the watercourse (Parish, 1990). These responses would occur over decades, and if the channel flows do not change further, a stable channel form would eventually be attained. Over the almost 50 years since the diversion, the rate of erosion in New Post Creek is expected to have decreased as the hydraulic regime approaches a more balanced and stable condition.

During operation of the proposed Project, flows will be reduced downstream of the proposed spillway location with the hydraulic regime approaching that of pre-diversion New Post Creek. The maximum flow withdrawal of 50 m^3/s by the proposed Project would reduce the intensity of peak events, thereby providing a net reduction in erosion potential along the lower 4.4 km of the creek downstream of the proposed intake weir location during freshet conditions. The lower flows in this creek section will result in an increase of exposed shorelines and banks. Although there may be more exposed streambed under the reduced flows, most of this will be coarse material that will provide a new and harder shoreline for the reduced stream size. Most of the finer substrate that is prone to erosion occurs higher up along the banks and will subsequently be less often subject to eroding flows. These exposed areas of finer substrate would be prone to erosion as flows fluctuate; however, this erosion is expected to stabilize over time as this creek section moves toward a state of equilibrium. Moreover, the implementation of minimum flows will promote attainment of the state of equilibrium.

Pulsing will be implemented during low flows (see Sections 2.4.2.1 and 2.4.2.2). Intermittent operation of the GS using water stored in the headpond would mitigate against sudden flow changes and associated erosion downstream of the proposed intake weir location, caused by the shutdown and start-up of the proposed GS.

It is expected that water-level fluctuations due to pulsing may result in proposed headpond shoreline erosion; however, stabilization of the erosion processes can be expected within one complete growing season. As indicated in Section 7.3, visual monitoring of shoreline erosion and sedimentation will be undertaken after one complete growing season after proposed GS operation initiation. These water-level fluctuations have the potential to result in localized increases of TSS concentrations. As indicated in Section 3.2.3, after three years of experimental drawdown of 2 to 3 m in a northwestern Ontario lake, concentrations of TSS remained extremely low (Turner *et al*., 2005). As water-level fluctuations in the inundation area will range only up to 0.5 m, it is anticipated that changes to TSS concentrations will be small.

Without mitigation, tailwater discharges during powerhouse operation would result in scouring of the Abitibi River bed with consequent development of a turbidity plume downstream. As indicated in Section 2.4.1, rip-rap lining will be provided in the tailrace area to protect against sloughing of the river bank overburden and riverbed erosion. Upon completion of tailrace construction, the temporary cofferdam material will be re-used as rip rap. Portions of the Abitibi River bank in the immediate vicinity of the tailrace area may also require shoreline rip-rap protection to minimize toe erosion due to scouring and to reduce bank sloughing along the river bank.

4.3.5 Plankton, Aquatic Vegetation and Benthic Macroinvertebrates

As indicated in Section 4.3.3, a period of trophic surge is expected due to the inundated area upstream of the proposed Project intake weir. In the short-term, a more productive planktonic community is expected to develop in response to the more lentic environment and increased nutrient loadings from the newly flooded lands.

The magnitude of the trophic surge is likely to be small compared to that observed in some large reservoirs (Baxter and Glaude, 1980). Nutrient concentrations are expected to be higher and may stimulate local plankton production.

Paterson *et al*. (1997) reported increases in bacterial, phytoplankton and zooplankton biomass due to increased nutrient concentrations following experimental flooding of a peatland reservoir in northwestern Ontario.

The release of dissolved nutrients from inundated soils would benefit aquatic macrophyte and periphyton growth, with epiphytic periphyton likely increasing in response to increase in attachment surfaces.

Overall benthic macroinvertebrate biomass in the inundated area will increase in response to an increase in substrate area. The benthic macroinvertebrate communities currently present in the lotic environmental conditions of New Post Creek would be replaced by those adapted to more lentic conditions.

During typical operation a consistent headpond water level will be maintained. However, during some years, there may be periods of time when there will not be enough flow in New Post Creek to provide the specified minimum flow downstream of the intake weir, and continuously operate the proposed GS. During these periods the required minimum flows will be provided downstream in New Post Creek, but the proposed GS will be shut down. Any water in excess to the minimum flow will be accumulated in the proposed headpond so that the proposed GS can be operated periodically using the stored water (see Sections 2.4.2.1 and 2.4.2.2). When this situation arises, the proposed GS will be shut down when the headpond water level drops to 0.5 m below the usual full headpond water level. Once the headpond refills to its normal level, the proposed GS will restart and operate until the specified lower headpond water level is again reached. This operational pulsing will continue until there is sufficient water for continuous operation.

A number of studies have investigated the effects of seasonal water-level fluctuations on plankton, aquatic vegetation and benthic macroinvertebrate communities in natural and/or regulated lakes. These studies have indicated that seasonal water-level fluctuations below 1 m had little or no effect on phytoplankton and zooplankton communities (Turner *et al*., 2005), periphyton species richness (Turner *et al*., 2005; White *et al*., 2008), aquatic macrophyte species richness (White *et al*., 2008) and benthic macroinvertebrate communities (Arovita and Hämäläinen, 2008; White *et al*., 2011).

Water levels presently vary by about 3 m in New Post Creek during the year. Water level fluctuations associated with the intermittent operation of the GS will be less, i.e., 0.5 m, but will occur over much shorter periods of time. Although less than the 1 m seasonal water-level fluctuations that have little or no effect, occasional water level fluctuations of 0.5 m will likely have some influence on the composition of periphyton, aquatic macrophyte and benthic macroinvertebrate communities established after inundation, particularly if they occur every year.

Anticipated mercury increases in zooplankton and benthic macroinvertebrates due to the proposed inundation area are discussed in Section 4.3.10.2.

4.3.6 Walleye Spawning

As indicated in Section 3.1.9.4, Walleye spawning does occur in the lower section of New Post Creek, downstream of the waterfalls (Coker and Portt, 2012c, d). As indicated in Section 4.3.1.2, River2D hydraulic and habitat modelling was undertaken in lower New Post Creek between the waterfalls and its outlet to the Abitibi River.

Based on the hydraulic and habitat modelling findings, a minimum flow of 15 m^3/s would provide the maximum amount of optimal habitat for Walleye spawning and egg incubation (see Figure 4.6).

4.3.7 Other Fish Species Habitat Utilization

As indicated in Section 3.1.9.5, Lake Sturgeon spawning is confined to the Abitibi Canyon GS tailrace area (Coker and Portt, 2013e). There was no evidence of Lake Sturgeon spawning in New Post Creek between the waterfalls and its outlet to the Abitibi River. However, Lake Sturgeon were caught in New Post Creek prior to and after the Abitibi Canyon spawning period, suggesting that the watercourse does provide an important habitat function, e.g., availability of higher benthic macroinvertebrate densities for foraging (see Section 3.1.8).

As indicated in Section 3.1.9.6, there was no evidence of Lake Whitefish spawning in New Post Creek between the waterfalls and its outlet to the Abitibi River (Coker and Portt, 2012a). If Lake Whitefish spawning occurs within the study area, it is likely confined to the area below the Abitibi Canyon GS. As a result, no mitigation measures need to be considered, e.g., with respect to minimum flows or restriction of in-stream construction during the fall and winter.

As indicated in Section 3.1.9.7, White Sucker and Longnose Sucker spawning also occurs in the lower section of New Post Creek, downstream of the waterfalls (Coker and Portt, 2012c, d). The minimum flow of 15 m^3/s recommended for Walleye spawning and egg incubation would also be suitable for spawning and egg incubation of suckers and other spring spawners.

The upstream limit of the zone of influence is considered to be the upstream limit of backwater effects from the proposed intake weir in New Post Creek, as direct effects upon upstream habitats will occur this far. There is a set of rapids at this location, but there are also rapids downstream of this location that have incrementally raised the stream's surface elevation to a point that it is no longer affected by the backwater effect from the proposed weir. There are also rapids upstream from this location. The establishment of a lacustrine fish community within the proposed headpond may result in some changes to the fish community farther upstream, since some members of the new lacustrine fish community may migrate upstream to spawn or feed.

The downstream limit of the zone of influence is at the mouth of New Post Creek at the Abitibi River. Upstream of its outlet, New Post Creek will be influenced by minimum flows and the operation of the proposed GS. A short section of the Abitibi River between the proposed tailrace and New Post Creek mouth will have increased flow reflecting that passed through the proposed GS. Upstream of the proposed tailrace and downstream of the New Post Creek mouth in the Abitibi River, flows will not be affected.

As indicated in Section 4.3.3, higher surface water temperatures can be expected during the summer due to the proposed headpond. During the spring and fall field work for this project, it was observed that New Post Creek water temperatures display a larger and more rapid response to changes in weather, compared to water temperatures in the Abitibi River. This is likely due to the large volume and greater depth of the Abitibi River, compared to the much smaller volume and shallower New Post Creek, as well as the New Post Creek Diversion Dam reservoir upstream. The proposed headpond, with its large surface area and extensive shallow areas, will likely exaggerate this effect. Water temperatures downstream of the proposed headpond will be warmer earlier in the spring, and cooler earlier in the fall, possibly affecting the timing of late spring and summer spawning that occurs in lower New Post Creek, and any future spawning that may occur in the proposed GS tailrace at the Abitibi River.

Summer water temperatures in New Post Creek downstream of the proposed intake weir will likely be warmer due to the surface area of the reservoir, the top draw of the proposed weir discharging the minimum flows downstream, and the reduced volume of flow. However, the magnitude of this change is unknown. As Longnose Sucker, Slimy Sculpin, and Burbot prefer coldwater temperatures, their populations in New Post Creek, although sparse, may be negatively affected by this potential increase in water temperature downstream of the proposed intake weir. The potential exists that the benthic macroinvertebrate and fish communities in this area may shift towards one that can tolerate slightly warmer conditions.

Flooding upstream of the proposed intake weir will result in the creation of shallow lacustrine habitat. The existing community of riverine fishes in the proposed headpond area will in structure to one that is more typical of a lacustrine system. As indicated in Section 3.1.9.7, a YOY Northern Pike was captured in drift nets set in New Post Creek at the Otter Rapids Road Bridge. The likely source of Northern Pike immigration to New Post Creek would be the Little Abitibi River upstream of the New Post Creek Diversion Dam that would entail being spilled over the dam. As indicated by Seyler (1997), Walleye, Northern Pike and White Sucker are the predominant sportfish in the Little Abitibi River. Other species likely present are those collected in New Post Creek upstream of the waterfalls, including Fallfish, Longnose Sucker, Lake Herring and Burbot. Based on distribution mapping provided by Seyler (1997), the Little Abitibi River does not appear to support populations of Lake Sturgeon, Smallmouth Bass, Lake Whitefish, Goldeye, Mooneye and Sauger. The creation of shallow lacustrine habitat will likely promote aquatic macrophyte growth and the concomitant spawning habitat may result in the establishment of a resident Northern Pike population.

Changes in the water levels of lakes, either natural or anthropogenic, affect temporal and spatial distribution of littoral fish communities, especially in large lakes with an extensive, shallow slope littoral area. A variety of studies on the population structure of littoral fish communities have indicated that seasonal fluctuations in water levels not only determine the presence or absence of any species in a temporally inundated area but can provoke subtle changes in the community structure of the littoral community (e.g., Sloman *et al*., 2001; Fischer and Öhl, 2005).

Based on comparison of long-term (~20 years) data for two natural lakes in northern Wisconsin, White *et al*. (2008) reported that there was no significant relationship between natural water-level fluctuations (0.35 and 0.88 m) and fish species richness. These seasonal water-level fluctuations are similar to those more frequent fluctuations, i.e., 0.50 m, during pulsing operations. As the pulsing operations are expected to occur outside the fish spawning period, significant negative effects on fish species richness is not expected to occur. In fact, fish species richness is expected to be enhanced by the increased habitat diversity due to the proposed inundation.

Pulsing would be undertaken during low flow periods, e.g., in the winter and possibly late summer (see Table 3.4). It is anticipated that 0.5 m water-level fluctuations during the winter period will have only minimal effects on the aquatic ecosystem in the proposed headpond. Water temperatures will be at or close to 0^{o}C, and most fish will be in a state of minimal activity. Intermittent pulsing in the late summer with water-level fluctuations of 0.5 m will have minimal negative effects on fish as spawning would have been completed; however, fish utilization of shallow habitats will be temporarily disrupted. Most fish present in the nearshore shallow waters would move to deeper waters to avoid the water-level fluctuations.

Moreover, it is anticipated that intermittent operation of the proposed GS will not have negative effects on downstream habitat and fish communities, as may occur in the absence of intermittent operation.

The following provides a discussion on the effects of immediate flow increases based on the operation of the proposed GS **without pulsing**.

As Walleye spawn early in the spring, sufficient flows can be expected to provide for the minimum flow of 15 m^3/s and continuous operation of the proposed GS. However, other fish species such as Shorthead Redhorse and some cyprinids spawn later in the spring (e.g., June) when flows are lower. During early June, a minimum flow of 15 m^3/s would apply to cover the Walleye egg incubation period and be transitional to 7.5 m^3/s at the end of the month. After these minimum flow requirements are met, the proposed GS can operate continuously with diverted flows through the intake greater than 10 m^3/s. In the absence of intermittent GS operation, if flow in New Post Creek decreases below 25 m^3/s during the 15 m^3/s minimum flow requirement (and below 25 to 17.5 m^3/s during the transitional period), the proposed GS would shut down. Therefore, for the 15 m^3/s minimum flow requirement, if flow in New Post Creek decreased below the 25 m^3/s and without the pulsing capability, the proposed GS would shut down and flow downstream of the intake weir and over the spawning grounds below the waterfalls would increase immediately from 15 m^3/s to as much as 24.9 m^3/s (66% increase). For a minimum flow requirement of 7.5 m^3/s, the immediate flow increase would be over two times higher. These significant percentage increases in flow may dislodge eggs deposited in the spawning area. Moreover, if flow in New Post Creek was 24 m^3/s, then this flow would be passing over the spawning area during and after egg deposition. If New Post Creek flow were to increase to 25 m^3/s, the proposed GS would restart and take 10 m^3/s, quickly reducing flow over the spawning area to 15 m^3/s, potentially resulting in the dewatering of deposited eggs/embryos.

Based on June 1998 flow data, flows were greater than 25 m^3/s on June 1 to 3 and would have permitted continuous operation of the proposed GS. After dropping below 25 m^3/s on June 4, without the pulsing option, the proposed GS would have had to shut down releasing significant increased flow. During the remainder of the month, flows were variable (i.e., above and below the 25 m^3/s threshold for proposed GS operation), resulting in a number of additional startups and shutdowns, and associated sudden downstream flow changes. Intermittent operation of the proposed GS using water stored in the headpond would mitigate against these sudden and potentially frequent flow increases downstream of the intake weir and over the spawning area downstream of the waterfalls.

With pulsing as part of the proposed operating regime of the GS, significant immediate increases to flow in New Post Creek downstream of the intake weir will not occur. The pulsing operation will mitigate the potential effects of intermittent GS operation on the spawning habitat in New Post Creek below the waterfalls.

As indicated in Section 2.4.2.1, pulsing will be permitted at any time of the year within the operating range of 0.5 m provided minimum flows are directed over the spillway and no negative effects due to pulsing, that cannot be otherwise mitigated, are observed (G. Funnell, MNR, 2013, pers. comm.).

4.3.8 Fish Habitat Loss and Gain/Enhancement

Fish Habitat Loss and Gain/Enhancement Due to Construction

As indicated in Section 4.2.6, fish habitat loss and gain due to direct construction effects of the proposed New Post Creek Project are relatively minor. The footprint of the proposed intake weir will result in the loss of approximately 1,832 m^2 of fish habitat, but will be offset by the same area (approximately 1,832 m^2) of habitat gained by the construction of the tailrace in the Abitibi River. In addition, approximately 604 m^2 of nearshore habitat in the Abitibi River will be permanently altered by tailrace construction, but is expected to remain productive habitat.

The following provides a summary of the potential operational effects of the proposed Project on fish habitat (Coker and Portt, 2013a; see Appendix A of the Aquatic Environment TSD).

Inundation Upstream of the Proposed Intake Weir

The existing water level immediately upstream of the proposed intake weir location is approximately 181 m.a.s.l. The proposed operational water level of the GS headpond is 187 m.a.s.l. This will result in an increase in the water depth immediately upstream of the weir by 6 m, affecting water levels for a distance of 7,166 m upstream. Overbank flooding will occur for approximately 5,419 m upstream of the proposed weir, with approximately half of the area flooded occurring within the valley associated with Tributary 1 (Figure 4.11). Approximately 37.5 ha of existing riverine habitat will be altered to lacustrine habitat. The proposed headpond area is projected to be 1,693,924 m^2 or 169.4 (~170) ha, which results in a 131.9 ha increase in wetted area (see Figures 2.6 and 4.11). This increase in wetted area represents a significant increase in fish habitat, although of a different type than currently exists. Approximately 1,528 m (linear) of riffle habitat with coarse substrates will be flooded by the proposed headpond.

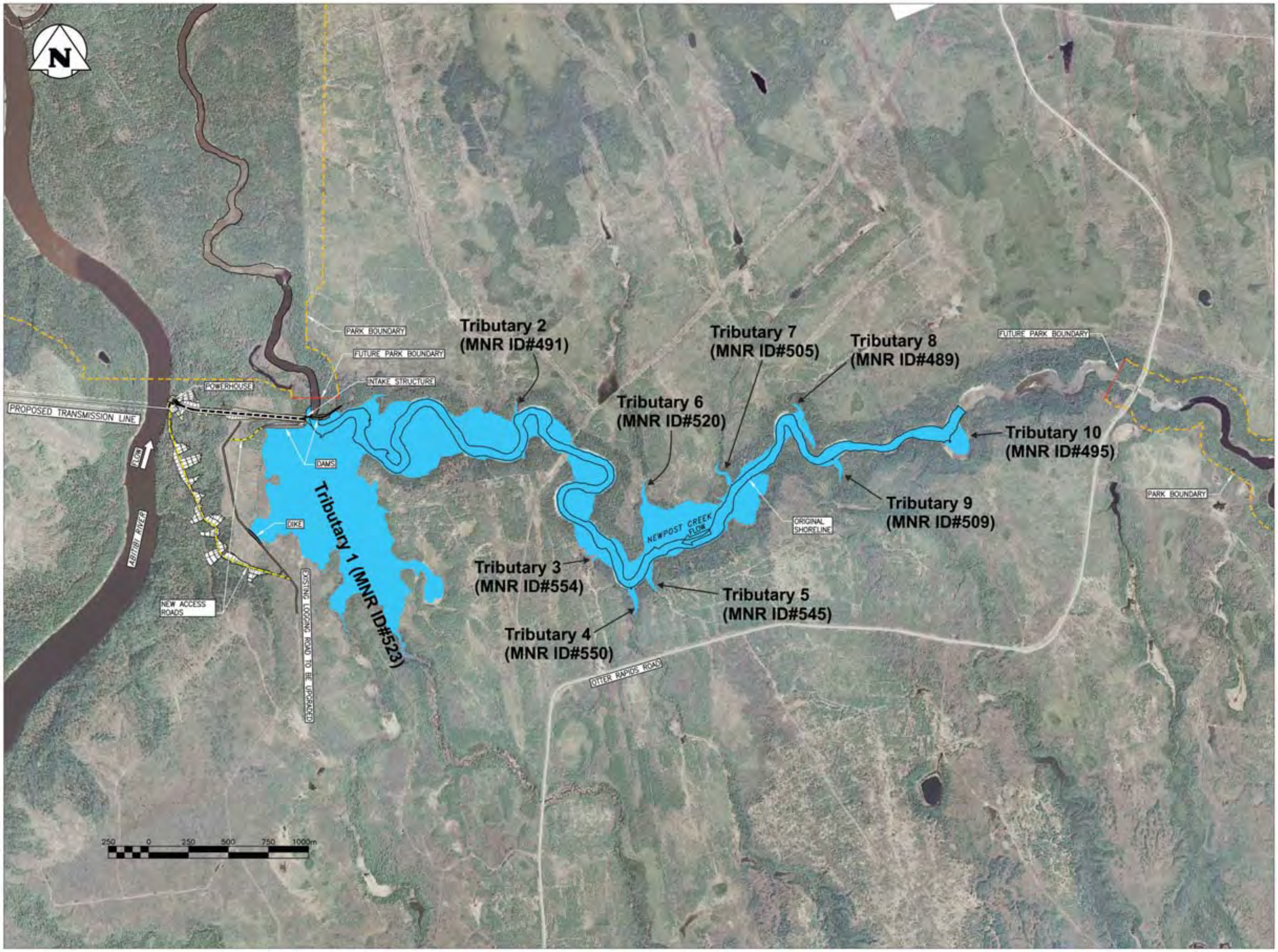
Habitat diversity will be significantly increased, because the drowned stream channel within the proposed headpond will provide deeper habitats than what presently exists. Moreover, much of the flooded area will provide a large expanse of shallow, still water habitat that is also currently not represented in New Post Creek. Significant amounts of riffle habitat will remain available to the fish community upstream of the proposed intake weir. There are 772 m (linear) of riffle habitat with coarse substrate within the 1,321 m of stream between the upstream limit of the proposed headpond and the Otter Rapids Road bridge. Another 1,965 m (linear) of riffle habitat occurs within the next 6 km upstream of the bridge.

The existing community of riverine fishes that occur within the proposed headpond area will shift in structure to one that is more typical of a lacustrine system. Although most of the known fish species present can also live in lacustrine habitats of this size, with the possible exception of Longnose Dace, shifts in relative abundance will likely occur, and other fish species may become established. Assuming that the significant expanse of shallow habitat within the headpond develops areas of aquatic plants, this may provide spawning habitat for a Northern Pike population (if established). The proposed headpond will also allow the establishment of, or increase in, populations of fish such as White Sucker that will utilize the slower and deeper water in the headpond, but require the faster waters that are plentiful upstream for spawning.

Flooding Upstream into Tributary Streams

As indicated in Section 3.1.9.1, there are 10 tributary streams that flow into the section of New Post Creek that will become the proposed headpond. To varying degrees, the proposed headpond will flood upstream into these tributaries. Tributary 1 (MNR ID#523) is the largest watercourse flowing into New Post Creek in the proposed headpond area, and will be affected the most from headpond development due to its proximity to the proposed weir and being subjected to the highest water level increase, as well as its low gradient channel.

Figure 4.11 New Post Creek Tributaries Affected by Proposed Inundation



Approximately 64 ha of the Tributary 1 valley will be flooded by the proposed Project, encompassing a length of 2,492 m of Tributary 1 (Figure 4.11). Almost all of the channel being flooded has an average width of approximately 4 m, with patchy substrates of gravel, sand, cobble, silt or soil, and riparian vegetation dominated by alder. The fish community is dominated by Slimy Sculpin. Based upon aerial photograph examination, it appears that this type of habitat extends almost continuously in Tributary 1 for approximately 9 km upstream of New Post Creek. The proposed headpond will inundate approximately 28% of this habitat type in Tributary 1. It is unlikely that this 28% of habitat being affected will contain unique or uncommon habitats that do not occur in the remaining 72%. Therefore, the remaining 72%, or approximately 6,500 m of watercourse, will continue to provide current system functions with the 28% being inundated continuing to be fish habitat, but as part of the proposed headpond.

Tributaries 4 (MNR ID#550), 6 (MNR ID#520), 7 (MNR ID#505), 8 (MNR ID#489) and 9 (MNR ID#509) are watercourses with defined channels, with either permanent or intermittent flow, and all apparently have permanent water somewhere along their length. The proposed headpond would extend, respectively, 205, 530, 217, 201 and 174 m upstream into these watercourses (Figure 4.11). Tributaries 4, 6, and 8 have simple fish communities that were confirmed by sampling, whereas Tributaries 7 and 9 likely have simple fish communities despite no fish being collected. No sport fish were found. None of the habitats inundated in these watercourses are considered critical or unique, and the inundated area represents a small portion of each watercourse. For some of these watercourses the section closest to New Post Creek is relatively steep, and therefore inundation by the headpond may facilitate access to these watercourses by fish from New Post Creek.

The proposed headpond would extend approximately 78, 103, 146 and 23 m upstream into Tributaries 2 (MNR ID#491), 3 (MNR ID#554), 5 (MNR ID#545) and 10 (MNR ID#495), respectively. These watercourses are usually dry and likely do not support fish; therefore, no fish habitat will be affected.

The length and drainage area for each New Post Creek tributary to be affected by the proposed inundation are summarized in Table 4.5.

Table 4.5 Lengths and Drainage Areas of New Post Creek Tributaries to be Affected by the Proposed Inundation

Tributary	Distance of Outlet Downstream of Proposed Weir (m)	Length of Channel to be Inundated (m)	Total Watershed Area (km^2)	Watershed Area to be Inundated (km^2)	Watershed Area to be Inundated (%)
1 (MNR ID#523)	108	2,492	36.6	0.642434	1.76
2 (MNR ID#491)	2,338	78	0.73	0.000874	0.12
3 (MNR ID#554)	3,943	103	0.24	0.004888	2.04
4 (MNR ID#550)	4,279	205	5.95	0.004632	0.08
5 (MNR ID#545)	4,392	146	0.60	0.002983	0.50
6 (MNR ID#520)	4,528	530	1.99	0.060005	3.02
7 (MNR ID#505)	5,233	217	2.66	0.003591	0.14
8 (MNR ID#489)	5,860	201	1.27	0.003717	0.29
9 (MNR ID#509)	6,240	174	4.65	0.003283	0.07
10 (MNR ID#495)	6,995	215	0.35	0.013241	3.78

Summary of Overall Habitat Loss and Gain/Enhancement

Table 4.6 provides a summary of the fish habitat lost, gained, or altered. While it is not possible to compare all habitat effects as losses or gains; overall, approximately 131 ha of aquatic habitat will be gained, and approximately 70 ha of aquatic habitat will be altered to some degree.

Table 4.6 Summary of Fish Habitat Alterations

Habitat Component	Analysis
Proposed intake weir	Approximately 1,832 m^2 of habitat in New Post Creek will be permanently lost to the weir footprint. This area is mostly bedrock and would not provide a significant amount of spawning habitat for any of the fishes found in New Post Creek. This area is general (feeding or residence) fish habitat.
Flooding upstream of the proposed intake weir in the main channel of New Post Creek	Approximately 131.9 ha of aquatic habitat will be created and 37.5 ha of existing riverine habitat will be altered to lacustrine habitat (with a total inundation area of approximately 170 ha). A large portion of this area will provide shallow lacustrine habitat, which is currently not present in this portion of New Post Creek. This body of water will support a typical shallow lacustrine fish community.
Flooding upstream into tributary streams	Approximately 4,361 m of watercourse length will be flooded (altered) in 10 tributaries, with more than half of this occurring in one tributary (2,492 m). No critical or unique habitats will be lost from the system, and in some cases the flooding of the downstream portions of watercourses will enhance access to these tributaries by fishes in New Post Creek.

Table 4.6 Summary of Fish Habitat Alterations (Cont'd)

Habitat Component	Analysis
Reduction of flow downstream of the proposed intake weir	Water depth and flow velocity will generally be lower during proposed GS operation. While some shifts in aquatic communities are expected, the minimum flows that have been established will ensure that key habitat components and functions (e.g., Walleye spawning) will be maintained. The area altered is approximately 32.8 ha. Reductions in habitat area under minimum flows cannot be quantified with the available information, but are considered to be minor.
Intermittent operation of proposed GS	Occasional water level fluctuation of 0.5 m is considered to have no significant direct effects to fish; in fact, intermittent operation would mitigate against sudden downstream flow changes due to proposed GS start-ups and shutdowns. These fluctuations will likely have some influence on nearshore periphyton, aquatic macrophyte and benthic macroinvertebrate community composition.
Proposed headpond impacts upon water temperature	The proposed headpond has the potential to increase water temperature downstream in New Post Creek although the magnitude of this effect is unknown. This may slightly shift spawning periods of fishes, but not impair spawning. However, summer water temperatures may increase in New Post Creek, potentially causing a shift in fish and benthic macroinvertebrate communities to those more tolerant of warmer water.
Proposed tailrace at the Abitibi River	Approximately 604 m^2 of the Abitibi River will be deepened to accommodate the outflow from the proposed GS tailrace, but habitat alteration is expected to be minor due to the type of habitat affected. Approximately 1,832 m^2 of tailrace channel will be constructed, representing an increase in habitat area.

Transmission Line ROW Maintenance

A potential adverse effect on fish habitat and fisheries could be the maintenance of riparian vegetation in a more open state due to vegetation management in the proposed ROW. These effects would be negligible for those watercourses where the riparian habitat is currently dominated by open wetlands such as bog and swamp. Some of the watercourses in the proposed ROW are dominated by these low plant communities, which are expected to remain similar even with vegetation management. The loss of riparian trees could result in less shading, potentially increased water temperatures, reduced allochtonous inputs (i.e., woody debris and litter fall in the stream) and reduced inputs of terrestrial invertebrate prey from overhanging vegetation (Richardson and Moore, 2005). However, overall adverse effects on any watercourse due to non-compatible riparian tree removal are expected to be minor given that the proposed ROW is only 30.5 m wide and will represent a very small proportion of the total length of the watercourse to be traversed. It is the intention of CRP/OPG to not fully clear the AoC at stream crossings but to manually clear only the non-compatible trees and retain the residual shrubby and ground level vegetation.

CRP/OPG will adhere to the requirements provided in the DFO (2010g) Ontario Operational Statement "Maintenance of Riparian Vegetation in Existing Rights-of-Way" as listed below:

- combined maintenance activities (e.g., mowing, brushing, topping, slashing, etc.) will affect no more than one-third of the total woody vegetation, such as trees and shrubs, in the ROW within 30 m of the ordinary high water mark in any given year;
- when practicable, riparian vegetation in the ROW will be altered by hand. If machinery must be used, it should be operated on land and in a manner that minimizes disturbance to the banks of the water body:
  - machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks,
  - washing, refuelling and servicing of machinery and storage of fuel and other materials for the machinery, including hand tools, should be undertaken at locations away from the water to prevent any deleterious substance from entering the water body,
  - an emergency spill kit should be kept on site in case of fluid leaks or spills from machinery, and
  - banks should be restored to original condition if any disturbance occurs;
- machinery fording the watercourse to bring equipment required for maintenance to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use:
  - if minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage,
  - grading of the stream banks for the approaches should not occur,
  - if the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas,
  - the one-time fording should prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see Section 4.2.3.1), and
  - fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding;
- when altering a tree that is located on the bank of a water body, the root structure and stability should be maintained;
- any waste materials removed from the work site should be stabilized to prevent them from entering the water body, including covering spoil piles with biodegradable mats or tarps;
- all long-term storage of waste materials should be kept outside of the riparian area;
- in order to prevent erosion and to help seeds germinate, any disturbed areas should be vegetated by planting and seeding preferably with native trees, shrubs or grasses and covered with mulch;
- if there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring; and

- effective sediment and erosion control measures should be maintained until re-vegetation of disturbed areas is achieved.

As the proposed transmission line will span the Abitibi River with access obtained from both sides, fish habitat will not be affected.

4.3.9 Fish Entrainment and Survival

Potential fish injury and/or mortality due to entrainment at power plants is an issue that has received technical consideration and analysis. Fish injury/mortality will vary with GS size, flow, turbine design, head, and the abundance and size of the fish population susceptible to entrainment. It should be noted that unlike the large hydroelectric developments in Québec, Manitoba and Labrador, such as Churchill Falls (5,428 MW), the proposed New Post Creek Project is a small- to medium-sized project (25 MW) with specific design features which will limit fish entrainment.

Trash racks will be positioned at the upstream face of the intake to prevent entrainment of debris and will be removable. The spacing of the rack bars shall be in accordance with the requirements of the turbine manufacturer, but will not exceed 150 mm (clear) between bars, or as per DFO and MNR approved spacing.

As indicated in Section 2.4.2, the proposed Project GS will be operated at design flow velocities that will minimize fish entrainment.

The proposed GS will operate two Francis turbines each with 13 blades. Extensive studies on various species, turbine sizes and operating regimes have shown survival rates for Francis turbines ranging from 52.2 to 100.0% (average of 76.8%) (JRP, 2009).

Fish survival through hydroelectric turbines is a function of fish size. Fish survival can be high especially if the entrained fish are very small. For example, Dedual (2007) has shown high survival (93.1% at 96 h after passage) of Rainbow Trout with fork lengths of 81 mm or smaller. The author concluded that the Francis turbine at the Hinemaiaia Power Plant which has 15 blades and a head of 22.6 m will provide a safe route for migrating fish less than 80 mm in size. Similarly, Cada (1990) estimated that a 4-cm fish (Walleye fingerling) would have a probability of runner contact of 5% or less. Higher mortality and fish injury is expected for larger-sized fish. For example, Ferguson *et al*. (2008) reported that mean blade-strike mortality was higher for adult Atlantic Salmon and sea-run Brown Trout (25.2-45.3%) than for juveniles (5.3-9.7%).

Gross head of a GS is another design feature that should be taken into consideration with respect to fish injury/mortality. There is likely a higher probability of fish injury and mortality at larger facilities than smaller facilities with lower heads due to the higher pressure differentials. The proposed New Post Creek Project has a gross head of only 66 m, considerably less than facilities such as the Churchill Falls GS (324 m). Minimal fish injury is expected for the proposed Project relative to larger facilities such as those in Québec or Labrador. OPG has operated the bulk of northern Ontario's hydroelectric facilities for over 100 years with typical low to medium heads, including Kakabeka Falls GS with a head of 56 m and capacity of 23 MW and Wawaitin GS with a head of 37.8 m and capacity of 15 MW. Discussions with OPG biologists and environmental consultants who have worked on these facilities have not identified aggregations of piscivorous birds such as gulls or fish feeding on injured and/or stunned entrained fish as an issue in the tailraces of these facilities.

Watercourses affected by diversions such as New Post Creek generally support a low diversity of fish species (C. Jorgensen, DFO, 2011, pers. comm.). Colonization from the Abitibi River is prevented by the waterfalls. As indicated in Section 3.1.9.3, no fish were captured by electrofishing at the proposed intake location in August 2009, although some Mottled Sculpin were observed. In 2010, low numbers of Sculpin (Mottled or Slimy) and Burbot were collected by electrofishing at this location. No fish were captured by gillnet in 2009, whereas a decomposed Longnose Sucker was collected in 2010. Despite intensive gillnetting and electroshocking in 2011, low numbers of Longnose Dace, Longnose Sucker, White Sucker, Burbot, Johnny Darter, Pearl Dace and Sculpin were captured. In June 2012, larval drift netting at the Otter Rapids Road bridge upstream of the proposed intake weir location also captured a few juvenile and adult fish were also captured including Northern Redbelly Dace, Lake Chub, Longnose Dace, Spottail Shiner, Blacknose Shiner and Fallfish.

Initially, very low fish entrainment mortality is expected for the proposed New Post Creek Project primarily due to the low numbers of small fish present in New Post Creek. However, as indicated in Section 4.3.8, creation of the proposed headpond may result in the establishment of fish populations of larger size, e.g., Northern Pike and White Sucker. As indicated in Section 7.3, an Adaptive Management Program (AMP) will be developed that will consider effects monitoring, adaptive management measures and adjustments to mitigation measures based on observed conditions, e.g., mitigation of fish entrainment if adverse effects on fisheries resources are determined. This monitoring plan will be designed and implemented to meaningfully assess impingement and entrainment effects on fish populations, and inform mitigation design and implementation effectiveness. The monitoring plan will follow a protocol and schedule developed in consultation with MNR and DFO.

Entrainment monitoring will be required as part of the AMP. If entrainment is deemed high relative to local populations, a retrofit fish diversion system will be considered following Best Available Technology Economically Achievable. There are many examples where successful retrofit diversion systems such as angled bar racks and other fish guidance systems have been installed when a significant entrainment problem has been identified after hydroelectric facility development in the United States.

In summary, no mitigation measures are recommended initially due to the low numbers of small resident fish; however, the establishment of fish populations of larger size should be monitored and the need for mitigation assessed.

4.3.10 Mercury

4.3.10.1 Background

Reservoir creation has been well documented to result in increased THg concentrations in fish (Bodaly *et al*., 1997, 2007; Bodaly and Fudge, 1999; St. Louis *et al*., 2004). While most mercury in the environment is inorganic, some is converted in aquatic systems to methylmercury (MeHg), which bioaccumulates in fish. Food is the dominant pathway of MeHg uptake by fish (Hall *et al*., 1997). Mercury concentrations in fish can be high enough to represent a risk to the health of humans and wildlife consuming fish (Mergler *et al*., 2007; Scheuhammer *et al*., 2007).

Mercury is biomagnified through the food chain such that piscivorous fish and bird species have significantly higher concentrations than planktivorous and benthivorous fish species, benthivorous or vegetarian bird species, or organisms lower in the food chain.

Mercury biomagnification in aquatic avifauna is not expected to be a concern based on studies undertaken by Vermeer *et al*. (1973) and Barr (1986) on hatching success of Herring Gull (*Larus argentatus*) and Common Loon (*Gavia immer*), respectively. Moreover, the proposed Project area does not provide important breeding habitat (see Section 3.1.10).

The primary cause of increased mercury body burden in fish in new reservoirs is increased decomposition in flooded terrestrial areas due to increased microbial activity resulting in increased methylation of inorganic mercury. As a result of higher MeHg production rates, MeHg concentrations increase in fish with elevated concentrations typically lasting up to three decades in boreal reservoirs as the rates of MeHg production decline (Bodaly *et al*., 1997, 2007). Peak THg concentrations, especially in top predatory fish can be, but are not always, up to seven times greater than background levels, often exceeding the Canadian limit of 0.5 µg/g wet weight for domestic commercial sale (Health Canada, 2007) in higher trophic level species such as Northern Pike or Walleye. Lower trophic level fish species such as Lake Whitefish tend to have lower THg concentrations. THg concentrations are analyzed in fish tissue as over 90% of the mercury is MeHg.

For example, Bodaly *et al*. (2007) analyzed THg concentrations in three species of fish for up to 35 years after impoundment of 14 boreal reservoirs in northern Manitoba. In the benthivorous Lake Whitefish, THg concentrations increased after flooding to between 0.2 and 0.4 µg/g compared with pre-impoundment concentrations between 0.05 and 0.14 µg/g. THg concentrations in Lake Whitefish were usually highest within six years after impoundment and took 10 to 20 years after impoundment to decrease to background concentrations in most reservoirs. THg concentrations in piscivorous Northern Pike and Walleye were highest two to eight years after flooding at 0.7 to 2.6 µg/g compared to pre-impoundment concentrations of 0.19 and 0.47 µg/g, respectively. THg concentrations in these two species decreased consistently in subsequent years and required 10 to 23 years to return to background levels.

4.3.10.2 Potential Mercury Biomagnification in Fish

The proposed Project intake weir, located about 4.5 km of the New Post Creek waterfalls, would result in upstream inundation of the creek for a distance of approximately 7.4 km, effectively converting this reach from lotic to lentic conditions with an inundation area of approximately 170 ha.

Mercury levels in fish due to the proposed Project will be influenced by a number of factors including:

- type of terrain flooded;
- water-level fluctuations;
- hydraulic residence time;
- mercury levels in the inundation area;
- fish community, habitat and movement;
- fish entrainment, injury and mortality; and
- discharge to a large waterbody (Abitibi River).

<u>Type of Terrain Flooded</u>

Flooded wetlands have been suggested to sustain increased MeHg production longer than flooded uplands (Bodaly *et al*., 2004, St. Louis *et al*., 2004, Hall *et al*., 2005) inferring that the smaller the wetland area inundated the faster the recovery of mercury body burden in fish to regional background levels. As indicated in Section 4.4.5.3, of the total terrestrial inundation area of 129.9 ha, only 3.7 ha consist of organic meadow marsh, organic shallow marsh and open water marsh, whereas an additional 16 ha consist of mineral thicket swamp and organic thicket swamp. Approximately 83% of the total wetland area (19.7 ha) to be inundated is associated with the ten tributaries (16.4 ha) draining into the proposed headpond. Significant enhancement of mercury methylation is not anticipated due to this relatively small area of inundated wetland area. It should be noted that mercury attenuation predictive models do not take into account the area of wetland inundation.

It is also expected that mercury contributions from wetland areas that will not be inundated will remain unchanged.

<u>Water-level Fluctuations</u>

Water-level fluctuations may also affect MeHg production. Fagerström and Jernelöv (1972) reported that when sediments containing mercury are exposed to air after dredging or due to fluctuations in water level, the rate of biological methylation of mercury may be extremely high, i.e., 10^3 to 10^4 times the “normal” methylation rate in the aquatic environment. A number of studies have shown that the mercury methylation rate in sediments is significantly higher in aerobic systems than in anaerobic systems, particularly when under anoxic conditions large amounts of sulphides are present which will make the mercury less available for methylation due to the formation of the almost insoluble mercuric sulphide (Fagerström and Jernelöv, 1971; Jacobs and Keeney, 1974; Bisogni and Lawrence, 1975; Compeau and Bartha, 1983; Berman and Bartha, 1986).

As indicated in Section 2.4.2.1, annual water levels in New Post Creek vary by approximately 3 m. With pulsing, water-level fluctuations will be less, but occur more frequently over short periods of time. Water-level fluctuations will be limited to 0.5 m below the usual full headpond water level. Pulsing will be permitted at any time during the year within this operating range of 0.5 m provided minimum flows are directed over the spillway and no negative effects due to pulsing, that can not be otherwise mitigated, are observed (G. Funnell, MNR, 2013, pers. comm.). As indicated in Section 2.4.2.2, water-level fluctuations in the proposed headpond due to pulsing are intended to provide operation during low flow periods, primarily in late winter and late summer. As biological production is significantly reduced in the winter due to low temperatures, the rate of microbial mercury methylation will be minimal. During the late summer, with mean flows approximately three times greater than in the late winter (see Table 3.4), pulsing will be less frequent and not likely to the low FSL of 186.50 m.a.s.l.

As indicated above, the majority of the total wetland area to be inundated is associated with the ten tributaries. During pulsing, the wetland areas to be inundated at the minimum and maximum operating levels are 12.5 ha and 16.4 ha, respectively, a difference of only 3.9 ha.

Hydraulic Residence Time

The short hydraulic residence time in the proposed headpond may contribute to a faster recovery period for the proposed Project, i.e., the faster the removal of mercury, the faster recovery times.

Mercury Levels in the Inundation Area

Increases in THg and MeHg have been observed in zooplankton (Bodaly *et al*., 1997; Paterson *et al*., 1998), benthic macroinvertebrates (Bodaly *et al*., 1997; Hall *et al*., 1998) and a cyprinid fish, Finescale Dace (*Chrosomus neogaeus*) (Bodaly *et al*., 1997; Bodaly and Fudge, 1999) following experimental flooding of a peatland reservoir in northwestern Ontario. The THg and MeHg concentrations remained elevated for the duration of the nine-year study (St. Louis *et al*., 2004).

A similar scenario can be expected for the inundated area upstream of the proposed Project intake weir. However, most of the MeHg generated will likely be retained within the inundated area. Although flux of MeHg to the Abitibi River will occur via the proposed GS or downstream over the waterfalls, most of the flux would be waterborne associated with suspended matter, rather than due to the movement of fish with elevated mercury body burdens (see below).

Fish Community, Habitat and Movement

As indicated in Section 3.1.9.2, watercourses affected by diversions such as New Post Creek generally support a low diversity of fish (C. Jorgensen, DFO, 2011, pers. comm.). New Post Creek waterfalls is a complete barrier to upriver fish movement from the Abitibi River. As a result, species diversity is reduced with relatively low numbers of small fish (see Section 3.1.9.3).

Only 14 fish species in small numbers have been collected in New Post Creek and its tributaries above the waterfalls compared to 22 species below the waterfalls (not including the dead and decomposing YOY Cisco which likely originated from the Little Abitibi River) (see Table 3.9). These species are generally small and/or benthivorous, except for Northern Pike and Burbot which becomes piscivorous when it reaches a length of 50 cm (Scott and Crossman, 1973). As a result, increases in mercury concentrations in most of these fish species will be lower than that of piscivorous species (Northern Pike and larger Burbot). At present, the absence of larger piscivorous sportfish such as Walleye in New Post Creek upstream of the waterfalls will result in no risk with respect to human consumption of fish with elevated mercury concentrations. However, with the creation of the shallow lacustrine habitat in the proposed headpond, Northern Pike may become established in the future. As indicated in Section 3.1.9.7, a YOY Northern Pike was captured in drift nets set in New Post Creek at the Otter Rapids Road Bridge.

Slimy Sculpin, the most numerous species at present, is generally sedentary. While the other species occurring in fewer numbers are more mobile, negligible juvenile or adult fish movement downstream over the waterfalls can be expected.

Fish Entrainment, Injury and Mortality

An issue that has been raised with hydroelectric development is the entrainment of reservoir fish with elevated mercury concentrations and their availability, due to injury/mortality, as forage in and downstream of the tailrace resulting in elevated THg concentrations in the feeding fish (Brouard *et al*., 1994; Anderson, 2011). This situation has been associated with large hydroelectric plants in Québec and Labrador even suggesting a shift of the planktivorous Lake Whitefish and benthivorous Longnose Sucker to piscivory resulting in higher mercury concentrations than would be expected. The concentrations in Northern Pike were also elevated, possibly due to predation on Longnose Sucker.

As indicated in Section 4.3.9, fish entrainment mortality is expected to be very low for the proposed Project primarily due to low numbers of small fish present in New Post Creek. Therefore, the availability of fish with elevated mercury body burdens as a food source in and downstream of the proposed Project tailrace will also be very low.

Presence of a Large Waterbody Downstream (Abitibi River)

As indicated above, migration of fish from the inundated area created by the proposed Project in New Post Creek into the Abitibi River over the waterfalls or due to entrainment is expected to be very low. MeHg concentrations in the water column and lower food web are expected to decline in the Abitibi River due to natural removal mechanisms including sedimentation and photochemical degradation. Dilution is also considered as a mechanism to reduce MeHg levels in the water column. As a result, MeHg concentrations will decline in the Abitibi River with distance from the proposed Project tailrace and the New Post Creek waterfalls. Moreover, it is expected that only a portion of a sportfish's life cycle will be spent in these localized areas of elevated exposure.

Mitigation Measures

The two primary mitigation measures to minimize peak mercury concentrations in the food chain and the duration of elevated mercury concentrations in reservoirs are:

1. minimize the size of the inundated area; and
2. minimize the amount of available organic material (Kelly *et al*., 1997; Bodaly *et al*., 2007; Hall *et al*., 2009).

As indicated in Table 2.3, the proposed New Post Creek Project would result in a total inundation area of only approximately 170 ha involving the submergence of 133 ha of riparian and forested lands.

In order to minimize the amount of available organic material, CRP/OPG is proposing to clear the headpond/reservoir (flooded) area associated with the proposed GS. In addition to reducing the mercury effect, this is being done to eliminate trees, vegetation and other material as barriers to navigation; ensure harvest (including wood supply directives) are appropriately permitted; and protect the new riparian edge.

CRP/OPG will ask the DBC to follow the Ontario Provincial Standard (OPS201) for "Close cut clearing", i.e., the cutting of all standing trees, brush, bushes and other vegetation at original ground level and the removal of felled material and windfalls.

The following is a preliminary description of the proposed headpond/reservoir clearing to be given to the DBC:

- clearing, cleaning and removal of all trees and significant vegetation (large woody shrubs) from the proposed inundated area;
- trees should be harvesting using full tree method with branches and tops removed at landings rather than in the proposed inundated area;
- clearing to the high water mark of the proposed reservoir plus an additional 1 m back to prevent trees and vegetation from falling into the reservoir;

- all cleared material to be removed from the potential inundated area;
- all merchantable timber to be stacked to roadside;
- harvest to be conducted in the winter to lessen the amount of site disturbance;
- the DBC to obtain a Forest Resource Licence (FRL) for the authority to cut the wood;
- as the FRL is issued under the *Crown Forest Sustainability Act,* all specified conditions and requirements to be followed by the DBC;
- the FRL to also indicate where wood is to be directed including rights of refusal on the wood (it is impossible to know the specifications at this point as this would be based on the market/industry conditions at the time of the clearing);
- all non-merchantable material (slash, such as tops and branches, vegetation, stumps and other woody material) to be utilized as firewood, ground to mulch or burned with approval to be obtained by MNR;
- all sorting, grinding and/or burning to be done away from the proposed inundated area and preferably at or near roadside; and
- all access roads and skidder paths used to gain access to the proposed reservoir to be decommissioned, including the destruction of all temporary roads, removal of all water crossings (including culverts) and the successful re-planting of road beds.

The Environmental Management Plan will incorporate the proposed reservoir clearing requirements.

4.3.10.3 Summary and Conclusions

Mercury concentrations are expected to increase in fish resident in the inundated area (primarily Slimy Sculpin) as a result of the proposed New Post Creek Project. However, the resident fish are non-sport species and as they are primarily benthivores/planktivores, the increased THg concentrations will not be significant with respect to the aquatic food chain.

In the Abitibi River, MeHg concentrations are expected to diminish with distance from the proposed Project tailrace and New Post Creek waterfalls due to natural removal processes for MeHg and the intermittent exposures of migrating fish. Due to limitations in the state of knowledge of mercury behavior in the aquatic systems, validated models are not currently available to accurately predict the rate of decline of THg concentrations in fish in the Abitibi River as a function of distance. However, it is anticipated that mercury concentrations in Walleye in New Post Creek below the waterfalls will be comparable to the pre-development mercury concentrations in Walleye (see Section 3.1.9.8).

Post-inundation fish mercury body burden monitoring programs will be implemented to confirm predicted increased THg concentrations in Slimy Sculpin within the proposed Project inundated area and unchanging THg concentrations in Walleye in New Post Creek downstream of the waterfalls (see Section 7.2). If inadequate numbers of Slimy Sculpin are available for analysis, CRP/OPG will consult with the MOE on alternative locations/species. As indicated in Section 7.3, monitoring of THg concentrations in Northern Pike will be undertaken, if a population becomes established in the proposed headpond.

THg body burden data for Northern Pike from Little Abitibi Lake were obtained from the MOE Environmental Monitoring and Reporting Branch (C. Mahon, MOE, 2013, pers. comm.) and will be used as baseline THg concentrations should a Northern Pike population becomes established in the proposed headpond. These data are summarized below:

- Number Analyzed for: 14;
- Mean Length (cm) (Range): 45.4 (30.4 – 74.9);
- Mean Weight (g) (Range): 755 (175 – 1,275);
- Mean THg Concentration (Range) (µg/g): 0.67 (0.18 – 1.70);
- THg Concentration (µg/g) for 55 cm Fish: 0.80.

The relationships between the THg concentrations and lengths and weights were statistically significant (see Figure 4.12).

4.3.11 Aquatic Avifauna

During operation, noise will be generated from the proposed GS. This steady noise will not elicit an adverse reaction from nearby habituated aquatic avifauna (see Section 4.4.1.3).

4.3.12 Summary of Potential Operation Effects on the Aquatic Environment and Mitigation/Remedial Measures

Table 4.7 summarizes potential operation effects, the recommended mitigation/remedial measures to minimize or obviate these effects and the net effects of the proposed New Post Creek Project on the aquatic environment.

Figure 4.12 Relationships between THg Concentrations and Length and Weight for Northern Pike in Little Abitibi Lake (1997)

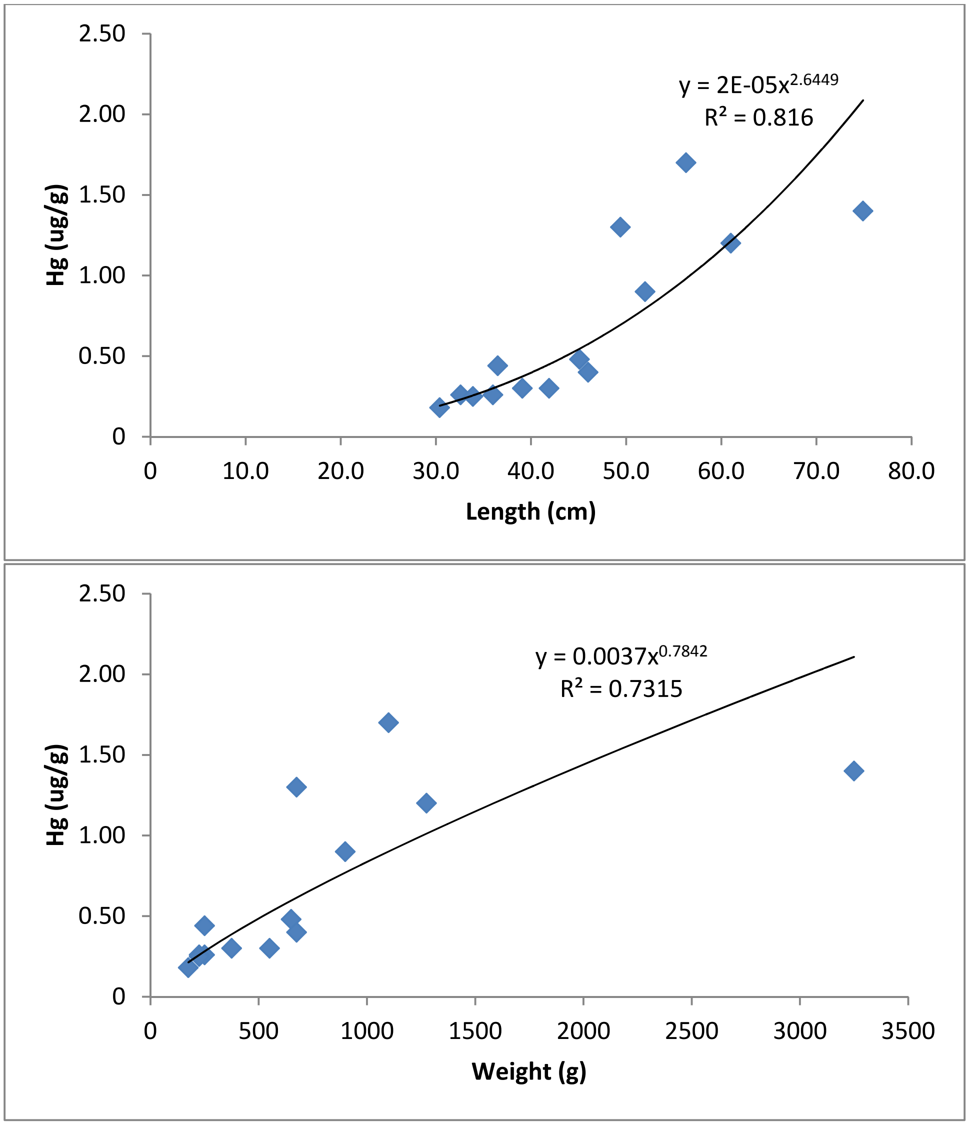


Table 4.7 Summary of Potential Operation Effects on the Aquatic Environment and Recommended Mitigation/Remedial Measures

Effect/Activity	Recommended Mitigation/Remedial Measures	Net Effect
Incidental spills	• Adherence to Spills Emergency Preparedness and Response Plan	No adverse residual effect
Seasonal minimal flow shifting on hydrology	• None recommended: overall peak flows in New Post Creek downstream of the proposed intake weir location to be lower than those occurring in past	No adverse residual effect
Sediment erosion and transport	• None recommended: net reduction in erosion potential due to inundated area and along lower New Post Creek due to flow regulation	No adverse residual effect
Inundated area creation on water quality	• None recommended: anticipated trophic surge to be temporary with rapid water quality return to baseline levels	No long-term adverse residual effect
Inundated area creation on aquatic biota	• None recommended: inundation will increase biotic biomass, which may be beneficial to fish production in the proposed headpond and possibly below the waterfalls (to be monitored); benthic macroinvertebrate communities in lotic conditions replaced by those adapted to lentic conditions; daily water-level fluctuations are below the 1 m trigger of negative effects	No adverse residual effect (potential net benefit in proposed headpond)
Inundation effects on mercury	• Low numbers of small resident fish at present • Monitoring of THg concentrations in Walleye downstream of proposed intake weir, as well as Slimy Sculpin (and any piscivorous species that may become established) in the headpond; based on results, implementation of appropriate fish consumption advisories	No long-term adverse residual effect
Loss/gain of fish habitat	• Overall, approximately 132 ha of aquatic habitat will be gained, and approximately 70 ha of aquatic habitat will be altered (see Table 4.5)	Potential net benefit
Pulsing	• None recommended (see Table 4.6)	No adverse residual effect
Fish entrainment and survival	• None recommended initially due to low numbers of small resident fish; however, the establishment of fish populations of larger size should be monitored and the need for mitigation assessed	No adverse residual effect initially; future effect unknown
Water uses	• Deployment of public safety measures	No adverse residual effect

The proposed New Post Creek Project will not have a negative effect upon the fish communities of New Post Creek or the Abitibi River, although local shifts in community structure are expected due to physical habitat and water temperature changes. Upstream of the proposed intake weir, the headpond will create an additional 131.9 ha of aquatic habitat, and alter an existing 37.5 ha of riverine habitat to be slower flowing and deeper (with a total inundation area of approximately 170 ha). This will provide a greater area and diversity of habitats that could potentially result in a more productive and diverse fish community. Downstream of the proposed intake weir a set of seasonally appropriate minimum flows will ensure that the habitat components and functions in New Post Creek are maintained, including the important Walleye spawning habitat below the waterfalls. The downstream area altered is approximately 32.8 ha. Reductions in downstream habitat area under minimum flows cannot be quantified with the available information, but are considered to be minor. The tailrace discharging to the Abitibi River will not result in the loss of habitat, but will increase habitat diversity in the vicinity of the tailrace.

During operation, an Environmental Compliance Monitoring Program will be implemented to ensure that all operation related commitments are met. Details on the Environmental Compliance Monitoring Program are provided in Section 7.2.

4.4 PROPOSED PROJECT CONSTRUCTION AND OPERATION – TERRESTRIAL ENVIRONMENT

The available environmental baseline information and site-specific vegetation and forest resources inventories, including incidental wildlife observations, provided the basis for an assessment of potential construction and operational effects of the proposed New Post Creek Project on the terrestrial environment, e.g., due to vegetation clearing, soil erosion, noise, blasting, increased human activity, inundation, etc.

Recommended mitigation measures for the potential effects on the terrestrial environment considered best industry practices and various sources such as OWA (2012b) "Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction", standard environmental construction guidelines, e.g., Cheminfo (2005), relevant government guidelines for proposed hydroelectric power plant development, e.g., MNR (1988), DFO Ontario Operational Statements, as well as government agency and other organization consultation.

The selection and application of measures to mitigate potential effects of proposed transmission line construction and operation on the terrestrial environment are based on the following seven principles:

1. Avoidance of sensitive areas, where practicable, through siting of towers, e.g., towers will not be located within watercourses or associated riparian vegetation.
2. Avoidance of temporary watercourse crossings, wherever practicable, e.g., by use of an existing nearby crossing, or access to the tower location obtained from either side of the watercourse, or use of off-corridor access.
3. Appropriate timing of construction activities, whenever practicable, to avoid sensitive time periods, e.g., vegetation clearing outside migratory bird nesting periods.
4. Construction in wetlands or areas too wet to access should be undertaken during frozen or dry conditions.
5. Implementation of conventional, proven mitigation measures during construction, e.g., DFO (2010g) Ontario Operational Statement for maintenance of riparian vegetation in existing ROWs; Environment Canada "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (Cheminfo, 2005); MNR (1988) "Environmental Guidelines for Access Roads and Water Crossings"; EPRI (2002) "Best Management Practices (BMPs) Manual for Access Road Crossings of Wetlands and Waterbodies", OWA (2012b) "Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction" and Hydro One (2008) "Environmental Guidelines for the Construction and Maintenance of Transmission Facilities".
6. Implementation of conventional proven mitigation measures during operation, e.g., EPRI (1999) "Vegetation Dynamics Along Utility Rights-of-Way"; Cieslewicz and Novembri

(2004) “Utility Vegetation Management. Trends, Issues, and Practices”; APLIC and USFWS (2005) “Avian Protection Plan (APP) Guidelines”; APLIC (2006) “Suggested Practices for Avian Protection on Power Lines: The State-of-the-Art in 2006” and Hydro One (2008).

7. Development of environmental enhancement/compensation measures to offset the unavoidable effects of construction and operation.

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

4.4.1 Atmospheric Environment

4.4.1.1 Climate

Climatic data of relevance to construction activities include the occurrence of wet soils after prolonged wet weather events, the flooding of excavated areas after a period of heavy rainfall and the generation of fugitive dust emissions due to high winds during dry conditions. Soil moisture levels are anticipated to be low during frozen conditions in the winter and the dry summer months.

During periods of excessive rainfall or saturated soil conditions, construction activities will be monitored to ensure that gullying does not occur on the relatively steep slope along the Abitibi River at the proposed powerhouse location, as well as on the more gently sloping area along the proposed penstock footprint between the proposed intake and powerhouse locations, and that excavated soils do not migrate off the work area. Eroded areas will be stabilized as soon as sufficiently dry conditions prevail and, where appropriate, excavated soils will be stabilized by the use of silt fencing enhanced with straw bales to be deployed prior to excavation. Additional information on mitigation of soil erosion is provided in Section 4.4.4.1.

Erosion associated with high winds, resulting in soil loss and nuisance dust, should be reduced or eliminated by stabilizing spoil piles with straw mulch. Dust generation will be controlled by watering dusty roads and the construction sites (Cheminfo, 2005).

The mean start and end of the growing season occur in early to mid-May and early to mid-October, respectively; therefore, revegetation/reseeding should occur within this period or be postponed until the following spring.

The implementation of the proposed mitigation measures should reduce the effect of inclement weather and is predicted to result in no net effects on the terrestrial environment affected by construction of the proposed New Post Creek Project and adjacent waterbodies.

4.4.1.2 Air Quality

The construction of the proposed New Post Creek Project will result in typical combustion and dust emissions.

Construction activities have the potential for short-term effects on air quality in the vicinity of the site. Emissions are primarily exhaust emissions (and associated odour) from construction equipment and fugitive dust due to disturbance of dry fine-grained soils. As with any construction site, these emissions will be of relatively short duration and unlikely to have any effect on the surrounding airshed.

During construction, exhaust emissions from construction equipment and fugitive dust emissions will have localized, short-term and transitory effects on the surrounding airshed. Typical combustion emissions include nitrogen oxides (NO_x), CO, SO_2, volatile organic compounds (VOCs) and particulate matter (PM). NO_x can affect vegetation negatively by causing damage or death to leaves, altered photosynthesis, stunting, spindly growth, reduced fruit set and/or reduced yield (Taylor *et al*., 1975). CO is not readily taken up by vegetation (Bennett and Hill, 1975; Mudd, 1975). Soil microorganisms appear to be the major sink for CO (Bennett and Hill, 1975). Sulphur is an essential element for plant metabolism because it is an important component of amino acids, proteins and some vitamins; however, under acute SO_2 levels, foliage symptoms range from chlorosis to necrosis (Malhotra and Blauel, 1980). Elevated VOC levels can also result in foliage chlorosis and necrosis (Malhotra and Blauel, 1980). PM generally does not damage vegetation, possibly because the particles would be removed by rain before any adverse effect could occur (Lerman and Darley, 1975).

During construction, the practices and procedures outlined in the Cheminfo (2005) document "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities", prepared in conjunction with the Construction and Demolition Multi-Stakeholder Working Group for Environment Canada, will be followed, including:

- plans to minimize dust generation through planning, site layout and the proper use of materials, tools and equipment;
- use of wind fencing;
- compacting disturbed soil;
- activity scheduling;
- storage piles management;
- minimization of drop heights;
- barriers to prevent dispersion of materials;
- avoidance of blasting where feasible;
- work practices for loading debris;
- avoidance of prolonged storage of debris; and
- proper techniques for the use of materials that include VOCs.

The DBC and subcontractors will be required to maintain equipment in good working condition to minimize combustion emissions to the extent practicable (Cheminfo, 2005). To reduce fugitive dust emissions, effective dust suppression techniques, such as on-site and road watering, will be used.

The application of the recommended mitigation measures should minimize combustion emissions and limit fugitive dust emissions to the work area. As a result of the low concentrations of the atmospheric pollutants generated during construction, no adverse effects on terrestrial vegetation due to these emissions are anticipated.

A PTTW will be obtained from the MOE if more than 50,000 L/day is withdrawn from a natural water source for dust suppression. Reseeding will be undertaken as soon as conditions permit after construction to reduce potential dust generation.

Emissions from the batch plant will meet the requirements of the ECA issued by the MOE under the *EPA*.

There will be no atmospheric emissions from the proposed powerhouse during operation. As ambient air quality will not be affected during the operation of the proposed New Post Creek Project and monitoring is not deemed necessary.

4.4.1.3 Environmental Noise

The construction of the proposed New Post Creek Project will be the source of short-term local noise. All work is expected to be completed using conventional construction methods. Construction activities such as site grading, ROW clearing, site preparation, pile driving, blasting and foundation work will be sources of noise generation. All of these activities, which are expected to take approximately 30 months, will require the use of various pieces of heavy equipment including bulldozers, front-end loaders, small trucks, backhoes, bobcats, dump trucks, compactors, ready-mix concrete trucks and cranes. Other construction activities, such as those related to the placement of the facility components (e.g., generator) and activities inside the building (once built) are expected to generate less noise. The movement of worker vehicles from the construction camp to the construction site will also result in minor increase in the background sound levels during the 30-month construction period.

The proposed New Post Creek Project will be constructed using standard construction BMPs (e.g., Cheminfo, 2005). Sound emission standards for various equipment are set according to the date of manufacture of the equipment as defined by the MOE in the NPC-115 publication, listed in the MOE (1978) Model Municipal Noise Control By-Law. This document stipulates specific sound emission standards for various pieces of construction equipment and will form the basis of a Noise Management Plan to be developed by the contractor. No mitigation is required as no unusual construction noise effects are anticipated at the nearest sensitive receptors:

- seasonal trapper's cabin belonging to a MCFN citizen located proximate to the ONR line approximately 500 m south of the transmission line connection and over 7 km from the proposed GS location;
- seasonal occupation of the Abitibi Canyon GS facilities approximately 13 km to the southwest; and
- seasonally occupied dwelling at Fraserdale, approximately 15 km south.

The construction disturbance should be sufficiently local that little displacement of wildlife is expected to occur. Any sensitive resident animals can relocate temporarily to avoid noise and disturbance associated with construction activities and return after construction activity cessation. In the unusual event of permanent displacement, other wildlife is expected to take advantage of the available habitat. Based on literature review, Kaseloo (2004) reported that small mammals do not appear to be adversely affected by road noise occurring in significant numbers in rights-of-way.

The behavioural response of wild birds to noise is variable. The response varies with species, sex, group, size, season, activities engaged in prior to disturbance, previous exposure to the noise source and distance from the noise source (Fitchko and Lang, 1999). Some species may be very sensitive and may abandon their nests because of anthropogenic noise or activities. Other species habituate to anthropogenic noise or activities, yet others may be attracted to them.

Kaseloo (2004, 2006) reported that a number of studies have indicated that road noise has a negative effect on bird populations (particularly during breeding) of a variety of species. This effect is based on increased bird densities with distance from the road with the effect distances increasing with increased traffic densities. Traffic noise has not been explicitly established as the primary causal factor for avoidance by these species. Moreover, not all species have shown this effect and some species show the opposite response, with increased numbers near roads. As indicated by Kaseloo (2004), there are large gaps in the existing knowledge of the impact of noise on wildlife populations with the need to determine why noise, the presumptive cause, has such variable effects and if the effect is attributable to noise alone or if other factors and/or interactions are present.

While a bird's first reaction to a new noise source appearing in a new ecological niche may be fear and avoidance, if its other sensory systems (optical, chemical) are not stimulated, the organism quickly learns to ignore the noise source (Busnel, 1978). However, avoidance of noise should occur if the organism is approached or chased by humans. For example, it is well known that flocks of crows and gulls will follow a tractor and tilling implement to feed on worms and insect larvae exposed by tilling, ignoring the noise from the tractor; however, they leave immediately if the driver stops the engine and walks away from the tractor.

Drilling activities to facilitate blasting will generate noise and vibration similar to any general construction operation. Potential effects due to noise and vibration will be minimized by proper maintenance and operation of drill rig equipment. In addition, noise baffling equipment can be provided, as recommended by the blasting engineer.

The abrupt loud noise associated with blasting may startle wildlife. In a review of the effects of sonic boom on wildlife, Bell (1972) and Cottereau (1978) reported that wild animals may show behavioural startle when they first experience a sonic boom; however, their reaction is usually slight and they seem to adapt readily to further boom. Lynch and Speake (1978) studied the effect of sonic booms on the nesting behaviour of Wild Turkey and reported that sonic booms did not cause abnormal behaviour that would result in decreased productivity. Additional information on the effects of blasting is provided in Sections 4.2.2.3 and 4.2.7. As some wildlife species will relocate temporarily to avoid noise and disturbance associated with construction activities whereas others may become habituated to human activities and associated noise, no mitigation is recommended, with the exception of those provided for migratory birds during the nesting season (see Section 4.4.7).

During powerhouse operation, all sources of noise energy will be designed with noise limitations of 85 dBA inside the station (KGS Group, 2013c). The noise level within the station will be mitigated by the powerhouse walls and rapidly attenuate with distance from the station. Local resident wildlife are expected to become habituated to the noise emanating from the station.

4.4.2 Geology

As indicated in Section 2.3.2, the proposed penstocks will extend approximately 820 m from the intake to the powerhouse and will be buried with a minimum 2 m cover to provide thermal insulation during winter operation. Blasting of surface and near-surface bedrock along the initial 150 m distance from the intake will be required to facilitate penstock burial. Blasting will also be required at the intake location.

Explosives used in construction will be closely controlled in accordance with all government regulations, and their use restricted to authorized personnel who have been trained in the use of explosives in a manner so as to minimize impacts on the environment. Appropriate government agencies and the local trappers and tourism excursion operators will be informed of the blasting schedule in advance of construction, as well as just prior to the detonation program. All necessary permits will be obtained by the DBC, who will also comply with all legal requirements in connection with the use, storage and transportation of explosives, including, but not limited to, the *Canada Explosives Act* and the *Transportation of Dangerous Goods Act*. The DBC will be required to retain a consulting engineer with technical expertise in blasting to provide advice on maximum loading of explosives for all blasting, as well as an engineering report indicating recommended charges and blasting methods to be used at specific locations. All blasting will occur in such a way as to be in compliance with federal regulations and directions. Minimization of the physical effects of blasting will be ensured by following the recommendations of the blasting engineer and the DFO blasting guidelines, "Guidelines for the Use of Explosives in or near Canadian Fisheries Waters" (Wright and Hopky, 1998). Excess rock will be removed for suitable use or disposal. Sampling and analysis of bedrock indicated that it is not acid generating (see Section 4.2.2.3).

A Site Development Plan will be prepared by the DBC, including planning considerations; site and design considerations; site development scheduling; selection of construction equipment; and site development details.

No effects on geology are anticipated beyond the intake and 150 m penstock footprints requiring blasting for construction. As these effects are localized relative to overall geology in the area, no mitigation measures are required beyond those set out in the Site Development Plan.

No effects on geology are anticipated as a result of the operation of the proposed New Post Creek Project; therefore, no mitigation is required.

4.4.3 Physiography

As indicated in Section 2.3, lands along the proposed penstock footprint between the proposed intake and powerhouse locations are gently sloping, with a relatively steep slope along the Abitibi River at the proposed powerhouse location. The physiography at the proposed intake/earth dam, penstock and powerhouse sites will be altered due to requisite grading and slope stabilization, as well as at proposed laydown/assembly areas due to requisite grading.

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

No effects on physiography are anticipated as a result of the operation of the proposed New Post Creek Project; therefore, no mitigation is required.

4.4.4 Soils

Soils on the proposed Project site consist primarily of sillty clay loam, with some organic soil (see Section 3.2.3).

4.4.4.1 Soil Erosion

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

As indicated in Section 4.4.1.1, during periods of excessive rainfall or saturated soil conditions, construction activities will be monitored to ensure that gullying does not occur on the relatively steep slope along the Abitibi River at the proposed powerhouse location, as well as on the more gently sloping area along the proposed penstock footprint between the proposed intake and powerhouse locations, and that excavated soils do not migrate off the work area. Exposed areas will be stabilized as soon as sufficiently dry conditions prevail and, where appropriate, excavated soils will be stabilized by the use of silt fencing enhanced with straw bales, stockpile covers, berms, controlled compaction, etc.

Erosion associated with high winds, resulting in soil loss, will be reduced or eliminated by stabilizing spoil piles with straw mulch or more stable materials.

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

- fitting of proposed works to the terrain (i.e., using the natural topography of the land in the placement and organization of the construction site);
- timing of grading and construction activities to minimize soil exposure;
- retention of existing vegetation where feasible;
- restriction of the use of heavy construction equipment to within the approved work areas to minimize soil disturbance and vegetation destruction;
- storage of stripped soil at upland locations with a minimum of 5 m from the edge of the Abitibi River and New Post Creek and beyond the inundation area;
- implementation of erosion control measures, e.g., rip-rap berms underlain by filter geotextile, straw bales used as filters, silt fencing along the shoreline and/or mulching for interim stabilization;
- diversion of runoff away from exposed areas;
- minimization of the length and steepness of slopes;
- maintenance of low runoff velocities;
- design of drainage works, such as ditches and outfalls, to handle concentrated runoff;
- retention of sediment on site;
- routine inspection and maintenance of erosion and sediment control measures; and
- revegetation of disturbed areas by seeding and/or planting following construction as soon as seasonal conditions permit.

The site-specific Erosion and Sediment Control Plan will be part of a broader Environmental Management Plan for the proposed Project.

For the clearing of the reservoir, stumps are to remain in the ground so as to maintain root mat, limit soil disturbance and lower the risk of erosion and total suspended solids released to the reservoir.

After construction, the disturbed sites will be rehabilitated. A Site Rehabilitation Plan including planning considerations, soil stabilization and re-vegetation (using only native vegetation and planting of tree species typical of the specific ecosite) will be prepared for the proposed Project.

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

4.4.4.2 Management and Control of Hazardous Materials, Construction Wastes and Incidental Spills

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

A Hazardous Materials Management Plan, Waste Management Plan and a Spills Emergency Preparedness and Response Plan will be developed by the DBC for the proposed Project as part of the broader Environmental Management Plan.

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

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

4.4.5 Vegetation

4.4.5.1 Forestry Resources

As indicated in Section 3.2.4.1, forestry operations have been undertaken previously within the local study area. However, forestry operations are not proposed in the current FMPs. More than one-quarter (27%) of the area has been disturbed due to harvesting and extensive road development.

The proposed New Post Creek Project will involve the clearing of approximately 249 ha of disturbed and undisturbed land, of which approximately 181 ha is productive forest (Fleming, 2012; see Appendix A of the Terrestrial Environment TSD). The majority of this forest will be lost from production. Temporary work areas will be re-planted with native tree species appropriate for each ecosite.

Based on clearing of approximately 181 ha, the FRI timber volumes in Net Merchantable Cubic Metres (NMm^3) are estimated to be 11,372 NMm^3, consisting mainly of Black Spruce, Balsam Poplar, Balsam Fir and White Spruce. The marketable volume will be significantly less given the lack of markets for many species and products. In addition, a significant volume of very small wood from younger stands (i.e., less than 50 years old) will likely not be marketable and require chipping or crushing for disposal.

A total of 9.6 ha of plantation will be affected by clearing the proposed transmission line ROW. Normally, silviculture liability charges of approximately $8,160 would be recoverable to the Forest Renewal Trust Fund for plantation loss (Fleming, 2012).

Early involvement and regular consultation will be undertaken by the DBC with the MNR Fire Management Headquarters in Cochrane to maintain situational awareness, ensure compliance and seek clarification on procedures. Specific concerns to be addressed by the DBC include the handling and storage of hazardous materials on site; vegetation management procedures related to the construction and maintenance of temporary and permanent facilities, transmission line ROW and access roads; and access to the site for fire response purposes with consideration for ease of access turnarounds and egress. If access is to be controlled procedures should be in place in advance to afford local fire response staff reasonable access to the site. Fire management should also be aware of any hazards that they may encounter in the event that they are dispatched to a fire on site and any relevant communications procedures.

Certain forest operations, such as road construction and land clearing, may be subject to the Modifying Industrial Operations Protocol if the fire hazard warrants imposing specific conditions within the annual fire season (April 1-October 31). The restrictions associated with operating in accordance to the protocol are directly correlated to the daily fire hazard. Specific conditions may include ensuring fire suppression equipment is on site and immediately available for deployment by trained staff, as well as the use of spark arrestors, cleaning machinery and smoking in the forest environment.

A Fire Protection Plan will be developed by the DBC. This Plan will provide an inventory of available fire suppressant equipment, fire brigade set-up, response plans and contingency plans. The Plan will also include fire reporting and procedures for obtaining fire permits and prohibitions on materials to be burned on-site. The conditions of any burning permits will be acknowledged in the Plan. If the burning of slash and unmerchantable timber is required, the Plan will outline the communication process with the MNR to obtain approval to proceed based on fire bans and weather forecasts, as well as to confirm availability of rapid fire response resources, if required. The Fire Protection Plan will be part of the broader Environmental Management Plan.

4.4.5.2 Terrestrial Constraints Analysis

A terrestrial constraints analysis was undertaken by Beacon for the purpose of assessing the effects of the proposed New Post Creek Project, evaluating alternative solutions (e.g., alternative transmission line routes from the proposed powerhouse to potential interconnection locations) and recommending mitigation measures. Terrestrial features were categorized as low, moderate and high constraint based on the criteria described below. Constraints were applied to ELC polygons to assist with the spatial identification of potentially sensitive terrestrial features (see Table 4.8 and Figures 4.13a, b, c and d). These constraint ratings are intended for general consideration purposes only and should be interpreted within the context of other development constraints.

High Constraint Areas generally include areas with significant ecological features and functions, including SAR, landform/vegetation (L/V) associations that are under-represented in Ecodistrict 3E-1, waterbodies and confirmed locations of significant wildlife habitat.

Moderate Constraint Areas support moderate to high quality ecological features and functions, notably wetlands, riparian vegetation, and mature forests and swamps that may be sensitive to disturbance, but are considered common and widespread throughout the boreal region and are adequately represented in Ecodistrict 3E-1.

Low Constraint Areas include features that provide basic ecological functions. These features are typically disturbed or capable of adapting to disturbance, or not natural in origin. Areas of low constraint include recent cutovers, plantations, roads, and young/secondary forests and thickets that are capable of withstanding and adapting to disturbances. Development can generally occur in such areas with limited requirements for mitigation.

Table 4.8 Terrestrial Constraints Summary

Map Unit	Ecosite	Constraint	Constraint Rationale
1	Fresh, Silty to Fine Loamy: Aspen-Birch Hardwood	Low	Young-mid aged secondary forest, common ecosite in 3E-1
2	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
3	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
4	Organic Thicket Swamp	Medium	Mature swamp, common ecosite in 3E-1
5	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
6	Organic Shallow Marsh	Medium	Riparian wetland, common ecosite in 3E-1
7	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
8	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
9	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
10	Sparse Treed Bog	Medium	Mature bog, common ecosite in 3E-1
11	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
12	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
13	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
14	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
15	Organic Thicket Swamp	Medium	Riparian wetland, common ecosite in 3E-1
16	Black Spruce Plantation	Low	Young plantation
17	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Conifer	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
18	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
19	Spruce-Fir Conifer	Medium	Mature swamp, common ecosite in 3E-1
20	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
21	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
22	Sparse Treed Bog	Medium	Mature bog, common ecosite in 3E-1
23	Organic Thicket Swamp	Medium	Riparian wetland, common ecosite in 3E-1
24	Black Spruce Plantation	Medium	Young plantation
25	Sparse Treed Bog	Medium	Mature bog, common ecosite in 3E-1
26	Poor Fen	Medium	Wetland, common ecosite in 3E-1
27	Sparse Treed Fen	Medium	Mature fen, common ecosite in 3E-1
28	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
29	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
30	Black Spruce Plantation	Low	Young plantation
31	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Conifer	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
32	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
33	Moist, Fine: Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
34	Moist, Fine: Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
35	Black Spruce Plantation	Low	Young plantation
36	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1

Table 4.8 Terrestrial Constraints Summary (Cont'd)

Map Unit	Ecosite	Constraint	Constraint Rationale
37	Black Spruce Plantation	Low	Young plantation
38	Open Water Marsh: Organic	Medium	Wetland, well represented L/V association in 3E-1
39	Open Water Marsh: Organic	Medium	Wetland, well represented L/V association in 3E-2
40	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
41	Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
42	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
43	Fresh, Clayey: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
44	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
45	Mineral Thicket Swamp	Medium	Riparian wetland, common ecosite in 3E-1
46	Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
47	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
48	Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
49	Mineral Thicket Swamp	Medium	Riparian thicket, common ecosite in 3E-1
50	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
51	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
52	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
53	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
54	Intolerant Hardwood Swamp	High	Considered significant wildlife habitat in 3E-1
55	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
56	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
57	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
58	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
59	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
60	Active Bluff	Medium	Riparian
61	Moist, Coarse: Aspen-Birch Hardwood; Moist, Coarse: Spruce-Fir Conifer	Medium	Riparian forest, common ecosite in 3E-1
62	Active Bluff	Medium	Riparian
63	Active Bluff	Medium	Riparian
64	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
65	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
66	Active Bluff	Medium	Riparian
67	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
68	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
69	Active Bluff	Medium	Riparian
70	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
71	Active Bluff	Medium	Riparian
72	Active Bluff	Medium	Riparian
73	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
74	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1

Table 4.8 Terrestrial Constraints Summary (Cont'd)

Map Unit	Ecosite	Constraint	Constraint Rationale
75	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
76	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
77	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
78	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
79	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
80	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
81	Active Bluff	Medium	Riparian
82	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
83	Active Bluff	Medium	Riparian
84	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
85	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
86	Moist, Coarse: Spruce-Fir Conifer	Medium	Riparian thicket, common ecosite in 3E-1
87	Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
88	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
89	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
90	Bluff	Medium	Riparian
91	Active Bluff	Medium	Riparian
92	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
93	Active Bluff	Medium	Riparian
94	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
95	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
96	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
97	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
98	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
99	Dry-Fresh, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
100	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
101	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
102	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
103	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
104	Moist, Coarse: Aspen-Birch Hardwood	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
105	Aspen-Birch Hardwood	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
106	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
107	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
108	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
109	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
110	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
111	Organic Shallow Marsh	High	Marsh wetland under-represented L/V type in 3E-1
112	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1

Table 4.8 Terrestrial Constraints Summary (Cont'd)

Map Unit	Ecosite	Constraint	Constraint Rationale
113	Organic Meadow Marsh	High	Marsh wetland under-represented L/V type in 3E-1
114	Organic Meadow Marsh	High	Marsh wetland under-represented L/V type in 3E-1
115	Sparse Treed Fen	Medium	Mature fen, common ecosite in 3E-1
116	Organic Meadow Marsh	High	Marsh wetland under-represented L/V type in 3E-1 Ontario Parks
117	Active Bluff	Medium	Riparian
118	Active Cliff	High	Considered significant wildlife habitat in 3E-1
119	Organic Poor Conifer Swamp	low	Young to mid-aged conifer regeneration following logging
120	Mineral Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
121	Fresh, Clayey: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
122	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
123	Moist-Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
124	Moist-Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
125	Dry-Fresh, Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
126	Dry-Fresh, Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
127	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
128	Dry-Fresh, Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
129	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
130	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging
131	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
132	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
133	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging
134	Open Water Marsh: Organic	High	Marsh wetland under-represented L/V association in 3E-1
135	Organic Shallow Marsh	High	Marsh wetland under-represented L/V association in 3E-1
136	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging
137	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging

[1] See Figures 4.13a, b, c and d for map unit locations.

Figure 4.13a Constraints Mapping – Transmission Line Study Area

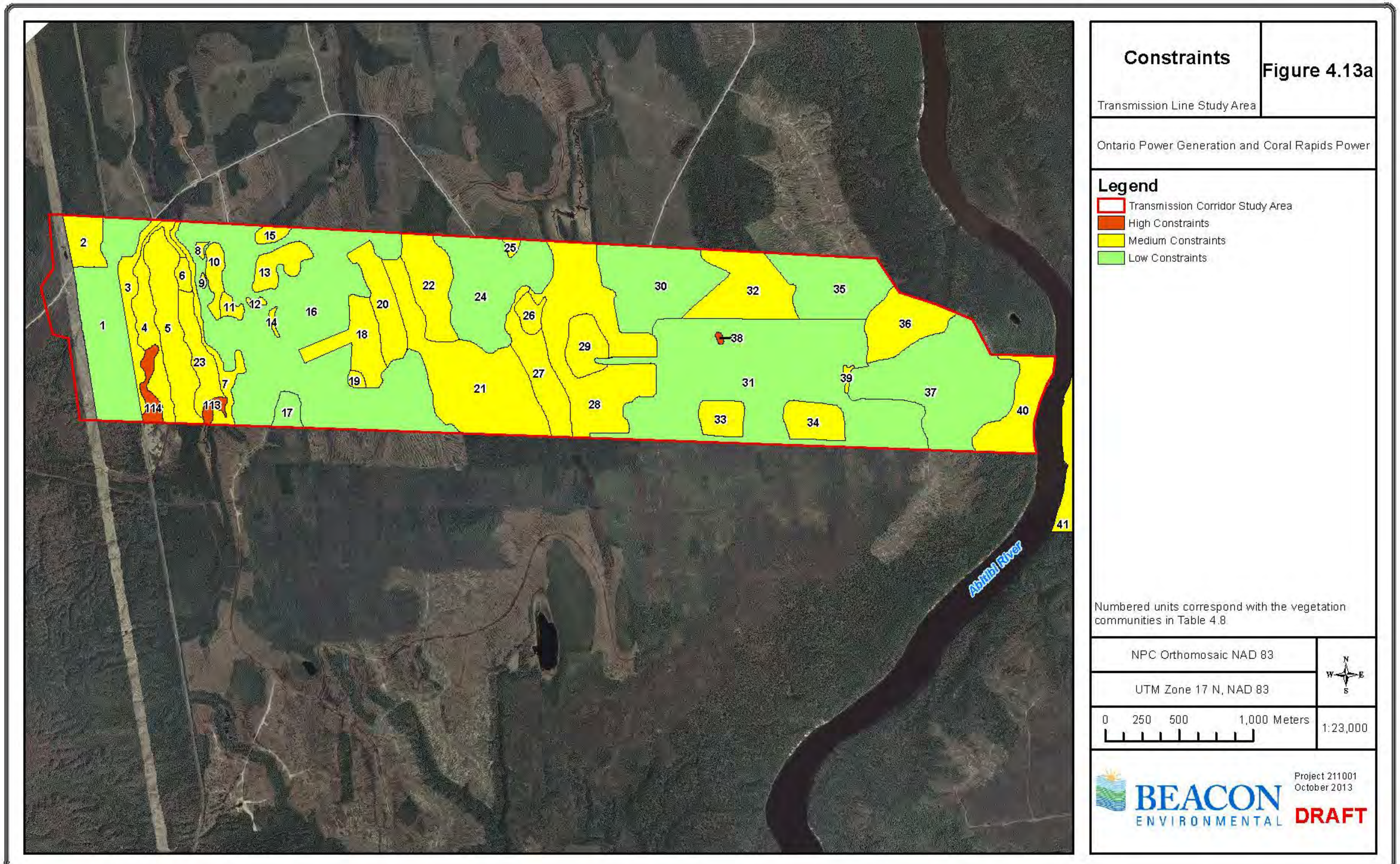


Figure 4.13b Constraints Mapping – Work Area/Laydown Zone and Downstream Riparian Study Area

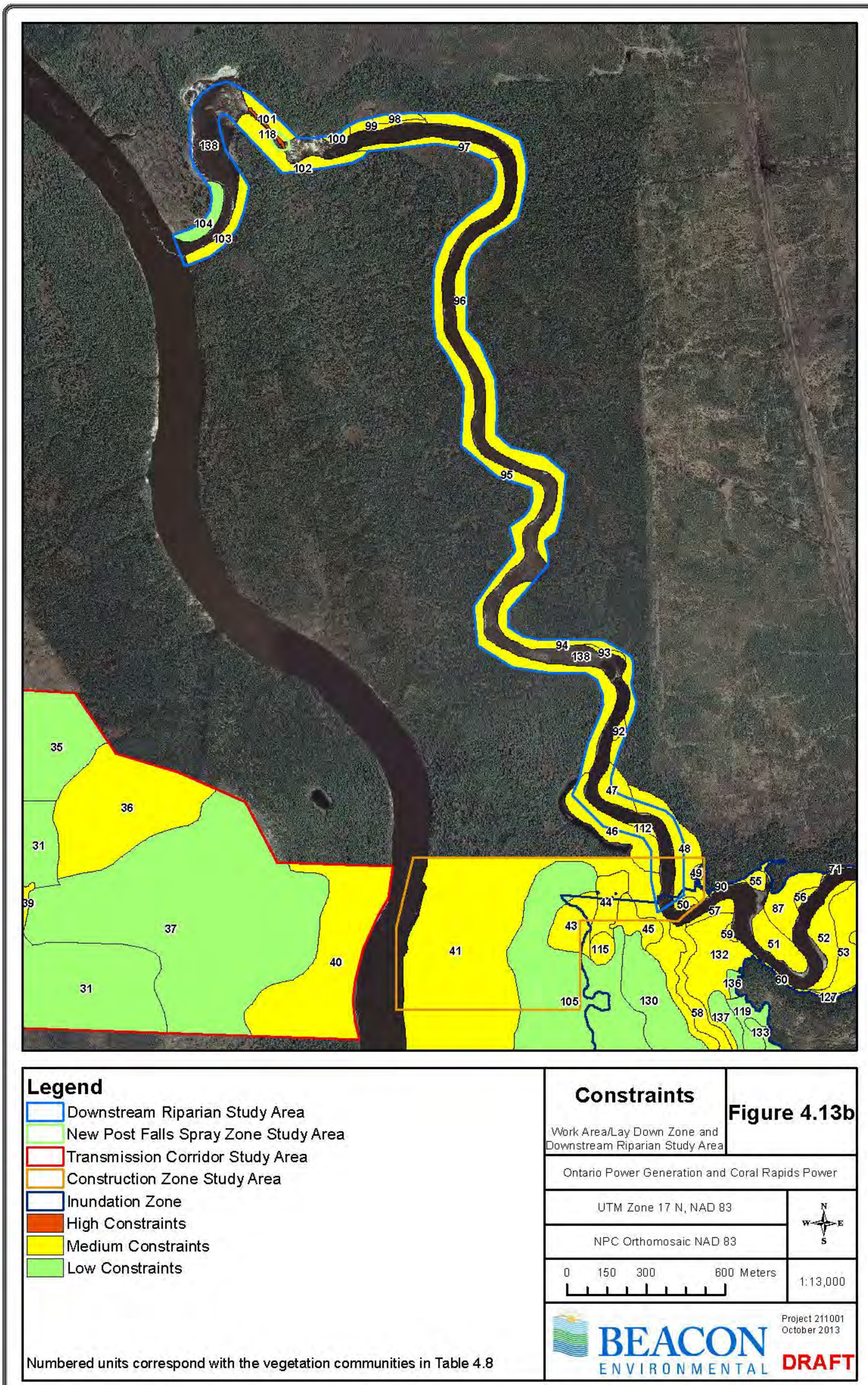
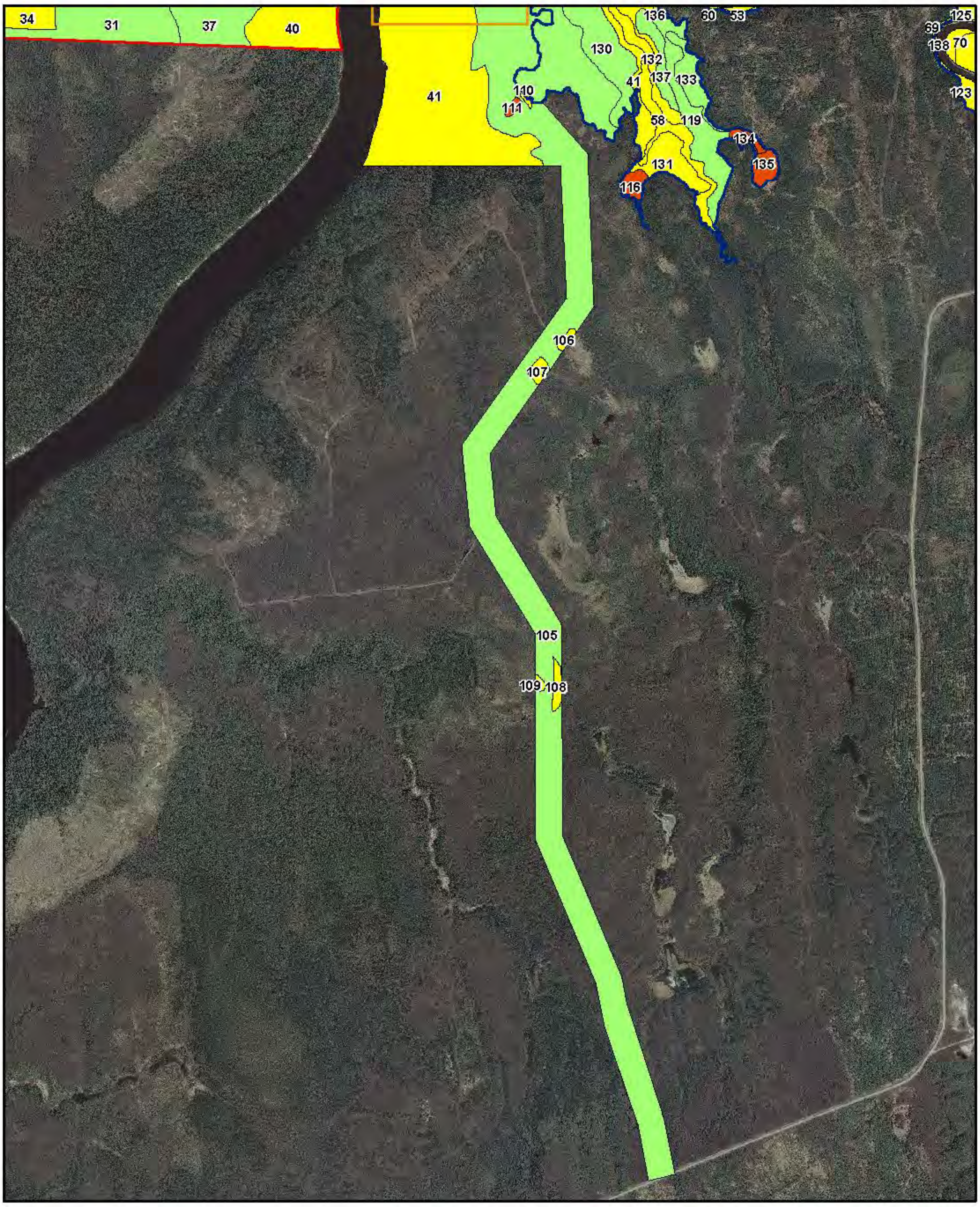


Figure 4.13c Constraints Mapping – Access Road Study Area



Legend
- Transmission Corridor Study Area
- Construction Zone Study Area
- Inundation Zone Study Area
- High Constraints
- Medium Constraints
- Low Constraints

Numbered units correspond with the vegetation communities in Table 4.8

Constraints
Access Road Study Area

Figure 4.13c

Ontario Power Generation and Coral Rapids Power

UTM Zone 17 N, NAD 83

NPC Orthomosaic NAD 83

0 200 400 800 Meters

1:18,000

BEACON ENVIRONMENTAL

Project 211001
October 2013

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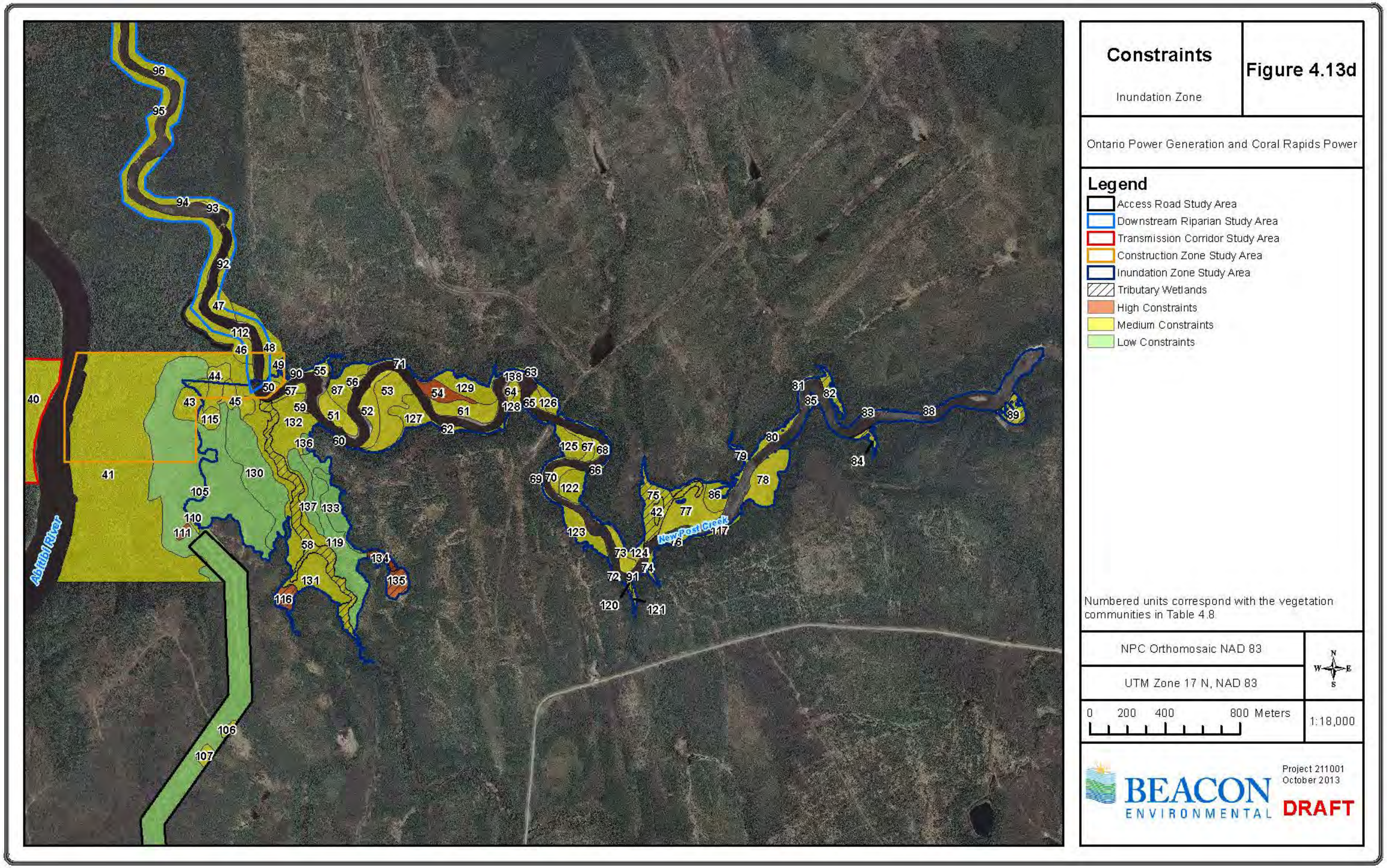
Figure 4.13d Constraints Mapping – Inundation Zone and Upstream Riparian Study Area



4.4.5.3 Effects of Proposed Project Components on Vegetation Communities/Ecosites

This section describes the effects of the construction of the proposed New Post Creek Project components on vegetation communities/ecosites. Table 4.9 summarizes the areas of vegetation types that will be affected by the proposed Project. Affected areas associated with the various proposed Project components, including the transmission line, laydown areas, construction/building areas and associated grading/earthworks, access roads and inundation zone are shown on Figures 4.14a, b and c.

Table 4.9 Areas of Vegetation Types Affected by the Proposed New Post Creek Project

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Aquatic	Open Water	0.2
Bluff	Active Bluff	2.4
Bog	Sparse Treed Bog	1.4
Conifer Forest	Spruce-Fir Conifer, Pine-Black Spruce Dominated	73.6
Conifer Plantation	Black Spruce Plantation	11.2
Conifer Swamp	Organic Poor Conifer Swamp, Intermediate Conifer Swamp, Rich Conifer Swamp	14.5
Deciduous Forest	Aspen-Birch Hardwood	56.1
Deciduous Swamp	Intolerant Hardwood Swamp	1.8
Fen	Poor Fen, Sparse Treed Fen	1.2
Marsh	Organic Shallow Marsh, Organic Meadow Marsh, Open Water Marsh	4.17
Mixed Forest	Aspen-Birch, Hardwood/Spruce-Fir, Conifer/Pine-Black Spruce Dominated	10.1
Thicket	Alder Thicket, Willow Thicket	14.5
Thicket Swamp	Organic Thicket Swamp, Mineral Thicket Swamp	17.13
Total		**208.3**

The total area of natural vegetation types to be affected is approximately 208 ha with deciduous forest and conifer forest together comprising approximately 62% of the affected area.

<u>Proposed Work Area and Laydown Zone Effects</u>

A 0.5 ha forest area, consisting predominantly of Balsam Fir and Black Spruce (Map Unit 41), will be permanently displaced by the new powerhouse adjacent to the Abitibi River. Construction of the proposed penstocks and intake structure and maintenance of a 10 m ROW along the penstocks will displace the following:

- 1.8 ha of conifer forest (including portions of Map Units 41, 43, 44);
- 0.6 ha of deciduous forest (Map Unit 105); and
- 0.14 ha of thicket swamp (Map Unit 45).

Figure 4.14a Affected Vegetation Communities – Proposed Transmission Line Project Component

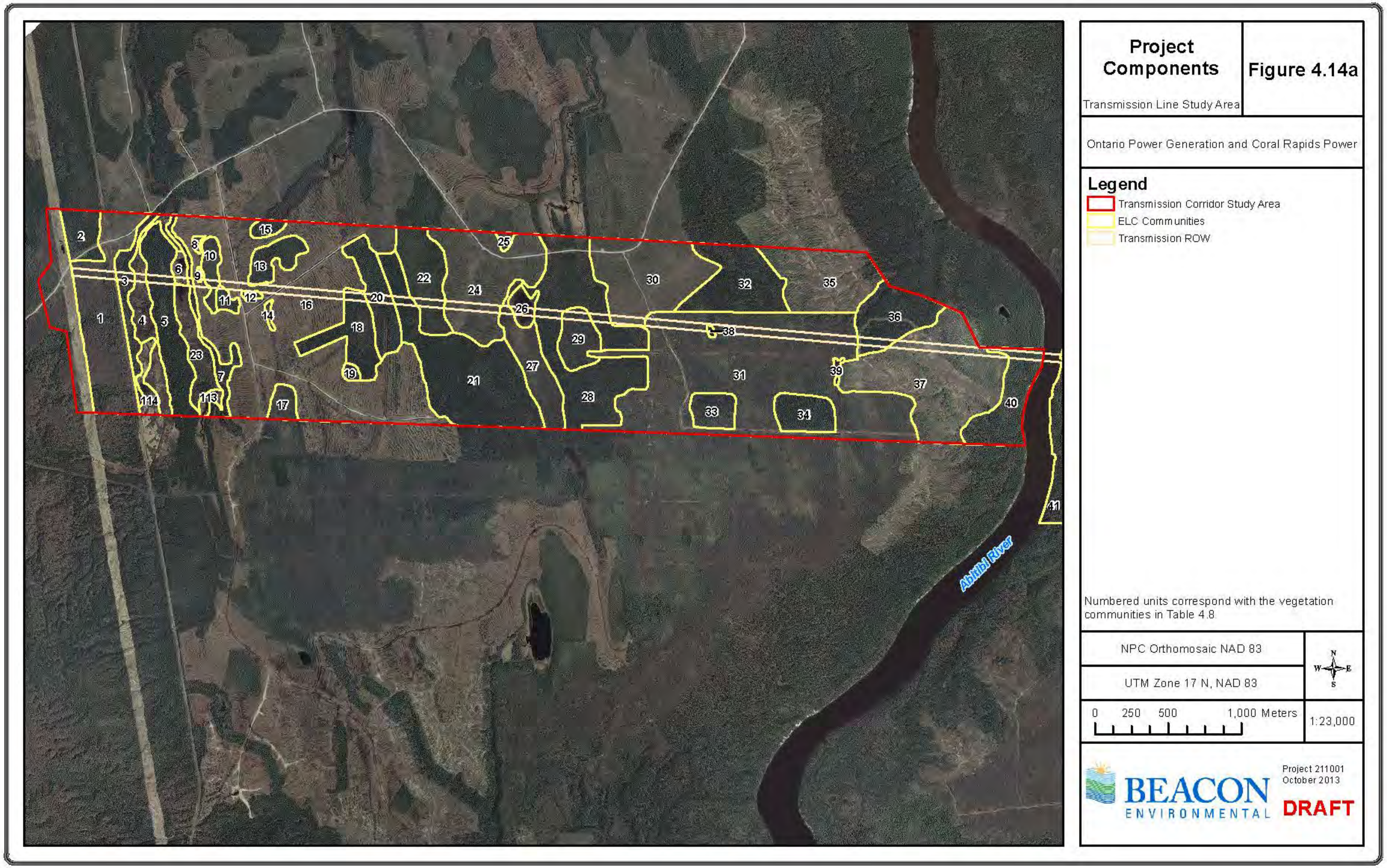


Figure 4.14b Affected Vegetation Communities – Proposed Work Area/Laydown Zone Project Component

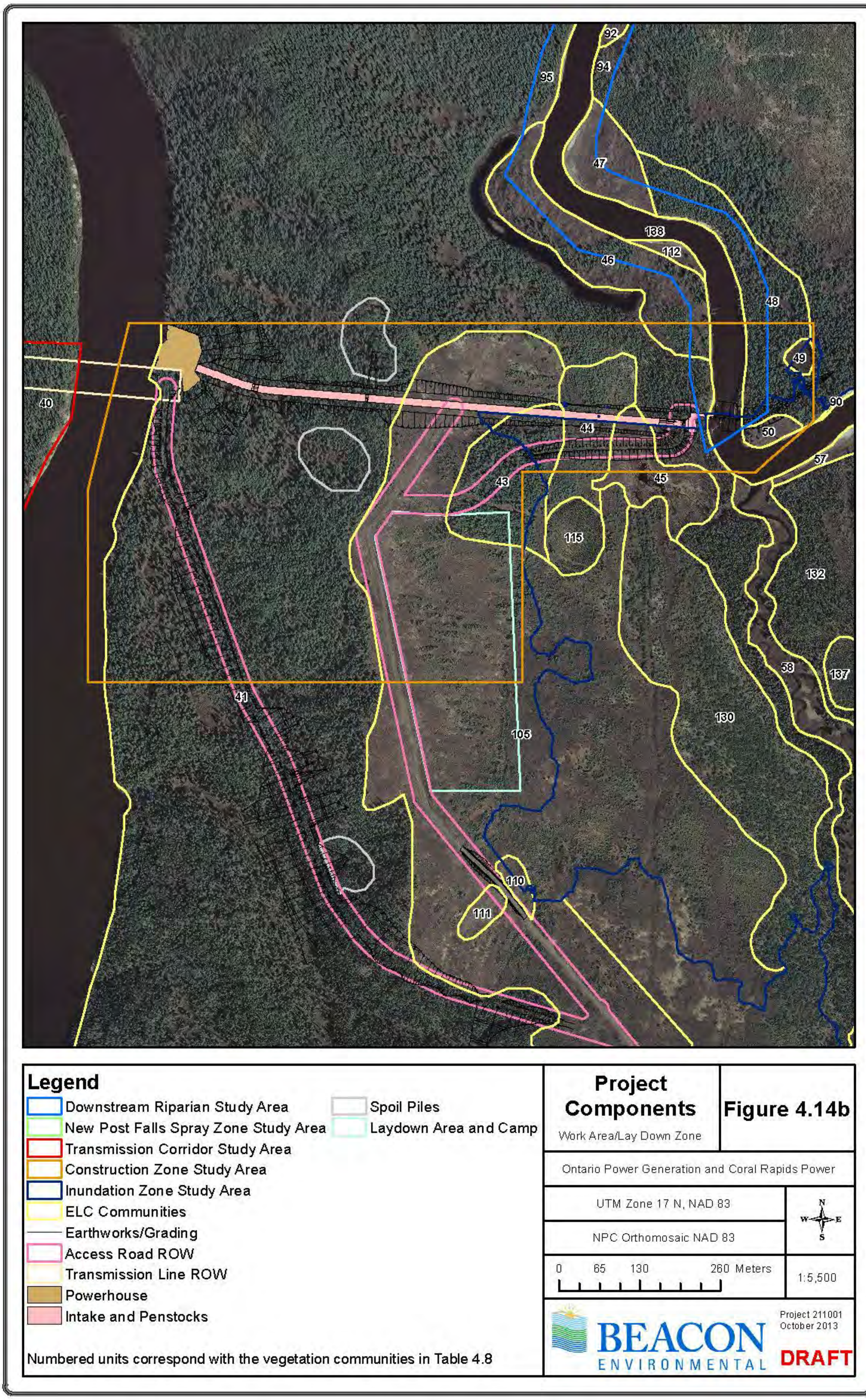
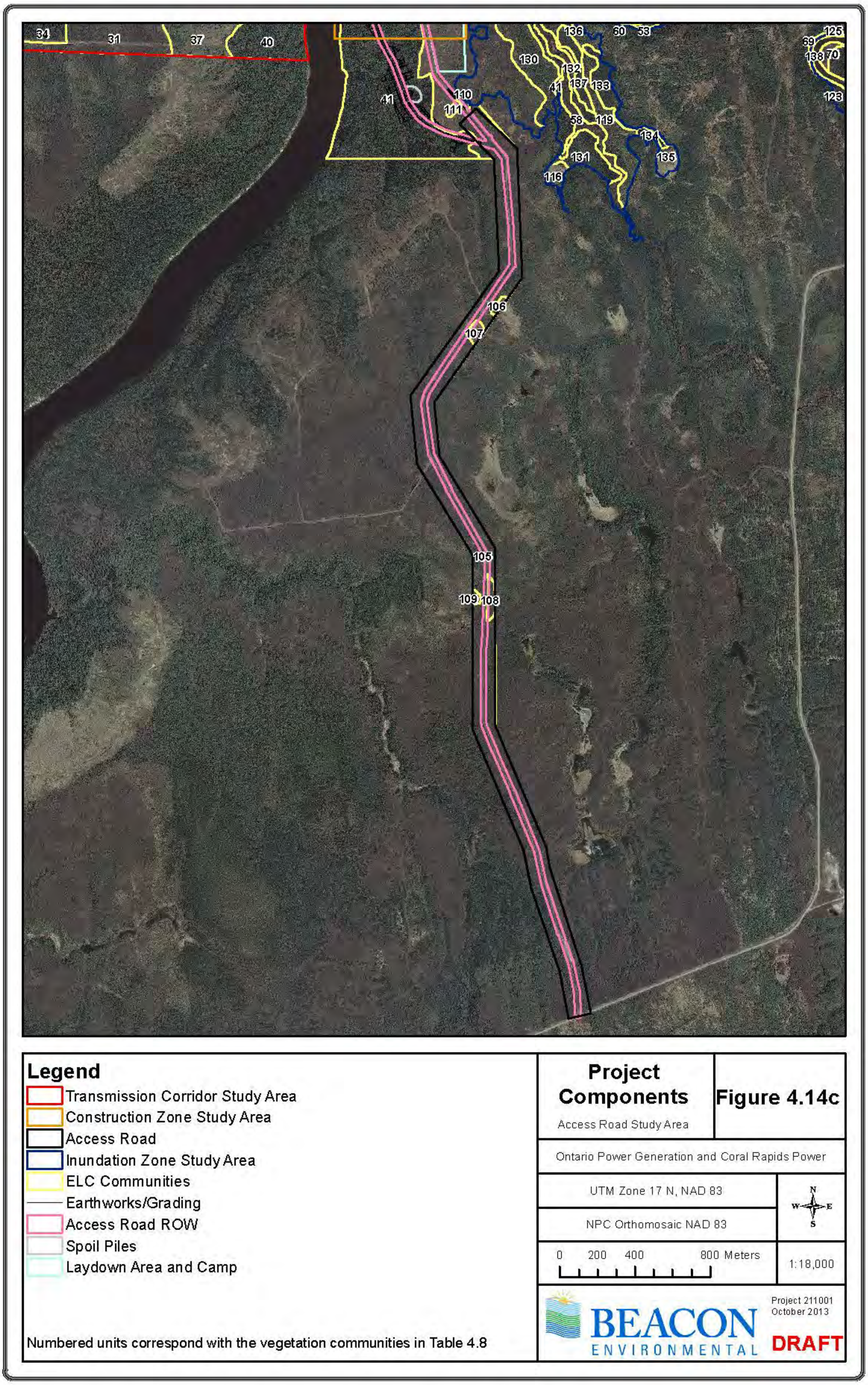


Figure 4.14c Affected Vegetation Communities – Proposed Access Road Project Component



Spoil piles will displace approximately 2.3 ha of mature Black Spruce forest (Map Unit 41). This disturbance will be temporary as vegetation will regenerate and/or be replanted on the spoil pile locations following construction completion.

The proposed laydown area and camp will affect a 7.74 ha area of young to mid-aged Aspen-Birch Hardwood forest (Map Unit 105). This is a relatively disturbed area recovering from past logging. Additionally, a small 0.42 ha area of mature Spruce-Fir Conifer forest (Map Unit 43) may be cleared for the proposed laydown area and camp. The disturbance to these communities will be temporary as the area will be revegetated naturally or through active reforestation following construction completion.

Grading and earthworks associated with the construction of the proposed access roads, the powerhouse, penstocks and intake will require the removal of vegetation from several vegetation communities. The total area of vegetation that will be disturbed by the proposed earthworks is approximately 8.4 ha, with the areas of the different vegetation types potentially affected summarized in Table 4.10. It is estimated that approximately 60% of the area disturbed by the proposed earthworks will be maintained as permanently cleared areas. The remaining 40% of the area will be revegetated naturally or through active restoration after construction completion.

Table 4.10 Areas of Vegetation Types Affected by Proposed Grading/Earthworks

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Conifer Forest	Spruce-Fir Conifer, Jack Pine-Black Spruce Dominated	6.6
Deciduous Forest	Aspen-Birch Hardwood	0.7
Thicket Swamp	Organic Thicket Swamp, Mineral Thicket Swamp	1.09
Open Marsh	Organic Shallow Marsh	0.013
Total		**8.403**

The total area of vegetation types affected by the proposed powerhouse, penstocks ROW, intake structure, spoil piles, laydown area, camp and grading/earthworks is approximately 20.9 ha, of which approximately 7.5 ha will be permanently displaced.

Vegetation clearing will adhere to standard construction practices as outlined in Section 3.5.5.

Proposed Inundation Zone Effects

Water levels will be raised upstream of the proposed intake weir location up to 187.00 m.a.s.l. This amounts to an increase of about 5 m given that topographic elevations within the inundation zone range between 182 and 187 m.a.s.l.

Table 4.11 summarizes the area of vegetation types affected by the proposed inundation. The total area affected is approximately 130 ha.

Table 4.11 Areas of Vegetation Types Affected by Proposed Inundation

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Conifer Forest	Spruce-Fir Conifer, Jack Pine-Black Spruce Dominated	54
Conifer Swamp	Organic Poor Conifer Swamp	7.5
Thicket Swamp	Mineral Thicket Swamp, Organic Thicket Swamp	16
Deciduous Forest	Aspen-Birch Hardwood	27
Marsh	Organic Meadow Marsh, Organic Shallow Marsh, Open Water Marsh	3.7
Mixed Forest	Aspen-Birch Hardwood, Spruce-Fir Conifer	3
Bluff	Active Bluff	2.4
Thicket	Alder Thicket, Willow Thicket	14.5
Deciduous Swamp	Intolerant Hardwood Swamp	1.8
Total		**129.9**

Existing vegetation communities within the inundation zone will be inundated with water levels ranging from approximately 1 to 5 m, depending on the elevations at which the communities occur. Vegetation communities situated between 182 and 185 m.a.s.l, which accounts for approximately 113 ha or 66% of the inundation zone, will be flooded by 2 to 5 m of water. It is unlikely that the existing terrestrial vegetation within that zone will persist or adapt to the predicted level of flooding; therefore, the result will be the conversion of a terrestrial environment dominated by thickets and Aspen forest to an open water aquatic community.

It is expected that vegetation communities occurring between 186 and 187 m.a.s.l will experience flooding of 1 m or less. These communities may shift in form and composition to adapt to the increased water levels. Depending on the extent and duration of flooding, shrub thickets may transition to thicket swamp or open marsh. Prolonged flooding of existing forest and plantation will likely result in tree mortality and a transition to thicket swamp, marsh, or open water.

The majority of the vegetation communities that will be impacted by the inundation are common and widespread throughout the boreal range and within Ecodistrict 3E-1. However, there are several significant vegetation communities that will be impacted by the inundation, which include:

- Map Unit 54: Intolerant Hardwood Swamp;
- Map Unit 116: Organic Meadow Marsh;
- Map Unit 134: Open Water Marsh: Organic; and
- Map Unit 135: Organic Shallow Marsh.

Map Unit 54 is an intolerant hardwood swamp dominated by Balsam Poplar situated along New Post Creek. Intolerant hardwood swamp is considered to be a rare community in Ecoregion 3E and for that reason it is designated as significant wildlife habitat according to the Draft Ecoregion 3E Significant Wildlife Habitat Criterion Schedule (MNR, 2012). The extent of flooding predicted for this area will likely result in tree mortality and conversion to an aquatic environment.

Map Units 116, 134 and 135 are open marsh communities that developed due to flooding caused by beaver dams. Open marsh on glaciofluvial outwash is an L/V association that is considered to be under-represented in Ecodistrict 3E-1 (Morris, 2010). These communities occur at the furthest extent of the inundation; therefore, flooding will be minimal in this area. No significant changes are expected to occur in these wetlands as a result of the additional flooding resulting from the proposed Project.

The wetland area for each New Post Creek tributary to be affected by the proposed inundation is summarized in Table 4.12 and demarcated (with hatch overlay) in Figure 4.13d. It should be noted that the total areas to be inundated in Tributaries 8, 9 and 10 are wetlands.

Table 4.12 Wetland Areas of New Post Creek Tributaries to be Affected by the Proposed Inundation

Tributary	Total Watershed Area (km^2)	Total Area Classified by MNR as Swamp/Lake[1] (km^2)	Percent Watershed as Swamp/ Lake	Wetland Area to be Inundated (km^2)	Percent Wetland Area to be Inundated[2]
1 (MNR ID#523)	36.6	13.83	37.8	0.110111	0.80
2 (MNR ID#491)	0.73	0.068	9.3	0	0
3 (MNR ID#554)	0.24	0.007	2.8	0	0
4 (MNR ID#550)	5.95	1.005	16.9	0.001031	0.10
5 (MNR ID#545)	0.60	0.012	2.0	0	0
6 (MNR ID#520)	1.99	0.715	36.0	0.034560	4.83
7 (MNR ID#505)	2.66	0.617	23.2	0	0
8 (MNR ID#489)	1.27	0.204	16.0	0.003717	1.82
9 (MNR ID#509)	4.65	1.801	38.7	0.003283	0.18
10 (MNR ID#495)	0.35	0.033	9.3	0.013241	40.12

[1] Swamp = wetlands; some of the tributaries drain beaver ponds.
[2] Percentage based on total swamp and lake area classified by MNR.

As indicated in Table 4.12, approximately 16.6 ha of wetland associated with six of the ten tributaries will be inundated. Table 4.11 provides the areas of vegetation types affected by the proposed inundation. Of the total terrestrial inundation area of 129.9 ha, only 3.7 ha consist of organic meadow marsh, organic shallow marsh and open water marsh. An additional 16 ha consist of mineral thicket swamp and organic thicket swamp. Therefore approximately 84% of the total wetland area (19.7 ha) to be inundated is associated with the ten tributaries (16.6 ha). As indicated in Section 4.3.10.2, during pulsing, the wetland areas to be inundated at the minimum and maximum operating levels are 12.5 ha and 16.4 ha, respectively, a difference of only 3.9 ha.

All trees and significant vegetation (large woody shrubs) will be cleared from the proposed inundation area (see Section 4.4.5.4).

Effects on Downstream Riparian Environment

Erosion and sediment deposition are expected to decrease overall as a result of the reduced flows downstream of the proposed GS. It is anticipated that the overall reduction in flows (which can vary considerably within and between years) will result in the shorelines and banks being more exposed for greater periods of time, as well as some areas of the streambed being more exposed at certain times of the year. Where streambed is exposed, it will be coarse material that will provide a new, harder shoreline for the reduced stream width. Most of the finer substrate that is more prone to erosion occurs higher up along the banks, and will be subject to eroding flows less often than it is under current conditions. Where exposed areas of finer substrate are subject to erosion in periods and/or years where flows are higher, the resulting erosion is expected to stabilize over time as this creek section moves toward a new state of equilibrium under the altered flow regime. The implementation of minimum flows will help achieve a new state of equilibrium, and as the shorelines stabilize over time, vegetation such as willow and alder will become established as part of natural successional processes, further contributing to soil stabilization and erosion control.

Existing downstream shoreline and floodplain vegetation communities are expected to adapt to the change in flows and/or shift in structure and species composition in response to the changes in disturbance patterns and moisture regime. Some areas along the creek that are subject to seasonal or periodic flooding under the existing flow regime will not be flooded to the same extent under the post-development flow regime. As a result, plant species less tolerant of flooding and the associated disturbance may move into these areas. For example, alder and willow thickets currently maintained by the disturbance associated with the current flooding regime may transition to forest, while the thickets may gradually expand into open areas exposed by the reduction in water levels.

Surveys for breeding amphibians were not within the scope of the field studies for the proposed Project, therefore, data on the specific locations of amphibian breeding sites in the downstream environment and the specific species present are not available. However, based on analysis of 32 years of historical flow data, our knowledge of the site, and knowledge of amphibian species known to occur in this area, some general assumptions can be formulated about anticipated effects to downstream amphibian populations.

Under current conditions, the volume and frequency of downstream flows can vary considerably within years as well as between years. Based on 32 years of historic data, flow in May range between 30 and 235 m^3/s. As a result of the dynamic nature of this hydraulic system, amphibians that breed in the area are naturally adapted to substantial variations in the frequency and timing of flooding in the spring and throughout the year. Based on the historic flow data, an approximately 40% reduction in May flow volumes is expected to occur on average, with a consequent reduction in flooding; however, the data indicate that in most years the predicted spring flows will exceed the 50 m^3/s to be diverted to the proposed GS. Breeding sites located at higher elevations or further inland from New Post Creek that depend on periodic flooding under the existing flow regime will be more vulnerable to the proposed reduction in flows in some years, however, these sites may be sustained by other processes such as rainfall, overland runoff and tributary inputs. Furthermore, given the dynamic nature of riverine ecosystems, it is expected that the amphibian populations present in New Post Creek have the capacity to adapt to the predicted flow reductions resulting in negligible, if any, effect.

Effects on New Post Creek Waterfalls Spray Zone

It is expected that the spray zone at the New Post Creek waterfalls will be reduced, but not eliminated, as a result of the reduction of flows downstream of the proposed spillway (see Photograph 4.1). The spray zone has created a somewhat unique microclimate in the area of the waterfalls, potentially supporting unique assemblages of species on the rock cliff and surrounding tableland. During field investigations conducted in accessible areas of the spray zone, no provincially or regionally rare plant species or communities were identified. It is not expected that the floral species composition in the area will change significantly as a result of the reduction in flows; however, the habitat for certain species that may be dependent on mist conditions will be slightly reduced.

Proposed Transmission Line Effects

Installation of the proposed transmission line will require clearing of vegetation within a maximum 50 m wide corridor extending from the proposed powerhouse switchyard directly west over a distance of approximately 7 km to the existing Otter Rapids GS/Abitibi Canyon GS transmission line.

Vegetation communities impacted by the transmission line include: young Black Spruce plantation (Map Units 16, 24, 30, 37), mid-aged mixed forest (Map Unit 31) and Aspen deciduous forest (Map Unit 1), mature conifer swamp/bog (Map Units 3, 5, 7, 9, 10, 11, 12, 13, 18, 20, 21, 22, 28, 29), and mature conifer forest (Map Units 36, 40).

Installation and maintenance of the transmission line will require localized removal of trees and other vegetation from these communities. The area of vegetation affected by the proposed transmission corridor is summarized in Table 4.13. The total loss of vegetation along the transmission line is approximately 33.4 ha, with Black Spruce plantation greatest affected (11.2 ha).

Table 4.13 Areas of Vegetation Types Affected by the Proposed Transmission Line ROW

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Aquatic	Open Water	0.2
Bog	Sparse Treed Bog	1.4
Conifer Forest	Spruce-Fir Conifer, Pine-Black Spruce Dominated	3
Conifer Plantation	Black Spruce Plantation	11.2
Conifer Swamp	Organic Poor Conifer Swamp, Intermediate Conifer Swamp, Rich Conifer Swamp	7
Deciduous Forest	Aspen-Birch Hardwood	1.5
Fen	Sparse Treed Fen, Poor Fen	1.2
Marsh	Organic Shallow Marsh	0.4
Mixed Forest	Aspen-Birch Hardwood, Pine-Black Spruce Dominated	7.1
Thicket Swamp	Organic Thicket Swamp	0.4
Total		**33.4**

It is expected that the DBC selected for this work will execute the construction of the transmission line likely in the winter to minimize the impact on the natural environment, particularly wet areas. Vegetation clearing along the proposed transmission line ROW will adhere to standard construction practices as outlined in Section 4.4.5.4.

<u>Proposed Access Road Effects</u>

The areas of vegetation types affected by the proposed access roads are summarized in Table 4.14. The areas of vegetation types affected by proposed grading/earthwork required for access road construction is summarized in Table 4.10.

Table 4.14 Areas of Vegetation Types Affected by Proposed Road Construction

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Conifer Forest	Spruce-Fir Conifer, Pine-Black Spruce Dominated	4.8
Deciduous Forest	Aspen-Birch Hardwood	18.6
Marsh	Organic Shallow Marsh	0.07
Thicket Swamp	Organic Thicket Swamp, Mineral Thicket Swamp	0.5
Total		**23.97**

The location of the main access road is aligned with an existing logging road, which leads to the proposed GS site from Otter Rapids Road. To improve access, the existing logging road will be upgraded. Vegetation along the logging road is comprised predominantly of young to mid-aged Aspen-Birch forest (Map Unit 105). Aligning the access road with an existing road will minimize disturbance and direct effects to vegetation; however, upgrades to the existing logging road will require the removal of trees and other vegetation from the Map Unit 105, as well as some small areas of thicket swamp (Map Units 107, 108, 110).

The main access road ROW occupies approximately 18 ha of Aspen-Birch forest, of which approximately 5 ha are occupied by the existing logging road, which will form the new road bed. The ROW also contains approximately 0.5 ha of alder and willow thicket swamp. It is assumed that 50% of the ROW area will be cleared for line-of-sight safety maintenance and 50% will be naturally re-vegetated. Therefore, the total permanent loss of forest and thicket swamp is approximately 9.25 ha.

A very small area (0.07 ha) of Map Unit 111 (Cattail Organic Shallow Marsh) falls within the access road ROW; however, only 0.013 ha (132 m^2) will be directly affected by grading associated with road construction (see Table 4.10). This community is considered significant as it is an open marsh situated on glaciofluvial outwash, which is an under-represented L/V association in Ecodistrict 3E-1 (Morris, 2010). The required grading associated with road upgrades will have a very minor effect on the wetland, and will not affect the overall functioning of the wetland provided that there are no prolonged or permanent disruptions to wetland hydrological connections.

In addition to the upgrades to the existing logging road, a new access road will be constructed within the western portion of Map Unit 41 connecting to the proposed powerhouse site. This area is comprised of mature Black Spruce mixed with Balsam Fir and occasionally Jack Pine. Some cut-and-fill is required to complete road construction in this area (effects of earthworks summarized in Table 4.10). A new access road will also be constructed to the proposed intake weir location through Map Units 43 and 44 (Spruce-Fir conifer forest), and Map Unit 45 (Mineral Thicket Swamp). A total of 5 ha of conifer forest will be removed to create the new roads to the proposed powerhouse and intake weir location; however, it is assumed that 50% of the ROW area will be naturally re-vegetated. A small area (0.2 ha) of thicket swamp (Map Unit 45) will be permanently removed from the ROW along the proposed intake weir access road.

As indicated in Section 2.4.1.2, Parliament Loop Road may be used to access the east bank of New Post Creek at the proposed intake weir location. If it is to be used, the DBC will be responsible for the completion of a comprehensive ground-truthing of vegetation communities along the road.

Vegetation clearing along the access roads will adhere to standard construction practices outlined in Section 4.4.5.4.

4.4.5.4 Effects on Significant Plant Species

No SAR plant species were documented during the field surveys or within the local study area land on examination of the NHIC (2012) and Environment Canada, CWS (2010/2011) databases.

The majority of the plant species observed during the field surveys were ranked by the NHIC (2010) as S5 (secure), while several were ranked S4S5 (apparently secure to secure), S4 (apparently secure); S4? (apparently secure; rank uncertain), or SNA (conservation status rank not applicable). Removal of these plant species will have negligible effect on their overall populations in Ontario.

As indicated in Section 3.2.4.3, a number of plant species in the proposed Project study area are listed as “rare” or “scarce” by Baldwin (1958) and Riley (2003). Most of these will be directly or indirectly affected by the proposed Project, as discussed below.

Beaked Hazel, Pussy Willow, Bracken Fern, American Mountain-ash and Longstalk (Peduncled) Sedge are considered “rare” by Riley (2003) in the Hudson Bay Lowlands. However, these species were occasionally or frequently encountered during field surveys within the proposed Project area as well as surrounding lands. These species likely occur more frequently south of the Hudson Bay Lowlands. Individuals and populations of these species will be affected by the proposed Project; however, there is not expected to be a significant decrease in the regional numbers of these species as a result of the proposed Project.

Black (Bear) Sedge was recorded in Plot 40 along the proposed access road and will likely be removed by upgrades to the existing logging road. This species is listed as “frequent” by Baldwin (1958) and “rare” by Riley (2003). It likely occurs more frequently south of the Hudson Bay Lowlands.

Canada Yew was recorded in Plot 23. It is listed as “rare” and “occasional” by Riley (2003) and Baldwin (1958), respectively. The distribution of this species within the Project area is unknown. This species in Plot 23 will be removed due to construction of the proposed powerhouse.

Kentucky Fescue, while considered “rare” by Riley (2003), is an exotic species and not a conservation concern.

Daisy (Hyssop-leaved) Fleabane was observed in the spray zone near the top of New Post Creek waterfalls. This species will be indirectly affected by a possible reduction in the quantity of mist in the area and perhaps longer periods of drought. Prolonged periods of drought may have a negative effect on this species in the area; however, the species will likely persist.

Dwarf Rattlesnake-plantain was recorded in Plots 26, 29 and 66. These plants will be directly removed as a result of construction-related activities and flooding. This species is listed as “scarce” by Baldwin (1958) and “occasional” by Riley (2003).

Scouring Rush, listed as “rare” and “occasional” by Riley (2003) and Baldwin (1958), respectively, was observed in Plots 47 and 74 within the proposed inundation zone, and likely occurs elsewhere along the shores of New Post Creek. These occurrences will be lost as a result of the flooding.

Variegated Horsetail was recorded in Plot 81 at the furthest extent of the inundation zone. It was also observed in other areas that will not be directly affected by the proposed Project; as a result, effects to this species will be insignificant.

Leafy White (Tall White Bog) Orchid and Nagoonberry (Stemless Raspberry) were recorded in Plot 11, south of the proposed transmission line ROW, and will not be affected by the proposed Project. Water Dock was recorded in Plot 4, also south of the proposed transmission line ROW, and therefore, will not be affected.

4.4.5.5 Standard Vegetation Clearing Construction Practices

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

- Vegetation clearing should be avoided during the migratory bird nesting season, if possible (see Section 4.4.7);
- Vegetation clearing should be restricted to the minimum necessary for construction activities;
- Brush and trees should be felled into the area to be cleared to prevent damage to adjacent vegetation;
- Branches overhanging the cleared area should be cut (pruned) cleanly and stubs shall not be dressed;
- Merchantable timber is to be sorted and stacked according to the MNR requirements on the acquired FRL;
- Residual non-merchantable timber could be left in piles for public fuelwood use subject to MNR's direction;
- All remaining slash material will either be burned or chipped according to MNR directives at the time of harvesting;
- Chipped material should be spread so as to lower the incidence of forest fire; and
- Slash material should not be stored near any water bodies.

Along with the above general vegetation clearing measures additional direction is provided for CRP/OPG's plan to clear the reservoir (flooded) area associated with the proposed GS. This is being done to:

- reduce mercury effects (a detailed discussion of mercury effects is provided in Section 4.3.10);
- eliminate trees, vegetation and related material as barriers to navigation and/or safety hazards in the flooded areas;
- ensure harvest (including wood supply directives) are appropriately permitted;
- reduce the amount of debris collecting at the proposed GS; and
- protect the riparian edge.

CRP/OPG will ask the DBC to follow the Ontario Provincial Standard (OPS201) definition of "Close cut clearing", i.e., the cutting of all standing trees, brush, bushes and other vegetation at original ground level and the removal of felled material and windfalls.

The following is a preliminary description of the proposed headpond/reservoir clearing to be given to the DBC to minimize the amount of available organic material available for promotion of mercury methylation:

- clearing, cleaning and removal of all trees and significant vegetation (large woody shrubs) from the proposed inundated area;
- trees should be harvested using full-tree logging method with branches and tops removed at landings rather than in the proposed inundated area;
- clearing to the high water mark of the proposed reservoir plus an additional 1 m back to prevent trees and vegetation from falling into the reservoirs;
- all cleared material to be removed from the potential inundated area;
- all merchantable timber to be stacked to roadside;
- harvest to be conducted in the winter to lessen the amount of site disturbance;
- the DBC to obtain a FRL for the authority to cut the wood;
- as the FRL is issued under the *Crown Forest Sustainability Act,* all specified conditions and requirements to be followed by the DBC (note that it is expected that the DBC will hire a qualified and experienced sub-contractor forest harvesting company in Ontario);
- the FRL to also indicate where wood is to be directed including rights of refusal on the wood (it is impossible to know the specifications at this point as this would be based on the market/industry conditions at the time of the clearing);
- all non-merchantable material (slash, such as tops and branches, vegetation, stumps and other woody material) to be utilized as firewood, ground to mulch or burned with approval to be obtained by MNR;
- all sorting, grinding and/or burning to be done away from the inundated area and preferably at or near roadside; and
- all access roads and skidder paths used to gain access to the proposed reservoir to be decommissioned so as to prevent public access to the new reservoir area, including the destruction of all roads, removal of all water crossings (including culverts) and the successful re-planting of road beds.

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

4.4.5.6 Transmission Line ROW Vegetation Control

Vegetation control will be required along the transmission line ROW to ensure that specified minimum safety clearances from conductors are maintained. As indicated in Section 2.4.2.3, vegetation control will involve a combination of manual and mechanical approaches. Based on commitments made to the Aboriginal communities, no chemical treatment will be utilized for vegetation management. Vegetation management will be infrequent and performed on six or seven year cycles.

4.4.6 Wetlands and Environmentally Significant Areas

As indicated in Section 3.2.5, the nearest designated natural area is LAPP, located proximate to the proposed Project property. The Replacement Lands regulated into LAPP increased Park size by approximately 212 ha and enhanced its overall ecological integrity. However, land deregulation to permit the proposed Project to proceed resulted in the disjunction of LAPP as the waterway class portion is no longer a continuous system.

The Pinard Moraine CR, located west of the Abitibi River approximately 8 km from the proposed GS location and 30 m west of the proposed transmission line interconnection with the existing 115 kV transmission line connecting Otter Rapids GS with Abitibi Canyon GS. This large 18,201 ha protected area was regulated on April 21, 2005 (MNR, 2006). This earth science feature is very prominent, rising up to an elevation of 54 m above its surroundings. A timber haul road bisects the Pinard Moraine CR. Upon regulation, this road continues to be used by the forestry industry for access to areas north of the CR as per agreements made between MNR and the industry. CRP/OPG proposes to use this road for access to the interconnection location of the proposed transmission line with the existing Hydro One 115 kV transmission line. An AoC prescription for use of this road may be required from the MNR.

Due to the geographic separation, construction and operation of the proposed New Post Creek Project will have no effect on other more distant environmentally significant areas.

Based on the PPS (OMMAH, 2005), development and site alteration shall not be permitted in significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. There are no significant wetlands within the local study area (NHIC, 2012); however, wetland evaluations have not been undertaken in northern Ontario to the extent in southern Ontario.

4.4.7 Wildlife

The potential effects of environmental noise on wildlife are presented in Section 3.1.2.

4.4.7.1 Proposed Inundated Area Creation

The area to be inundated above the proposed intake weir covers 170 ha of which 37 ha is existing New Post Creek and its tributaries. Summaries of the terrestrial and wetland habitat areas to be inundated are presented in Tables 4.11 and 4.14, respectively.

A number of terrestrial bird species utilize the proposed inundation area as nesting habitat. Most of these species are protected under the *Migratory Birds Convention Act*. The Canadian Wildlife Service (CWS) has stipulated that vegetation clearing shall not be undertaken during the breeding season of migratory birds in order to avoid the destruction of any occupied bird nests. Specifically, clearing shall not take place between about May 1 and July 31 in northern Ontario. Otherwise, a breeding bird survey must be conducted by a qualified avian biologist and any nests found must not be disturbed by the clearing activity until the young have fledged. A species-specific buffer zone restricting active construction activities is usually applied around a nest. The CWS will be consulted for the appropriate mitigation measures. To preclude the potential institution of a buffer zone that may affect construction activities, it is recommended that vegetation (including grubbing) be removed prior to nesting season initiation (May 1), and/or after nesting season completion (July 31).

As indicated in Section 4.3.10.1, reservoir creation results in decomposition of flooded organic matter and increased rates of mercury methylation. The MeHg can be transferred from aquatic food webs to terrestrial organisms. For example, Gerrard and St. Louis (2001) reported increased MeHg concentrations in nestling Tree Swallows near an experimental reservoir; however, no overt toxicological effects were observed. In fact, an increase in dipteran productivity (the primary food source) after reservoir creation resulted in earlier nest initiation, larger eggs, and faster growth rates of wing and bill length in nestlings reared during the post-flood years.

Similarly, Des Granges *et al.* (1994) reported that THg concentrations were significantly higher in the feathers of adult Osprey and nestlings proximate to reservoirs. Despite this much higher THg exposure, the number of young fledged was not statistically different between nests located near reservoirs and located near lakes and rivers. The results suggested that growing feathers, either in molting adults or in nestlings, provide an excretion pathway for THg.

Weech and Scheuhammer (2006) assessed reproductive success and productivity of Bald Eagle nesting proximate to Pinchi Lake historically impacted by mercury mining activities, including the direct deposition of mercury mining-related wastes. Reproductive success and average productivity of the Bald Eagles over the study period were 62% and 0.98 chicks/territory on Pinchi Lake compared to 64% and 1.17 chicks/territory on five unaffected lakes. Despite elevated THg concentrations in adult eagle blood, the birds from Pinchi Lake appeared to be in excellent condition. The adult eagle with the highest THg concentration was one of the most productive birds in the study area, having successfully raised two eaglets in each of the summers of 2001 and 2002.

A Human Health Risk Assessment (HHRA) was undertaken as part of the EA of the proposed Keeyask Generation Project (KGP), a 695 MW hydroelectric GS on the Nelson River in northern Manitoba (Wilson, 2012). The proposed KGP will result in a new reservoir approximately 93 km^2 in area consisting of 48 km^2 in existing waterway and 45 km^2 of newly inundated lands. Based on the HHRA, Muskrat was the only mammal that was predicted to have increased tissue concentrations of mercury following impoundment. However, the predicted increases were considered to be very minor, i.e., from 0.02 to 0.04 µg/g. No measurable changes in mercury tissue concentrations under post-impoundment condition were predicted in Moose, Beaver and Snowshoe Hare.

Grassy Narrows First Nation (2010) reported low mercury concentrations in the flesh of herbivorous wildlife (White-tailed Deer, Moose, Snowshoe Hare, Beaver, Muskrat, Partridge (Spruce Grouse) and Ruffed Grouse) from the mercury-contaminated Wabigoon-English River watershed, i.e., generally below the detection limit of 0.005 µg/g. Mercury concentrations were higher in kidney and liver samples of White-tailed Deer, Moose and Beaver that were analyzed. Mercury concentrations in the flesh of carnivorous mammals was generally higher, e.g., ranging from <0.005 to 0.38 µg/g in Marten, 0.49 to 4.4 µg/g in Mink, 0.57 µg/g in Raccoon and 1.0 to 2.6 µg/g in River Otter. As the extent of mercury availability due to the proposed Project headpond is significantly smaller, similar or lower mercury concentrations in local mammals are expected.

4.4.7.2 Proposed Project Construction

Areas to be disturbed by construction encompass approximately 208 ha (Table 4.9). Part of this area consists of temporary disturbance (camps, borrow pits, laydown areas) that will be rehabilitated following construction. As indicated in Section 4.4.4.1, a Site Rehabilitation Plan will be developed by the DBC. Rehabilitation will include planting native tree species typical of the specific ecosite.

A number of proposed borrow pits have been identified as potential aggregate sources (see Figure 2.2). Upon selection of the sites to be used by the DBC, terrestrial surveys will be undertaken of the borrow areas and associated access. No fieldwork was conducted at these sites.

As indicated in Section 3.2.6, the lands around the proposed Project are designated as Classes 4 and 6 with moderate and severe limitations, respectively, for the production of Moose. According to NRVIS data, there are no season wildlife concentration areas within the proposed Project area; however, the NRVIS data show a Moose late wintering area approximately 1 km west of the existing Otter Rapids GS/Abitibi Canyon GS transmission line. With the exception of the Moose late wintering area and two Woodland Caribou wintering areas (see Section 3.2.6), no other significant wildlife habitat was identified within or proximate to the local study areas based on review of the MNR NRVIS database (see Section 3.2.9).

As indicated in Section 4.4.1.3, the construction disturbance will be sufficiently local that little displacement of wildlife will occur. Any resident animals can relocate temporarily to avoid noise and disturbance associated with construction activities. Once construction of the proposed Project is completed, any displaced animals could reoccupy the habitat created on the rehabilitated areas and the habitat not directly affected by construction activities.

All construction workers will be given an orientation on environmental management including a focus on non-harassment of wildlife. Moreover, construction workers as a term of their employment agreement will not be allowed to hunt, fish or trap. All sanitary waste and food sources will be properly managed so as to reduce the incidence of wildlife feeding.

Overall, the construction of the proposed New Post Creek Project will have minimal effect on wildlife populations or wildlife-carrying capacity in the local study area.

4.4.7.3 Construction Traffic

Any large scale resource development in northern Ontario could lead to road development and resultant increased access for hunters and other resource users to exploit or disturb wildlife. Most of the proposed GS development can be constructed based on the existing road network. The exception to this is approximately 530 and 1,450 m of new road that will be constructed to the proposed intake and powerhouse locations, respectively.

Increased road traffic has the potential to increase disturbance to wildlife and animal mortality due to vehicle accidents (road kills).

Vehicular traffic along Highway 634 to the proposed Project site will include: delivery trucks for equipment and supplies, waste haul vehicles, occasional visits in personal vehicles by management and technical staff, stakeholders, etc. Daily vehicle traffic rates will be mitigated as most workers will be living in the construction camp. Because of these mitigation measures, CRP/OPG would expect the total number of vehicles to the site every day to be less than 50.

There would also be some significant truck traffic from the proposed borrow areas to the main proposed Project site. This could result in a couple hundred truck movements per day for up to a year.

All drivers who will regularly transport workers, equipment and materials to the site will be given a training session on the importance of road speeds and wildlife, particularly with respect to Moose and Black Bear. In addition, close tracking of vehicle/wildlife incidents should be undertaken to investigate, develop and implement corrective/preventative measures on an ongoing basis throughout the construction period.

Increased road kill of birds will likely occur with the increased traffic. However, traffic volume and speed along the access roads will be relatively lower than that on highways; and therefore, additional mortality can be expected to be small.

CRP/OPG does not plan on permanently staffing the proposed GS. However, periodic visits are made by staff for inspections, maintenance and repair. Overall, CRP/OPG expects that this would result in less than one vehicle per day.

4.4.7.4 Proposed Project Operation

As indicated in Section 4.4.7.2, once construction of the proposed Project is completed, any displaced animals could reoccupy the habitat created on the rehabilitated areas, and the habitat not directly affected by construction activities. The steady noise from the proposed Project powerhouse during operation is not expected to elicit an adverse reaction from wildlife due to habituation.

The proposed GS facilities footprint (including the headpond) will result in the permanent loss of approximately 121 ha of forest cover, whereas clearing of the proposed transmission line ROW will result in loss of approximately 30 ha of forest cover that will be replaced by graminoid, forb and shrub communities depending on vegetation management. The overall effect of loss of forest habitat on bird populations is uncertain because breeding habitat may not be limiting for some species (e.g., species limited by wintering habitat or other mortality factors) and displaced birds may be able to occupy vacant territories nearby. Habitat removal will affect local bird species, but the largely boreal forest habitat that will be removed is common in the local study area and adjacent landscape. Songbirds that breed in the boreal forest are adapted to large-scale disturbances such as wildfire. The permanent conversion of forest to open and aquatic habitats represents approximately 1% of the forestry resources assessment broad study area.

Two significant wildlife habitats were confirmed by Beacon during site-specific field investigations, i.e., Cliffs and Talus Slopes (at the New Post Creek waterfalls) and Hardwood Swamps (Balsam Poplar community along New Post Creek). The Cliffs and Talus Slopes habitat will likely be affected by decreased flows in New Post Creek downstream of the proposed Project resulting in diminution of its area. The Hardwood Swamp habitat will also likely diminish in area due to proposed upstream inundation (headpond).

Electrocution and collisions with transmission lines have been reported for large bird species. However, electrocution and collisions is expected to be minimal due to the short length of the transmission line and the implementation of the following mitigation measures:

- markers (e.g., marker cones and/or coloured spiral markers) will used to increase the visibility of the proposed transmission line crossing the Abitibi River; and
- appropriate “Suggested Practices” outlined in APLIC (2006), e.g., minimizing the use of guy wire.

After construction of the proposed transmission line ROW, shrub- and ground-nesting migratory birds could potentially be affected by vegetation management practices (manual and/or mechanical). Based on commitments made to the Aboriginal communities, no chemical treatment will be utilized for vegetation management. To mitigate negative effects, vegetation management activities will take place outside the main breeding season (May 1 to July 31). If this is not possible, a breeding bird survey prior to vegetation management activities must be conducted by a qualified avian biologist to determine if any nests are present, and any nests found must not be disturbed by the clearing activity until the young have fledged. A species-specific buffer zone restricting active maintenance activities is typically applied around a nest location.

The potential effects of electric and magnetic fields (EMF) on wildlife, much like the effects of EMF on humans, are a subject of continuing debate. The World Health Organization report on environmental effects of EMF concluded that effects of EMF associated with major electric technologies are few, generally minor in nature and confined to the vicinity of high-powered sources (Foster and Repacholi, 2002). It was further concluded that "human EMF exposure limits recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) would also be protective of the environment." The proposed Project will be well within the recommended ICNIRP limits.

Overall, the operation of the proposed New Post Creek Project will have minimal effect on wildlife population or wildlife-carrying capacity in the local study area.

4.4.8 Summary of Potential Effects on the Terrestrial Environment and Mitigation/Remedial Measures

Table 4.15 summarizes potential construction and operation effects, the recommended mitigation/remedial measures to minimize or obviate these effects and the net effects of the proposed New Post Creek Project on the terrestrial environment.

Table 4.15 Summary of Potential Effects on the Terrestrial Environment and Recommended Mitigation/Remedial Measures

Effect	Recommended Mitigation/Remedial Measure	Net Effect
Construction		
Air quality/fugitive dust	• Use of well-maintained equipment to minimize combustion emissions. • Use of water trucks and/or sprinklers (e.g., Cheminfo, 2005).	Negligible effect
Noise	• Use of well-maintained equipment and noise silencers (as required).	Negligible effect
Blasting	• Adherence to blasting engineer recommendations.	Negligible effect
Soil erosion	• Adherence to Erosion and Sediment Control Plan.	Negligible effect
Incidental spills of oil, gasoline and other liquids during construction	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect
Hazardous materials/ waste	• Adherence to Hazardous Materials Management Plan and Waste Management Plan. • Waste disposal in accordance with regulatory requirements.	Negligible effect

Table 4.15 Summary of Potential Effects on the Terrestrial Environment and Recommended Mitigation/Remedial Measures (Cont'd)

Effect	Recommended Mitigation/Remedial Measure	Net Effect
Construction		
Vegetation clearing	• Adherence to standard construction practices. • Implementation of the Site Rehabilitation Plan.	Negligible effect
Partial plantation loss	• Forest Renewal Trust Fund compensation.	Negligible effect
Loss of productive forest	• None recommended: permanent loss represents approximately 1% of productive forest in the local study area.	Negligible effect
Organic Meadow Marsh disturbance	• Avoidance by proposed transmission line routing	Negligible effect
Increased human activity	• No harassment of wildlife. • No fishing, hunting or recreational ATV use.	Negligible effect
Displacement of nesting birds	• Vegetation clearing to be undertaken outside the migratory bird breeding season (01 May to 31 July).	Negligible effect
Operation		
Noise	• Ambient noise levels will be localized.	Negligible effect
Incidental spills of oil, gasoline and other liquids during operation	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect
Inundation	• None recommended: dominant vegetation communities adapted to disturbance and water level fluctuations; some communities may transition to other type. • None recommended: significant wildlife habitat associated with Intolerant Hardwood Marsh (Map Units 113 and 114; see Figure 4.13a) will likely increase in size due to inundation. • None recommended: significant wildlife habitat associated with Hardwood Swamp (Map Unit 54; see Figure 4.13d) will likely diminish in area due to the proposed inundation.	Negligible effect Net benefit
Flow reduction	• None recommended: significant wildlife habitat associated with Active Cliff (Map Unit 118; see Figure 4.13b) will likely diminish in size due to flow reduction.	Minor effect

4.5 SPECIES AT RISK

As indicated in Section 4.4.5.4, no SAR plant species were documented during the field surveys or within the local study area based on examination of the NHIC (2012) and Environment Canada, CWS (2010/2011) databases.

As indicated in Section 3.2.6, the proposed Project is located within the “Kesagami Caribou Range”. No Woodland Caribou, designated as Threatened federally (COSEWIC, 2012) and provincially (MNR, 2013), have been recorded within 5 km of the proposed Project GS site (M. Gauthier, MNR, 2011, pers. comm.), likely due to the presence of roads and clearings. According to NRVIS data, Woodland Caribou wintering areas occur approximately 4 km north and 3 km south of the proposed transmission line. The MNR will use a caribou habitat screening tool to assess the cumulative impacts of the proposed Project on the local caribou population and range (R. Stewart, MNR, 2011, pers. comm.).

As indicated in Sections 3.2.6 and 3.2.7, most native mammal and avian species likely present in the local study area are ranked by the NHIC (2010) as S5 (secure) and S4 (apparently secure) in Ontario. All of the herptofauna species are ranked by the NHIC (2010) as S5 and S4.

Bald Eagle, designated Special Concern provincially (MNR, 2013) but Not At Risk federally (COSEWIC, 2012), was observed in the summer of 2011 along the Abitibi River shoreline near the proposed Project powerhouse location. However, the only recorded raptor nest is located approximately 1 km north of the proposed Project within LAPP along the Abitibi River.

Canada Warbler, designated as Threatened federally and Special Concern provincially, and Rusty Blackbird, designated Special Concern federally but Not At Risk provincially, have been recorded as possibly breeding in the 10-km by 10-km grids overlapping the New Post Creek Project area. Olive-sided Flycatcher, designated as Threatened federally and Special Concern provincially, may also be present in the proposed Project area (Beacon, 2010). Two additional avian SAR have distribution ranges overlapping the Project area, i.e., Short-eared Owl, designated Special Concern federally and provincially, and Golden Eagle, designated of Special Concern provincially but Not At Risk federally (Environment Canada, CWS, 2010/2011). As indicated in Section 4.4.7.1, the CWS has stipulated that vegetation clearing should not be undertaken during the breeding season of migratory birds in order to avoid the destruction of any bird nests (May 1 to July 31). Otherwise, a nest survey must be undertaken prior to clearing with a buffer established for any nests located that would be maintained until the young have fledged. Adherence to this requirement will mitigate any potential adverse effects on these avian SAR.

The distribution range of Monarch, designated Special Concern federally and provincially, also overlaps the proposed Project area. With the absence of milkweed, the proposed Project site does not provide preferred habitat for the Monarch which has not been recorded within the local study area (NHIC, 2012).

4.6 Socio-Economic, Land and Resource Use Impacts

4.6.1 Socio-Economics

Construction Phase

The proposed New Post Creek Project will have a positive economic effect on the Province, northeastern Ontario and locally in Cochrane District. Positive letters of support have been provided by local Mayors in Cochrane District and appear in the Appendices of the Public and Agency Consultation TSD.

The proposed Project was identified by the Ontario Ministry of Energy (2010) as being under consideration as a clean, renewable cost-effective hydroelectric generation project in "Ontario's Long Term Energy Plan" and offers a substantial opportunity to create approximately 25 MW of power which translates to approximately 125 GWh/year of renewable energy. At full capacity this will meet the needs of 25,000 homes in Ontario.

The proposed Project is expected to result in the creation of 150 to 200 person years (PYs) of work over an approximately 2.5 year construction period. This employment will be distributed across a wide variety of professions and trades typically associated with a remote heavy construction project. Large labour needs will include engineers, equipment operators (e.g., backhoe, crane, dozer), labourers (e.g., general, skilled and unskilled), drillers, cement workers, ironworkers/rodmen, electricians, welders, carpenters and camp support services (e.g., catering, maintenance, drivers, clerical).

The extent to which labour requirements for the proposed Project are to be filled by the regional labour market (i.e., within Cochrane District) will be a function of several factors: union requirements; the match of skill requirements of the Project to local labour supply; quantitative labour needs; existence of other projects in the study; and the degree of worker interest in being employed on the Project. All these factors will contribute to the amount of regional labour used on the proposed Project.

Recent OPG experience on the Lower Mattagami Re-Development Project indicates that approximately 60% of the total labour requirement for the on-site work would be met by the labour market in northern Ontario (Shantz, 2012). The labour required from outside of northern Ontario would be generally managerial, professional and technical professions related to hydroelectric and other large construction projects.

For a construction project, OPG requires that all labour associated with the proposed Project be members of the unions with which it has collective agreements in place. The Electrical Power Systems Construction Association (EPSCA) negotiates and administers collective agreements with the Building Trades for OPG and all contractors performing trades work on OPG projects.

The unions covered under the EPSCA agreement vary from highly specialized workers such as electricians to more generalist trades such as labourers. Local individuals who are qualified to do work but are not union members would be required to join the union that represents their trade.

Opportunities for the region and in particular the local Aboriginal populations to capture a higher proportion of the labour opportunities would be partially dependent on workers ensuring that they are trained and qualified to perform in some of the higher skilled job categories.

Additional indirect and induced employment will also be created as a result of the proposed Project, particularly in sectors associated with the supply of construction materials and the provision of goods and services to the Project and associated workforce. Based on other recent OPG hydroelectric projects in northern Ontario, for every direct job associated with the proposed Project another 0.65 person years of employment will be generated elsewhere in northeastern Ontario.

Economic and business activity effects are all the economic effects associated with sub-contracting opportunities on the proposed Project to the DBC and also the indirect and induced economic effects associated with the Project on the regional economy. Opportunities for existing local businesses and the regional economy will come via contracting work, as well as local Project purchasing and expenditures by workers in the local and regional economy.

Based on previous projects, OPG has estimated that slightly less than one-third of the total expenditure of the proposed Project is likely to occur in a region such as northeastern Ontario. The balance of the expenditure will occur elsewhere in Ontario, Canada and internationally; the ratios of which are somewhat dependent on the selected DBC for the proposed Project.

Some of the more common businesses or sectors in the local and regional economies that will benefit from this proposed Project include:

- Other construction and construction supply (e.g., building or aggregate supply)) companies;
- Local accommodation suppliers (e.g., motels) as short-term workers on the proposed Project visit the area;
- Business, professional and personal services companies that are likely going to experience increased levels of activity;
- Transportation related companies that are likely to experience an increased level of business; and
- Local and regional retail (e.g., convenience stores, grocery stores, drug stores) and food services industries (e.g., restaurants, bars, grocery stores) that will benefit from worker expenditures at these businesses.

Based on other socio-economic studies on hydroelectric projects in northern Ontario, it is estimated that the sales multiplier associated with the proposed Project will be $1.50, i.e., for every dollar expended on the Project an additional $0.50 will be spent within northern Ontario.

It should also be noted that the proposed Project will have additional positive economic benefits for TTN. TTN will benefit both as a partner in the proposed Project and through TTN business and employment opportunities. The proposed New Post Creek Project Team is working to ensure that TTN employment and contracting opportunities are maximized. Employment and contracting opportunities will also be available for other First Nation and Métis Communities.

Little to no effect is expected on the population, demographic or social composition of local communities such as Smooth Rock Falls or Cochrane because of the proposed Project. It is expected that the proposed Project could require a camp, with the camp located at Abitibi Canyon. While the majority of workers are likely to come from various locations in northeastern Ontario, it would be expected that few if any would re-locate their home residences for the purposes of the proposed Project. It is possible that the employment opportunities created by the proposed Project might allow some people from the nearby communities to continue to live in those communities should other employment opportunities not be available.

Operational Phase

The proposed Project will be operated remotely from the OPG NECC and there will be no permanent staff at the facility. However, staff from the Abitibi Canyon will likely be required to undertake periodic maintenance activities. As such, it may have a positive effect on employment levels.

Over the life of the proposed Project, it is expected that the Province will earn approximately $150 million in gross revenue charges from water royalties.

4.6.2 Land Use Planning, Access and Transportation

Little Abitibi Provincial Park

Based on a review of all the relevant Crown Land Use Area Policies, the proposed Project and its ancillary activities are permitted and wholly consistent with the existing land use direction for the area and the PPS (OMMAH, 2005), with the exception of a small part of the Project that was proposed within LAPP.

As indicated in Section 1.1, a small portion of the proposed Project was to be constructed within LAPP and this would be in contravention of the *PPCRA*. The area of LAPP that was deregulated to facilitate proposed Project development is approximately 228 ha, representing approximately 1.1% of the original total park area of 20,296 ha. In return an area of 440 ha has been added as Replacement Lands to the Park, resulting in the current total park area of approximately 20,508 ha.

As indicated in Section 1.1, OPG, CRP and TTN had been working with MNR and Ontario Parks since 2006 to: (i) discuss mechanisms for allowing the hydroelectric facility to be built on lands currently within LAPP, and (ii) discuss the required site release process since the existing MNR Site Release Process does not allow for this. OPG, CRP and TTN came to an agreement with MNR and Ontario Parks for a coordinated process to deregulate a small portion out of LAPP and regulate the Replacement Lands into LAPP. This required that the OWA Class EA for the proposed Project be coordinated with the MNR Class EA.

Hydroelectric Development in the Moose River Basin

In a letter to the Chairman of the Moose River/James Bay Coalition, from then Minister of Environment and Energy, Bud Wildman, the provincial government agreed that "within the Moose River Basin north of Highway 11, there will be no hydroelectric development beyond Ontario Hydro's Mattagami River Hydroelectric Station Extensions project until such time as a co-planning process has been developed, agreed to and applied by the affected First Nations and Ontario". More recent correspondence (August 1, 2007) from A/Assistant Deputy Minister David de Launay of the MNR invited discussion on the Moose River Basin Co-planning Commitment, and proposed to MCFN, TTN and MoCreebec that (1) lands within the Moose River Basin north of Highway 11 could be directly allocated where such applications for new hydroelectric projects are proposed by the local First Nation and/or their development partner; (2) there not be a megawatt limit on the installed capacity of a project; and (3) the current Northern Rivers Policy for the Albany, Winisk, Attawapiskat and Severn Rivers remain in place for the time being.

Subsequently, the MCFN, in a written agreement with TTN, acknowledged receipt of both of the above letters, and agreed to support the proposed New Post Creek Project. Further, the MCFN agreed that the proposed Project could proceed as an exception to the Co-Planning Commitment. Subsequently, MCFN have had substantial involvement in the proposed Project. A Joint Working Group (JWG) was established prior to the commencement of the EA that includes membership of MCFN, TTN, CRP and OPG. A MCFN representative has been hired to work on the proposed New Post Creek Project acting as an MCFN Coordinator on the JWG and identifying relevant MCFN issues to the New Post Creek Project Team. As well, two consultation sessions were held in Moose Factory. In addition, the MCFN trapper, whose trapline is overlapped by the proposed transmission line, has also been consulted.

Similarly, MoCreebec has provided a letter of support to TTN for the proposed New Post Creek Project in light of the co-planning discussions.

Other Land Use and Tenure

OPG currently has a LO for a section of New Post Creek in the vicinity of the New Post Creek Diversion Dam. Various Land Use Permits, Crown Leases and a Construction Lease will be required from MNR under the *Public Lands Act* to allow for short-term tenure authorizing the occupation of Crown land for construction of the proposed Project. Plans and Specifications are required for the construction of the proposed waterpower facility.

A Location Approval is required for the approved use of the proposed Project site for waterpower generation (not construction). As well, CRP/OPG will need to obtain a Waterpower Lease Agreement for the proposed Project once construction is completed and the site is in-service. A new Easement will be required for the proposed inundation area.

A Land Use Permit or an Easement will also be required under the *Public Lands Act* for the transmission line. A Letter of Authority can also be provided by the MNR for the construction of the transmission line in correspondence with a Land Use Permit or Easement.

<u>Access and Transportation</u>

Access to Abitibi Canyon GS and Fraserdale is via provincial highway #634 from Smooth Rock Falls. This is a provincially maintained highway.

Access to the site from Abitibi Canyon GS is via the Otter Rapids Road and then a clay trace site access road. OPG currently maintains the Otter Rapids Road and would continue to do so during the construction period for the proposed Project. The road is deemed sufficient for the purposes of the proposed Project.

The clay trace road from the Otter Rapids Road to the proposed site of the GS will need to be upgraded for the proposed Project. This will be undertaken by the DBC.

Access to the transmission line would be on the west side of the Abitibi River. From Fraserdale the transmission line is accessible via the Branch Road #1 and then an unnamed forestry road. These roads are in good condition and will likely be sufficient for the construction of the transmission line.

With respect to traffic, the operation of the proposed GS will be remotely controlled at OPG NECC and permanent staffing will not be required. However, OPG staff will periodically visit the station to undertake maintenance, minor repairs and tests. It is anticipated that there will be only a couple trips to the proposed GS per week and therefore the incremental traffic on an already lightly used road will be insignificant.

As previously indicated OPG/CRP anticipates that the DBC will establish a workers camp at Abitibi Canyon. Some workers could commute from their homes to the camp. In general, workers will travel from the camp to the work site on a semi-regular basis. Most of the workers will remain at the work site during the day and therefore traffic movement between Abitibi Canyon and the construction site will be controlled and limited.

It should be noted that all roads will have a half load restriction from mid-April to June 1.

4.6.3 Resource Uses

Forest Resources

The SFL for the recently amalgamated Abitibi River Forest will be amended by the MNR through a separate process to change the boundary of the licensed area to account for the proposed Project property.

A FRL would be required from MNR to harvest the timber associated with all aspects of the proposed Project. Wood would have to be skidded out to the existing roads to allow it to be utilized.

It is expected that MNR will determine which forest processing facilities the wood would be directed to at the time of harvest. Depending on when the harvest occurs and the state of markets for forest products in northeastern Ontario, there may not enough volume to be easily marketable, particularly given its location farther from the mills. Therefore, one other option may be to provide the non-economic volume(s) to local TTN or MCFN people.

Stumpage fees would be due to the Crown on the merchantable volumes. Compensation is required and the dollars collected are to go into the appropriate Forest Renewal Trust account. Cochrane District MNR would set the general rule for the $/ha required for artificially-regenerated Crown lands lost to clearing activities. This would be negotiated based on the FRL.

Mining and Prospecting Activities

As indicated in Section 3.4.2.3, there are no mineral claims at or near the proposed Project or in the vicinity of the Replacement Lands; and therefore, there will be no effect to mining and prospecting activities. MNR, working through the Ontario Ministry of Northern Development and Mining, has alienated lands to ensure that there are no new claims in the vicinity of the proposed transmission line, the generating facility including the inundated area and the Replacement Lands.

Hunting

As indicated in Section 3.4.2.4, moose, bear and small game hunting occur in the local study area.

During the construction period, in order to ensure both worker and hunter safety, there will be no hunting in the immediate area of the proposed Project. Because of the area's importance as a hunting area it is important that workers associated with the Construction Phase of the proposed Project not degrade the experience of other users. Therefore, it is recommended that contractors and employees of the DBC be restricted from hunting during the duration of the construction period. As well, overnight trailers and stays by workers will not be permitted.

During the operation period of the proposed Project it is expected that there will be no effects on hunting.

Trapping

As indicated in Section 3.4.2.4, all the trappers in the vicinity of the proposed Project are members of TTN except for one trapper who is a MCFN citizen. The construction of the proposed Project including the intake, headpond, penstocks, powerhouse and most of the transmission line is wholly contained within the trapline of a TTN Trapper with a small segment of the transmission line located within the trapline of the MCFN citizen. The Replacements Lands for LAPP are located wholly within a trapline of another TTN member.

During the full two to three year construction period, it is expected that fur bearing wildlife will leave the area of construction being disturbed by the noise and heavy equipment in the areas around the proposed Project footprint. This effect could be extended up to 1 km from the footprint. This same effect would occur for the transmission line but the effect would be limited to the construction period of less than six months.

None of the trap cabins will be affected by the proposed Project.

OPG/CRP is having direct discussions with the three Trappers with respect to any mitigation and compensation associated with the effects on their traplines.

Recreational Uses

The proposed Project will not displace or disrupt any snowmobile trails in the region.

As Crown land camping does not occur directly at the proposed Project site or along the transmission corridor, there will be no effect on this activity.

4.6.4 Watercourse Uses

Although New Post Creek was not navigable during the summer prior to flow diversion, Ontario Parks may wish that sufficient flows be available during this period to facilitate canoeing within LAPP downstream of the proposed Project intake weir location. This would necessitate the establishment of a new portage either around the proposed Project intake weir in order to continue downstream to the portage around the waterfalls, or alternatively provide access from New Post Creek to the Abitibi River. The existing portage around the waterfalls occurs along a poorly marked upper trail with significant blowdown obstructions and a very steep and slippery trail down to the base of the waterfalls. This portage has been designated as difficult (http://www.myccr.com).

An alternative portage trail approximately 1 km long from New Post Creek to the Abitibi River could be provided to the south of the proposed Project site to facilitate further access for canoeists to LAPP. This alternative would enhance public safety by precluding the need to portage around the proposed Project intake weir on the east side of New Post Creek, and to locate and access the difficult portage around the waterfalls. The areas associated with the proposed alternative portage would be delineated by public safety measures such as booms, buoys and signage, in accordance with MNR and OPG dam safety requirements.

Prior to initiation of construction of the proposed Project, the DBC will identify disembark/launch locations (with appropriate signage) for canoeists to access the new portage trail between New Post Creek and the Abitibi River during the construction period. A map showing the proposed location of the new portage trail will be provided to Ontario Parks and MNR for review and approval. The disembark/launch location on New Post Creek will subsequently likely need to be relocated due to the proposed inundation and the final portage trail location between New Post Creek and the Abitibi River will be discussed with Ontario Parks during the construction phase.

As indicated in Section 3.4.3.4, the New Post Creek waterfalls has been identified as a tourism destination by the www.northernontario.travel website under Wilderness Heritage Canoe Tours. Two tourism operators located in Smooth Rock Falls provide half, full and/or two-day trips to "New Post Falls" and New Post. Reduction of flows over the waterfalls to historic levels may possibly diminish visitor experience appreciation value, particularly with respect to the mist generated by the waterfalls. Although no visual record of the waterfalls is available for the proposed minimum flows of 7.5 and 5 m^3/s during July/August and September, respectively, the waterfalls did generate appreciable mist during an average daily flow of 9.17 m^3/s (see Photograph 4.1). Appreciable mist generation is also expected at the minimum flows of 7.5 and 5 m^3/s.

A reduction of water flowing over New Post Creek waterfalls due to the proposed New Post Creek Project would result in flows more typical of natural conditions as recalled by TTN Elders (P. Archibald Sr., TTN, 2011, pers. comm.). As described by Bell (1904), "an interesting fall is that on the Blue Water river of New Post brook just behind New Post. At this point the small stream enters the Abitibi with an almost vertical fall of ninety feet, flowing directly over the edge of the plateau in a veritable hanging valley" (see Photograph 3.4).

As part of a monitoring commitment (see Section 7.3), CRP/OPG will be undertaking a photographic and video documentation of the minimum flows over the New Post Creek waterfalls in July/August (7.5 m^3/s) and September (5 m^3/s) of the first year of proposed GS operation, particularly with respect to aesthetics (e.g., mist generation). CRP/OPG does not expect this documentation of minimum flows to be significantly different than the average daily flow of 9.17 m^3/s indicated in Photograph 4.1. The photographic and video documentation of minimum flows over the waterfalls will be provided to the MNR for review of aesthetic values and assessment for potential adjustment up or down taking into account net societal economic costs and benefits.

It should be noted that an individual who describes himself as a "friend of the falls" requested additional information on the potential effects of the proposed minimum flows on the scenic value of the New Post Creek waterfalls. Based on the detailed information provided to him by CRP (including Photographs 3.4 and 4.1), he responded with the following: “Thanks so much for the thorough letter and information. Great job. I now know the story….there still will be a falls.” It should also be noted that the New Post Creek waterfalls was not included in a recent inventory of over 425 waterfalls in Ontario (Harris, 2011).

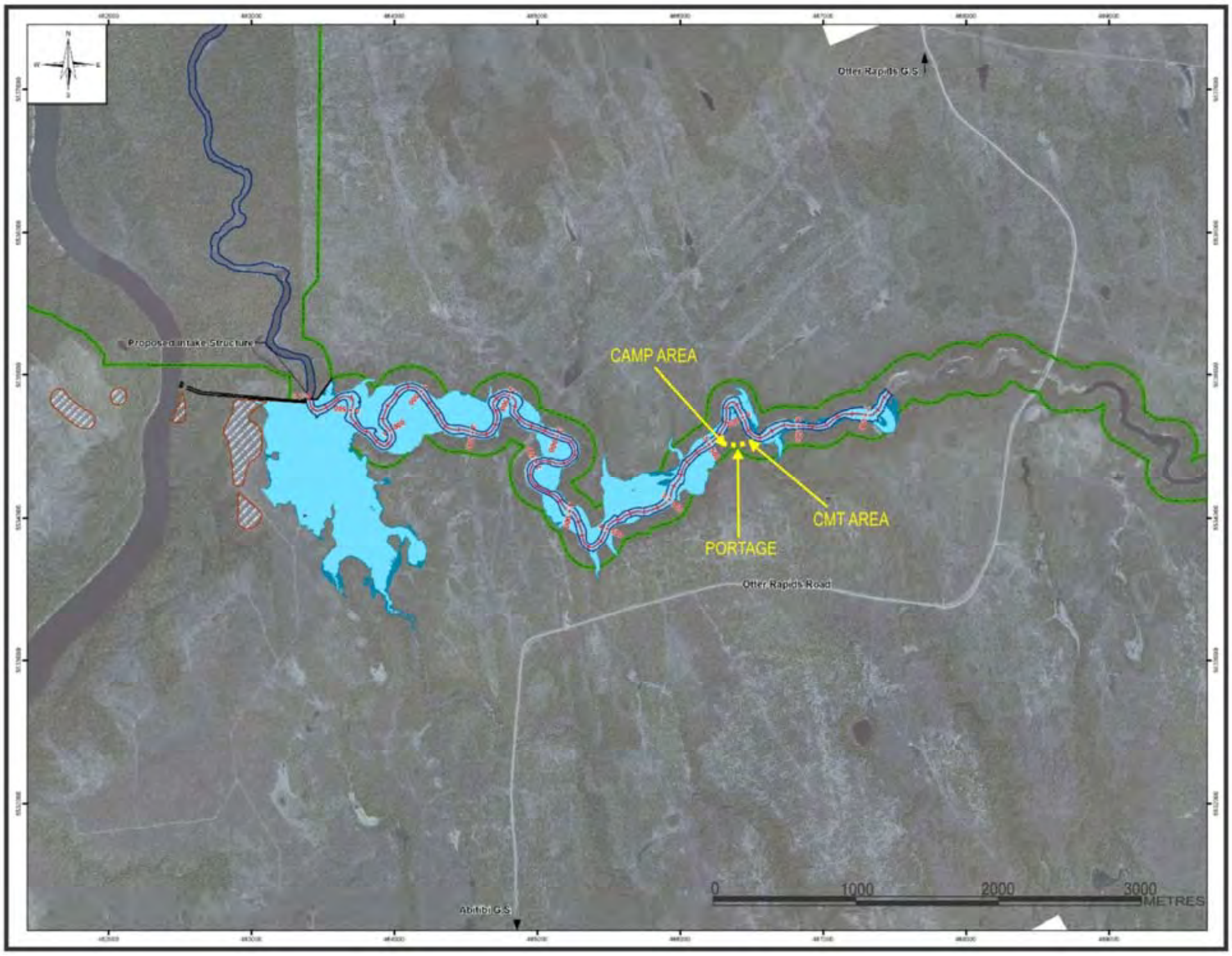
To ensure no adverse effect on sportfish populations, construction workers will not be permitted to sportfish while in camp as a condition of employment. As concluded in Section 4.3.10.3, mercury concentrations in Walleye in New Post Creek below the waterfalls are anticipated to be comparable to pre-development concentrations.

4.7 CULTURAL RESOURCES

As indicated in Section 3.5, no archaeological or cultural heritage resources or sites were located that would be directly affected by the proposed Project. With the exception of approximately 1 km section, all evidence of an old portage from the HBC New Post site to south of Abitibi Canyon has been eliminated through logging activities over the last 50 years. The portion of the portage from the New Post site to New Post Creek located approximately 1 km north of the proposed Project has also been identified. Therefore, the proposed Project will not affect the former trail and no mitigation was recommended. The diversion of the Little Abitibi River caused the potential destruction of almost all former evidence of human habitation along New Post Creek with the exception of the remnant portages that were located.

The only cultural resources (pre-diversion) located along New Post Creek approximately 3 km east of the proposed intake location were associated with a remnant of a former portage used before the diversion to by-pass a formerly un-navigable section of New Post Creek. The occurrence of food containers and Culturally Modified Trees indicated the presence of an historic campsite dating to the early 1900s. Although the proposed inundated (headpond) area will extend beyond 3 km upstream of the intake location, this historic archaeological site (DlHi-1 – Borden number pending) will apparently not be affected (see Figure 4.15). However, it was recommended that further Stage 3 mitigation assessments be undertaken if this site is within the final headpond inundation limits.

Figure 4.15 Location of the Historic Archaeological Site (DlHi-1 – Borden Number Pending) Relative to the Proposed Inundation Area[1]



[1] It should be noted that Figure 4.15 shows the previous LAPP boundary prior to land deregulation and replacement.

4.8 First Nations and Métis Peoples

4.8.1 Taykwa Tagamou Nation

The area of the proposed Project lies in the heart of TTN Traditional Territory and almost exclusively within traplines held by TTN members. The area is well known, understood and used by various TTN members. While no TTN member has a trap cabin at or in the immediate vicinity of the proposed Project, there would be several cabins and/or camps within 10 to 15 km of the proposed Project site and the area is used for hunting and fishing purposes. TTN interests in the area around the proposed Project include trapping, hunting, fishing, historical interests and other possible uses.

According to Wayne Ross, a TTN member and President of CRP, the proposed site of the New Post Creek Project is within the Traditional Territory (trapline) of Peter Sutherland Sr., the last TTN member to reside in the area. The trapline is currently held by Donald Ross a grandson of Peter Sutherland Sr. The site is a few kilometres from where the Treaty was signed. The New Post Creek Diversion Dam built in 1963 was done without prior consultation. LAPP was also established without prior consultation. These two occurrences do not sit well with TTN Membership. TTN realizes decisions were made in the past without prior consultation and some cannot be changed. In order to move on “we must forgive and leave the past behind”. New relationships are being formed with various governmental entities. MNR and Ontario Parks are in agreement and working cooperatively with TTN in moving the proposed Project forward. When the OPG Past Grievance was in negotiations this idea of TTN and OPG forming a partnership in developing the proposed Project site was initiated. The community approved the Past Grievance settlement and partnership for the proposed Project. It has always been TTN’s desire to develop this site, with the opinion that the effects of the proposed Project to the area would be minimal and mitigated to further reduce potential effects.

As indicated in Section 4.6.1, TTN will benefit both as a partner in the proposed Project and through TTN business, and employment opportunities. The proposed New Post Creek Project Team is working to ensure that TTN employment and contracting opportunities are maximized.

The proposed New Post Creek Project provides some unique opportunities for economic and social development of TTN and its members. TTN’s equity share in the proposed Project will provide a steady flow of revenue to use as a source on which to build future development within TTN Traditional Territory. There will also be opportunities for employment during the Construction Phase of the proposed Project.

Trapping

Trapping is a common traditional activity in northern Ontario undertaken by both Aboriginal and non-Aboriginal peoples. Today, trapping is perhaps more important as a social, cultural and personal activity than it is as an economic one.

Three traplines overlap the proposed Project study area:

- Trapline CC-092 held by a TTN member with an area of 23,735.5 ha will be directly affected by the proposed Project components including the intake, penstocks, powerhouse, a portion of the headpond and most of the transmission line;
- Trapline CC-091 held by another TTN member with an area of 54,385.5 ha will be affected by the remainder of the headpond and encompasses the Replacement Lands for LAPP; and
- Trapline CC-185 held by a MCFN citizen with an area of 28,413.9 ha will be affected by the western portion of the transmission line.

The TTN Trapper of Trapline CC-092 will lose the greatest trapline area, estimated to be 92.5 ha. However, given that his trapline includes the proposed GS footprint, an allowance for further additional effect has been included during the full two to three year construction period, as it is expected that fur bearing wildlife will leave the area of construction due to noise and heavy equipment disturbance. This effect could be extended up to 1 km from the footprint. This same effect would occur for the one year construction period for the proposed transmission line. With consideration for adjacent area effects, it is estimated a trapline area of 142.9 ha would be affected, or approximately 1.2% of the total trapline area.

The TTN Trapper with Trapline CC-091 will be unaffected by the proposed Project except for a small area of inundation (102.9 ha, or 0.38% of the trapline area). Therefore, while this trapline will lose some forested habitat, aquatic habitat associated with the proposed headpond will be added and therefore there may be a slight change to the species composition with more aquatic furbearers (e.g., beaver) versus interior forest furbearers (e.g., marten).

As indicated above, the Replacement Lands occur within Trapline CC-091. MNR has already indicated that a Treaty 9 First Nation trapper would not lose any rights to trapping and/or uses of trails, cabins, etc. because of the addition of the Replacement Lands to LAPP. This TTN Trapper has documented his cabin, trails, boat launches and other uses that would be located within the Replacement Lands to ensure they will not be affected by any Park policy or use.

CRP/OPG are having direct discussions with the Trappers with respect to any mitigation and compensation associated with the effects on their traplines. CRP/OPG will work with the Trapper with Trapline CC-092 to facilitate access to his trapline during the construction period.

None of the trap cabins will be affected by the proposed Project.

During the construction period it will be important for the DBC to control beaver populations around the proposed GS footprint during construction (e.g., to prevent major road washouts). It is therefore recommended that the DBC work with the Trappers to control nuisance beaver populations in areas affected by the proposed Project.

During the operation period, it will also be important for CRP/OPG to control beaver populations in and around the proposed GS. It is therefore also recommended that they continue to work with the Trappers to manage beaver in these locations.

Hunting

TTN members are known to hunt in the area around the proposed Project. It would not have any effect on game populations such as Moose; and therefore, there is no likely effect on hunting during the operation period. During construction it is likely that noise and traffic associated with the proposed Project will scare and startle animals near the proposed GS site. However, this would be confined to a small area and therefore result in only a very small loss of hunting area for a two to three year period.

Fishing

TTN members fish widely throughout their Traditional Territory. Fishing by TTN members in the Abitibi River between Abitibi Canyon and Otter Rapids GS is considered to be very limited as is fishing in New Post Creek. The proposed Project is not anticipated to have any effect on the overall abundance of fish in these watercourses. Therefore, no overall effect is anticipated.

Plant/Food Collection

To date TTN members have not indicated that their members collect any native plants or berries in the immediate area associated with the proposed Project. Should any TTN member indicate at some point that they do, it is recommended that CRP/OPG biologists identify other Ecosites in the vicinity in which these plant materials can likely be found.

Heritage and Cultural Resources

As indicated in Section 4.7, based on the heritage assessment undertaken for the EA, there are no known artifacts or heritage values at the proposed Project location. The HBC New Post is an important historic site for TTN. The proposed Project is located approximately 1 km south of the New Post site, and its location and setting are such that it would not be affected. One historic (early 1900s) campsite and Culturally Modified Trees may be affected by the proposed Project inundation. CRP/OPG and its environmental team are recommending a Stage 3 archaeological assessment be undertaken to assess the potential effect should these cultural resources occur within the area of inundation.

4.8.2 Moose Cree First Nation

MCFN interests extend to the west shore of the Abitibi River and the transmission line for the proposed Project occurs within this area. MCFN citizens have identified their environmental interests and concerns specifically water quality and quantity, fish and fish habitat, transmission maintenance and noise pollution. Other interests include business and employment opportunities during the Construction Phase and other possible future hydroelectric development in the Moose River watershed. From historical map biographies, MCFN citizens have harvested in the proposed Project area and may have worked and/or lived in the Fraserdale area during the railway construction and other hydroelectric development.

Trapping

CRP/OPG are aware of and have consulted with the MCFN Trapper with Trapline CC-185. This Trapper and his helpers have actively trapped as a family in this area for approximately 40 years consecutively. Less than 0.1% of his total trapline area will be affected by the proposed transmission line. A small treed area along the proposed transmission line will be lost to the trapline as it will be converted to an open grassland type habitat. This Trapper has indicated to CRP/OPG that the road that would be used for access to construct the proposed transmission line is an area used for harvesting. Therefore this Trapper will experience a short-term temporary disturbance effect and loss of access to his trapline during the proposed transmission line construction period. Furthermore, wildlife will leave the area due to noise and construction activities to return after some period of time after construction. Therefore, as in the case of Trapline CC-092, consideration has been made for additional adjacent area effects (see Section 4.8.1).

As indicated in Section 4.4.1.3, the Trapper's cabin is located proximate to the ONR line approximately 500 m south of the transmission line interconnection and over 7 km from the proposed GS location. As the cabin is outside the 100 m AoC buffer, no adverse effects are anticipated.

Hunting

MCFN citizens (and other hunters) are known to frequent the area on the west side of the Abitibi River and specifically around the location of Trapline CC-185 for Moose hunting during the fall to the early winter season. The MCFN Trapper hunts all year round. As proposed transmission line construction is expected to take place during the colder winter months and Moose will relocate to other undisturbed areas, the re-directed hunting activities are not expected to be significantly affected.

Fishing

MCFN citizens are known to fish on the Abitibi River and Pinard Creek. Fishing in the cold waters of Pinard Creek is of significant interest to MCFN. Therefore, the construction of the transmission line to cross this creek will require special attention to not disturb fish habitat in this creek.

In summary, the proposed Project will have a very minor effect on the trapping and negligible effect on the hunting and fishing activities of MCFN members.

4.8.3 Other First Nations

Based on CRP/OPG knowledge of the area and discussions with Wahgoshig and MoCreebec is opined that there are no Wahgoshig or MoCreebec interests that occur in or near the proposed Project.

4.8.4 Métis Nation of Ontario

As indicated in Sections 4.8.1 and 4.8.2, the three Trappers affected by the proposed Project are First Nations trappers. There are no Métis trappers in the immediate area.

OPG has provided funding as part of the Lower Mattagami Re-Development Project for the Region 3 (essentially northeastern Ontario) to MNO to undertake a Traditional Knowledge and historical study. The Terms of Reference for this study had been developed and the study is near completion. However, to date the MNO has not identified any traditional uses at the proposed Project site although it is recognized that MNO members widely hunt and fish throughout northeastern Ontario.

While no particular traditional sites or activities would appear to be affected by the proposed Project, the MNO has articulated some more general issues and concerns that were discussed at the MNO and TTN meeting in February of 2012 (see Section 5.4).

The MNO have indicated on previous projects that they are opposed to herbicide spraying. At that meeting TTN indicated that they have the same concern and would be asking CRP/OPG to undertake manual and/or mechanical vegetation management for the transmission line ROW.

The MNO also expressed an interest in knowing if any of their traditional plants of interest may be affected by the proposed Project. Subsequently, OPG sent the fieldwork plant list to the MNO to determine if there were any plants of concern. To date the MNO has not indicated a concern or that its members harvest plants in that specific area. That being said, if the MNO does identify plants of concern and its members indicate that they harvest plants from an area affected by the proposed Project, CRP/OPG would ask their biologists to identify other Ecosites where these plants may likely be found.

In order to encourage a positive and on-going relationship, CRP/OPG are encouraging an open door policy with MNO to discuss issues or concerns as they may arise on the proposed Project. An example of this is that MNO has indicated on previous projects to tour the sites during construction and become aware of how the environment is protected. CRP/OPG would continue to provide such an opportunity.

5.0 CONSULTATION WITH FIRST NATIONS AND MÉTIS PEOPLES

More detailed information on First Nation and Métis consultation is provided in the First Nation and Métis Interests and Consultation TSD.

The first step in developing a First Nation and Métis consultation program was to determine which First Nations and Métis groups should be consulted. This assessment was based on the local knowledge of CRP/OPG about traditional territories and users in the area. The assessment also considered other planning exercises having occurred in the area and previous consultations (e.g., forest management planning). Based on this assessment the following First Nations and Aboriginal organizations were identified as having or potentially having an interest in the area of the proposed Project:

- Taykwa Tagamou Nation;
- Moose Cree First Nation;
- Wahgoshig First Nation;
- MoCreebec Council of the Cree Nation; and
- Métis Nation of Ontario, Northern Lights Community Council.

As TTN is a co-proponent on the proposed Project it was obvious that consultation would need to occur with them. Determining the balance of First Nations and Métis interests to be consulted on the proposed Project required more a rigorous assessment process.

Based on a review of Wabun Tribal Council's members Traditional Territory map that appears on the Council website (http://www.wabun.on.ca/major-resource-development-initiatives), it was determined that all components of the proposed Project and any effects would fall outside of this Traditional Territory. Therefore, the decision was made that consultation was not required with Wabun Council First Nations.

As part of the determination process, CRP/OPG also needed to consider previous government policy on Aboriginal involvement in hydroelectric development in the Moose River Basin (see Section 4.6.2). Based on the Moose River Basin Co-planning Commitment and also recognizing that the MCFN self-described Homeland Declaration extends to the western bank of the Abitibi River which includes the lands for the transmission line for this proposed Project, a decision was made to involve MCFN in the consultation process. Subsequently, the MCFN has agreed to actively support the proposed New Post Creek Project.

Because of the Moose River Basin policy discussed above it was also decided that MoCreebec should also be consulted on the proposed Project. Subsequently, MoCreebec has provided a letter of support to TTN for the proposed New Post Creek Project in light of the co-planning discussions.

A decision was made to send a letter to Wahgoshig informing them of the proposed Project even though there was no information that indicated the Project and its extent of effects were located within Wahgoshig Traditional Territory. Wahgoshig is the nearest neighboring First Nation with its community located near the Québec border east of Iroquois Falls, and they were included as a matter of due diligence.

Through its experiences on other projects in northeastern Ontario, OPG was aware that the MNO would also likely to express an interest to be consulted on the proposed Project. The NLCC based in Cochrane is the closest MNO Council to the proposed Project. Therefore they were also added to the list.

To ensure the list of First Nations, Métis and/or other Aboriginal organizations was adequate CRP/OPG consulted with government agencies and followed the direction provided by the MOE, with respect to projects subject to the *EA Act.* In that regard, the MOE website identifies a series of government agencies to which proponents can send letters to assist in potentially identifying First Nations communities and Aboriginal organizations. Letters were sent to the following government agencies:

- Indian and Northern Affairs Canada (INAC), Specific Claims Branch;
- INAC, Environment Unit;
- INAC, Comprehensive Claims Branch (Consultation and Accommodation Unit);
- INAC, Litigation Management and Resolution Branch;
- INAC, Office of the Federal Interlocutor for Métis and Non-Status Indians; and
- Ontario Ministry of Aboriginal Affairs, Consultation Unit.

Responses were received from the Specific Claims Branch, the Environment Unit and the Consultation and Accommodation Unit of INAC. There was no information provided from any of the three units that indicated other First Nation, Métis or Aboriginal groups to contact.

Other than the groups listed above, CRP/OPG have not identified any other First Nation, Métis or Aboriginal organization that would need to be consulted on the proposed Project.

5.1 TAYKWA TAGAMOU NATION

As TTN is a partner on the proposed Project, through the involvement of CRP, in every aspect of proposed Project development. CRP has been permanently staffed by a President (Wayne Ross) from TTN from 2011 to present. While he is the main conduit for TTN participation, he has made an extensive effort to keep the community informed of the proposed Project.

In May 2008, a newsletter series "*New Post Creek Project News*" was commenced by CRP for the purpose of providing information on proposed Project achievements, status and ongoing endeavors to the TTN Community. Several additional newsletters (October 2008, May 2009, November 2009, July 2010, February 2011, July 2011, April 2012, Fall 2012 and Summer 2013) have been distributed within the TTN Community and have been posted on the CRP website: www.coralrapidspower.com, which was set up in October 2008 to provide information and updates to the Community.

CRP keeps TTN leadership informed of the proposed Project by receiving invitations to CRP Board Meetings, specifically Peter Archibald Sr., who is CRP's ex officio who also sits on Council. OPG supplies a quarterly report that is commented on and approved by CRP before submitting to Chief and Council on the progress of the proposed Project. Finally, a briefing report is provided to TTN leadership at the Annual General Meeting, typically held every August. The President of CRP also has an open door policy to speak to individual TTN members on any issue pertaining to the proposed Project whether they are environmental, employment, contracting or business opportunities or equity issues.

Presentations on the proposed New Post Creek Project have been made by CRP, OPG and its consultants at the TTN Annual General meetings for several years running.

Community Meetings on the EA aspects of the proposed Project have been held in November/December 2011 and November/December 2012 at the Reserve outside of Cochrane and in Moosonee where many members reside.

Furthermore, smaller group meetings have been held with key TTN members such as local trappers or individuals interested in contracting or employment opportunities. Consultation has been undertaken formally and informally with the two local TTN trappers directly affected by the proposed Project and is ongoing.

A number of TTN members have been employed during the Concept and Definition Phases of the proposed Project whether as employees of CRP or employees or contractors to the engineering and environmental consultants on the Project.

In addition to the activities noted above, a JWG including TTN, MCFN and CRP/OPG was created to serve as a forum to discuss the concerns of both TTN and MCFN as they relate to the proposed Project. The EA consultant and a representative from MNR and Ontario Parks is available to the JWG as a resource.

An Advisory Committee referred to as the Working Relationship Agreement between MNR, Tembec and TTN meets monthly to discuss any resource development issues within TTN Traditional Territory. This Committee was created to address forestry related issues, and while forestry is still the main focus, they deal with all resource development in TTN Traditional Territory. While CRP/OPG are not a part of these meetings, this committee serves to discuss resource management issues in Cochrane District and it can be a forum to pass on relevant information about the proposed Project to TTN and also CRP/OPG.

While TTN has been completely informed of the proposed Project and is a part of the planning team for all aspects, formal consultation notices were submitted to the Chief of TTN. All consultation letters appear in Appendix A of the First Nation and Métis Interests and Consultation TSD.

5.2 MOOSE CREE FIRST NATION

The MCFN agreed that the proposed Project could proceed as an exception to the Co-Planning Commitment. Subsequently, MCFN has had substantial involvement in the proposed Project. A MCFN Co-ordinator has been hired to work on the proposed Project acting as a community liaison and to identify relevant MCFN issues and concerns. The Co-ordinator is to facilitate MCFN interests, address environmental aspects, liaise with the MCFN Community on potential effects on aboriginal and treaty rights, and coordinate/facilitate MCFN input to the proposed Project.

As indicated in Section 4.1, the JWG involving TTN, MCFN and CRP/OPG was established as a collaborative forum for open dialogue regarding all environmental matters pertaining to the proposed New Post Creek Project. The role of the JWG is to:

- Act as a collaborative forum for open dialogue among members of JWG regarding all environmental matters pertaining to proposed New Post Creek Project;
- As is reasonably required engaging and coordinating with Government Authorities with respect to any environmental approval under the *CEAA* or the *EA Act* (Ontario) or any other Permit;
- As is reasonably required, acting as a collaborative forum for the Parties to review and consider applications for the Permits and preparing any future information reasonably required with respect to the Permits; and
- Acting as a collaborative forum for coordinating relevant research and data collection as may be reasonably required for the purpose of the proposed New Post Creek Project.

In addition to the above, two information sessions were held in Moose Factory on the proposed Project. These were held in November 2011 and December 2012. Approximately 10 to 15 people attended each of these sessions. The participants in the sessions had a number of concerns, questions and interests relating to business and employment opportunities, social and economic concerns, as well as environmental cumulative effects relating to all the hydroelectric projects in northeastern Ontario and their effects on treaty rights and their children's future. The questions raised were addressed at the meetings. SENES received one written comment sheet after the meetings. This individual was interested in knowing all the other hydroelectric development projects occurring in Cochrane District/northeastern Ontario. A response was given to this individual but CRP/OPG recognized this was really a response required from MNR (rather than a proponent) and therefore the concern was passed on to MNR to respond as well to this individual. As well, the MCFN Trapper who attended one of the Public Open Houses indicated that he was concerned with the potential use of herbicides for transmission line ROW maintenance. The CRP/OPG team has indicated to the Trapper and to the MNO that herbicides would not be used for transmission line ROW maintenance.

The MCFN citizen with the most direct interest in the proposed Project is the Trapper who resides in Cochrane and has a trapline on the west side of the Abitibi River. Consultation has been undertaken formally and informally with this individual and CRP/OPG are addressing his concerns and identifying mitigation and compensation measures. Further discussions between the MCFN Trapper, the MCFN Coordinator and CRP/OPG to address effects on this trapline, and proposed mitigation/compensation are continuing.

In addition to the communications through the JWG, formal consultation notices were sent to the Chief of the MCFN and meetings were planned with the MCFN Community as requested and discussed with them. MCFN has requested that CRP/OPG present the final reports to the Community. This meeting is expected to occur after the Notice of Completion is issued.

5.3 OTHER FIRST NATIONS

As indicated in Section 4.9.3, CRP/OPG has opined that Wahgoshig do not have Traditional Territory interests near the proposed Project. However, exercising the precautionary principle a letter was sent to Wahgoshig followed by a telephone call from the President of CRP (Wayne Ross) who personally knows the Chief of Wahgoshig. Chief Babin indicated that Wahgoshig had no concerns about the proposed New Post Creek Project.

As indicated in Section 4.9.3, MoCreebec has provided TTN with written support for the proposed New Post Creek Project. Nevertheless, consultation letters have been sent to MoCreebec to keep them informed about the proposed Project. As indicated in Section 4.9.3, CRP/OPG has determined that MoCreebec have never undertaken activities or have interests in or near the proposed Project.

5.4 MÉTIS NATION OF ONTARIO

The MNO has been sent letters informing them about the proposed Project during the EA process. However, in order to enhance consultation a formal meeting was held among CRP/OPG, MNO, MOE and MNR in February 2012. The purpose of the session was to present the proposed Project, provide a background on the proponents, allow the MNO to describe its organization and people, and discuss issues of interest and concern.

The meeting was very positive and issues of importance to the MNO were discussed. These included some history on the HBC New Post, concerns around the possible use of herbicides and potential loss of existing native plants in the area. General information questions about the proposed Project were also discussed.

It was also discussed at the meeting that OPG has provided the MNO with funding through the Lower Mattagami Re-Development Project (Lower Mattagami Project) to undertake a Traditional Knowledge study (see Section 4.8.4).

Subsequent to the meeting OPG has maintained periodic communications with the MNO Region 3 Consultation Officer. Based on those discussions no further meetings were considered warranted.

6.0 PUBLIC AND AGENCY CONSULTATION

More detailed information on public and agency consultation is provided in the Public and Agency Consultation TSD.

6.1 OVERVIEW

The general consultation approach undertaken as part of the proposed New Post Creek Project involved the following components.

Public Consultation Plan

A public consultation plan was prepared with the overall objective: "to provide the public with an opportunity to have meaningful input on the project and address public concerns where possible and feasible."

The public consultation plan identified various tools and activities to ensure that the public was able to readily obtain information on the proposed Project. These tools included: open houses, project newsletters, a project website and management of on-going public inquiries associated with the proposed Project.

Database

A database of public and agency stakeholders who were to be notified about the proposed Project, open houses and newsletters was developed. The database includes a total of 58 stakeholders, including:

- business owners and contractors with an interest in the construction of the proposed Project;
- general public;
- government agency stakeholders;
- outfitters;
- Aboriginal individuals and organizations;
- other energy and resource (e.g., mining and forest products) companies;
- resource users (e.g., canoeists); and
- municipal interests.

This database was modified and updated regularly during the course of the proposed Project.

All individuals on the database received notifications (primarily via e-mail) about newsletters and open houses.

Project Website

A website was created for the proposed Project and can be found at www.newpostcreek.com. This website was active by October 2011 for the public and its operation has been on-going. Contact information is provided to facilitate inquiries.

The website pages include:

- Home Page;
- Frequently Asked Questions;
- Project Information;
- Notices/Decisions;
- Supporting Documents;
- Newsletters;
- Open House Information; and
- Contact Page.

From May 2012 to April 2013 there had been over 5,700 visits to the website.

Notices and Newsletters

Public notices were circulated prior to each series of open houses and for the commencement of the proposed Project. They were as follows:

- Notice of Commencement and First Open House - November 2011; and
- Notice of Final Open House – November 2012.

The first Open House was advertised in:

- The Cochrane Times Post (English) (November 16 and 23, 2011);
- Kapuskasing Northern Times (English) (November 16 and 23, 2011);
- Kapuskasing L'Horizon (French) (November 16 and 23, 2011); and
- Kapuskasing Weekender (French and English) (November 17 and 24, 2011).

The second Open House was advertised in:

- Cochrane Times Post (English) on November 15 and 22, 2012;
- le Weekender (French and English) on November 15 and 22, 2012; and
- Kapuskasing Northern Times (English) on November 14 and 21, 2012.

Note that because the OWA Class EA was coordinated with the MNR Class EA, MNR also included information on the proposed Project in their mailout and attended all Open Houses and community meetings.

All individuals, business and organizations on the database received a copy of the Notice of Commencement and First Open House, and Notice of Final Open House. Notices were sent via e-mail or Canada Post and were also posted on the proposed Project website.

All Notices are provided in Appendix A of the Public and Agency Consultation TSD.

Two newsletters were produced during the course of the proposed Project. These newsletters appear in Appendix B of the Public and Agency Consultation TSD. They were as follows:

- Newsletter #1 – November 2011; and
- Newsletter #2 – November 2012.

Public Open Houses

Two rounds of Public Open Houses were held for the proposed Project: in November and December of 2011, and in December 2012 (see Sections 6.2.1 and 6.2.2).

6.2 PUBLIC AND AGENCY INPUT

6.2.1 Public Open House #1

The first round of public open houses on the EA for the proposed Project was held on November 30, 2011 in Smooth Rock Falls and December 1, 2011 in Cochrane. Separate consultation sessions were held with the MCFN and TTN at that time (see First Nation and Métis Interests and Consultation TSD).

Staff representation at the Open Houses was from OPG, CRP, KGS Group and SENES. TTN Chief Linda Job and Councillor Peter Archibald attended the Open Houses in Smooth Rock Falls and Cochrane. Representatives of MNR Cochrane District, Ontario Parks and MOE also attended the two sessions.

A total of 22 individuals attended the Open House in Smooth Rock Falls and seven individuals in Cochrane. The attendees represented a combination of general public, resource users (e.g., anglers, canoeists), business interests (i.e., possible contractors), Aboriginal interests and government agency stakeholders.

A total of 25 Information Panels were available for the public to review and staff available to respond to questions. The panels provided an overview of the proposed Project and indicated that an EA process under the OWA (2012a) Class EA was commencing. The panels also explained that federal agencies were also reviewing the proposed Project to determine whether a federal EA was required. The material explained and identified the types of studies and field work that would be undertaken. Finally the proposed Project benefits were identified. These presentation panels can be found on the proposed Project website and are also reproduced in Appendix C of the Public and Agency Consultation TSD.

A comment sheet was provided at the Open House giving the public four weeks to return comments. Only one comment sheet was returned by the public. SENES followed up with this individual.

Most individuals attending the Open Houses indicated support for the proposed Project, recognizing the variety of benefits associated with the Project for northern Ontario. A few concerns and questions were raised about the proposed Project with respect to effects on the fisheries resources, and aesthetic effects on the New Post Creek waterfalls due to the reduced flows resulting from the proposed Project.

The questions and comments received from the public are described below.

Comment/Question from the Public	Response
I am concerned with the fact there will be less water falling over the New Post Creek Falls (tourism/aesthetic concerns)? (Note: This was raised by a few individuals).	While there will be less water flowing over the Falls a minimum permanent year round flow would be provided. That minimum flow has not yet been determined but will be based on studies and consultation. During the spring and early summer there will be significant excess flows in most years.
Concerned with fisheries impacts when there will be less water falling over the Falls.	CRP/OPG has been studying the possible fisheries effects of the proposed Project for the past three years. CRP/OPG has identified that walleye spawn at the base of the Falls but not lake sturgeon or lake whitefish. CRP/OPG will work with the MNR and DFO to ensure that spawning will not be affected. As well, CRP/OPG will work with these agencies to identify a minimum flow that will be provided year round to benefit the fish community.
A number of individuals inquired about the Replacement Lands involved in the deregulation of lands in LAPP.	An explanation was provided on the Replacement Lands for LAPP. It was indicated that these generally are under-represented lands within the Ontario Parks system. The replacement lands are twice the size of the area to be removed from LAPP and the studies done indicate that the ecological integrity of the Replacement Lands are greater than what is to be removed.
A couple individuals wondered about the precedent of deregulating Park lands for a proposed hydroelectric development. (Note there was some acknowledgement that the Park was established without consultation with TTN in the first place and that TTN is a partner on the proposed Project).	MNR and Ontario Parks indicated that there is no precedent. This is a unique situation. It is being entertained because of past circumstances with this particular First Nation – there was a government commitment some years ago to look at this.
Numerous people indicated general interest in the proposed Project.	Acknowledged.
A number of contractors indicated interest in the opportunities associated with the proposed Project.	Acknowledged. General information was shared about the proposed Project.

6.2.2 Public Open House #2

The second round of public open houses on the EA for the proposed Project was held on December 5, 2012 in Smooth Rock Falls and December 6, 2012 in Cochrane. Separate consultation sessions were held with the MCFN and TTN at that time.

Representation at the Open Houses was from OPG, CRP, TTN, KGS Group and SENES. Representatives of MNR Cochrane District, Ontario Parks and MOE also attended the Open Houses.

A total of 29 individuals attended (signed-in) to the two Open Houses with 19 attending in Smooth Rock Falls and 10 individuals in Cochrane. The attendees represented a combination of general public, municipal interests, business interests (i.e., possible contractors and outfitters), Aboriginal interests and government agency stakeholders.

A total of 30 Information Panels were available for the public to review and OPG, CRP, KGS Group and SENES staff were available to respond to questions. The panels provided overviews of the proposed Project and the EA process, as well as descriptions of the proponents, likely environmental effects and recommended mitigation measures, and next steps. The proposed Project benefits were also identified. These presentation panels can be found on the proposed Project website and are also reproduced in Appendix D of the Public and Agency Consultation TSD.

A comment sheet was provided at the Open House giving the public four weeks to return comments. Two comment sheets were returned by the general public and none asked for further follow-up.

Most individuals attending the Open Houses indicated support for the proposed Project, recognizing the variety of benefits associated with the Project for northern Ontario. A few concerns and questions were raised about the proposed Project with respect to aesthetics associated with the reduction of flow over the New Post Creek waterfalls.

The questions and comments received from the public are described below (these were questions provided formally on Comment Sheets as well as verbally to the proposed Project team and/or the government regulators).

Comment/Question from the Public	Response
Effects on the Waterfalls	
Many members of the public inquired about whether flows would remain over the falls?	Yes there would be permanent flow over the waterfalls. These individuals were shown the presentation panel that described the proposed operating regime for the GS and outlined required minimum flows. Some of these individuals were interested in detailed explanations of the proposed minimum flow regimes. It was explained that the minimum flows are adjusted seasonally to address ecological, social and economic concerns as well as being based on the actual flow available at that time of the year. It was also explained that there will be many times (i.e., during the spring) when flows will exceed the minimum flows.
Two general public members (both retired hydro plant operators) wanted general information on the proposed Project indicating that they attended the session because they were concerned about the proximity of the GS to the waterfalls.	General information was provided and these individuals were relieved when it was explained that the GS will actually be a few km away from the waterfalls.
After better understanding the operating regime two outfitters expressed comment on it: (1) Summer flows of 7.5 m^3/s will not be attractive for visitors to the falls; (2) Early September date to reduce flows to 5 m^3/s. should be mid versus beginning of September; and, (3) Acknowledged that public safety and company liability are very important, but concerned that signage close to the waterfalls will take away from its aesthetic value, visitor enjoyment and ultimately outfitter business. They recommended that warning signs be erected away from the immediate waterfalls area (e.g., the confluence of the New Post Creek and Abitibi River and along the park trail from the road north of the waterfalls). There was also some general discussion with the outfitters on how the proposed operating regime would work.	It was explained that the proposed operating regime was considered a compromise among the ecological, social and economic considerations. It was indicated that CRP/OPG and MNR would be willing to consider any input the outfitters have and they were encouraged to put their comments and concerns down on paper for submission and consideration. It was explained that public safety could not be compromised and it was perhaps too early to discuss how such specifics could be worked out. Note subsequent to the second Open House, the CRP/OPG team has responded to questions submitted by the two outfitters. The written response further explained the operation regime, and answered questions on signage, etc.
Contracting and Economic Opportunity Questions	
A few contractors asked about the general design and engineering with no specific concerns being raised but with an expression to be on the mailing list for the proposed Project as they were interested in possible sub-contracting opportunities.	Information on the design and construction was provided. Discussions were held on the probable contracting strategy.

Comment/Question from the Public	Response
I think it's a good idea more electricity will be needed in the future.	Acknowledged
Many members of the public inquired about the general schedule and when construction would be initiated.	The general schedule and contracting strategy was explained.
Lake Abitibi Provincial Park	
A couple members of the public asked why is the Park boundary regulated the way it is and how was the park (LAPP) created?	It was explained by Ontario Parks officials that the long and narrow section of LAPP following the Little Abitibi River is a standard setback for waterway parks and other parks regulated along rivers. The history of the park was explained and that it originated from two neighbouring protected areas.
Specific Questions/Comments	
Will there be fencing around the facility?	A public safety review will be conducted which may include the placement of fencing and/or signage. Public safety will be given high priority.
Where would the camp be placed? How many people?	The camp will be the decision of the DBC; however indications are that there will be a construction camp. The camp would likely be located near the existing Abitibi Canyon staff house area and would accommodate approximately 100 people.
Does the proposed Project have a power purchase agreement?	No, the proposed Project is currently seeking a revenue contract.
Why not use solar power instead of dams? There are already six dams within 100 km of Cochrane.	It was explained that the Province's Long Term Energy Strategy includes power from several sources and that hydroelectric energy is often the most effective and cost efficient form of energy in the system. It was also indicated that at this site it is a hydroelectric opportunity because of available head.
Will we be impacting the flows to the Little Abitibi River – diverting more water?	No, the Little Abitibi River Diversion Dam will operate as it does today.
Will there be any impact to the Otter Rapids Road bridge?	No, the proposed Project effect is contained to downstream of the bridge.
Has there been much forest harvesting in these areas previously?	Yes. We used the transmission panels to indicate areas that have been harvested within the last 15-20 years.
Cabin owner downstream of former HBC New Post site inquired as to whether there will there be an effect on flows near his cabin?	No, the effect to flow is limited to where New Post Creek meets the Abitibi River. Also explained that the New Post Creek flows are only a small portion of the existing flows in the Abitibi River. The owner was satisfied that proposed Project would not affect his cabin or activities.

Comment/Question from the Public	Response
Another outfitter asked if there would be any impacts upstream of the New Post Creek Diversion Dam?	No, there will be no impacts to flows in the area of the outfitters business. The outfitter was satisfied and asked where they could leave positive comments on the proposed Project. A comment card was left indicating that they were satisfied and had no further concern.
Has the First Nation been consulted?	Yes – it was explained that TTN is a partner on the proposed Project, but meetings have been held with the TTN Community on Reserve and in Moosonee. It was explained that consultation was also being undertaken with MCFN and Métis peoples.
Take care of the environment when you do the work there.	Acknowledged.
An outfitter asked where the transmission line would go.	Transmission line runs in the opposite direction of outfitter's business. Outfitter was satisfied the proposed Project would not affect his activities.
General Comments	
Several members of the public asked for general information about the proposed Project but did not raise any specific concerns.	Acknowledged.
Mayor and CAO of Smooth Rock Falls indicated that they are in full support of the proposed Project and also stated to contact them if we require any assistance moving forward. Both gentlemen emphasized the need to involve the Town of Smooth Rock Falls in the construction stage of the proposed Project.	Acknowledged. Subsequent to the Open House, letters of support have been received from the mayors of Smooth Rock, Cochrane, Timmins and Kapuskasing. Copies can be found in the Appendix E.
A number of people said this would be good for the economy.	Acknowledged. No response necessary.

6.2.3 Government Agency Consultation Meetings and Contacts

Consultation with agencies, specifically MNR, DFO, INAC, (now known as AANDC) and the Canadian Environmental Assessment Agency (CEA Agency), started in the Concept Phase of the proposed New Post Creek Project (2006). Significant consultation was initiated in 2006 with MNR and Ontario Parks and continues to the current period. Initial discussions focused on:

- the deregulation of a small area of LAPP;
- assessing and defining Replacement Lands;
- consultation by MNR/Ontario Parks with TTN on the replacement lands options;
- installation of a flow gauge in the New Post Creek downstream of the proposed intake;
- survey of the Park boundary;
- discussions with respect to field work including geotechnical work inside and outside the Park;

- ecological integrity;
- understanding the inundation area upstream of the intake; and
- minimum flow (preliminary discussions on minimum flow with MNR were continued in greater detail during the EA process).

The nature of the consultation varied from:

- face to face meetings;
- regular phone calls with the District Manager and Planner(s);
- creation of a Task Team with membership from MNR, Ontario Parks, TTN, CRP and OPG; and
- facilitation of a team of MNR biologists and planners to undertake field work at the proposed New Post Creek Project site and vicinity to assess the proposed replacement lands (accommodation for one week was provided to MNR and Ontario Parks staff at the Abitibi Canyon staff house).

In addition to discussions with MNR noted above, the CRP/OPG team met with CEA Agency at their office during the Concept Phase to provide a Project overview, and also met with INAC to provide a similar update. A meeting was also held with DFO and MNR on January 7, 2011 to discuss MNR's suggested fisheries baseline fieldwork requirements for New Post Creek.

A summary of agency consultation activities undertaken once the EA commenced in May 2011 is provided below. CRP/OPG has consulted with various provincial and federal government agencies throughout the EA process. Some key dates and topics are summarized below:

- May 25, 2011 – Multi-Agency Meeting to Introduce the Project. Representation in person or on phone by MNR/Ontario Parks, MOE, MTCS, DFO, Transport Canada and Environment Canada. The intention of this all day meeting was to introduce the proposed Project and outline proposed field studies.
- June 6, 2011 – Meeting with the CEA Agency and AANDC introducing the proposed Project.
- October 20, 2011 – Meeting with the MNR, Ontario Parks and DFO on an approach to developing an operating regime for the proposed GS.
- November 30, 2011 – Visit to proposed New Post Creek Project site for interested regulators.
- November 2011 – Discussions with Ministry of Energy with respect to the Aboriginal Consultation Plan.
- April 5, 2011 – Meeting with MOE on the proposed Project.
- April 11, 2012 – Meeting with MNR/Ontario Parks, MOE and DFO on the proposed operating regime.
- October 20, 2011 – Proposed Project update meeting with MNR/Ontario Parks and MOE.

- October 27, 2011 – Conference Call with MOE to discuss their hydrological and hydraulic analysis requirements for waterpower projects.
- September 19, 2012 – Meeting with MNR and Ontario Parks to discuss proposed operating regime.
- October 23 – Meeting with MNR/Ontario Parks (DFO invited) to discuss the proposed operating regime.
- October 30, 2012 – Meeting with MNR (DFO invited) to discuss the proposed operating regime.
- Facilitated MOE, MNR, Ontario Parks and AANDC to attend meetings in Moose Factory and Moosonee (for both Open Houses).

In addition to the formal meetings noted above, CRP/OPG has met with and had ongoing communications with the MNR Cochrane District Office, Ontario Parks, MOE and MTCS throughout the EA process.

Finally, the draft ER and associated TSDs were reviewed by the MNR, Ontario Parks, MOE and DFO. All issues, comments, clarification requests and edits were resolved through an iterative process prior to document finalization for public review. CRP/OPG extends acknowledgement and appreciation to the following agency reviewers:

<u>MNR Cochrane District Office</u>

- Gary Funnell, Cochrane/Moosonee Area Supervisor
- Robin Stewart, District Planner
- Carole Boucher, Integrated Resource Management Technical Specialist
- Chris Chenier, Area Biologist
- Stephen Foley, Area Forester
- Derek Seim, Aggregates Technical Specialist
- Leeanne Beaudin, Fish & Wildlife Technical Specialist
- Marc Boucher, (Acting) Lands and Water Technical Specialist
- Peter Kapashesit, Community Liaison Officer

<u>MNR Cochrane Fire Management Headquarters</u>

- Al Winters, Fire Operations Supervisor

<u>MNR Northeast Regional Office</u>

- Rich Pyrce, Hydrologist
- Rob Schryburt, Sr. Project Engineer
- Christine Greenaway, (Acting) Renewable Energy Coordinator

<u>Ontario Parks</u>

- Nancy Daigle, Park Superintendent, Cochrane Cluster
- Will Kershaw, Northeast Zone Sr. Management Planner
- Ed Morris, Northeast Zone Ecologist

MOE

- Bill Armstrong, Regional Environmental Planner, Southwestern Region
- Jacinth Gilliam-Price, Surface Water Specialist, Technical Support, Northern Region (Thunder Bay)
- Carroll Leith, Environmental Officer, Timmins District Office
- Rod Whitlow, Senior Advisor, Aboriginal Affairs Branch
- Joe de Laronde, Senior Advisor, Outreach & Program Support, Aboriginal Support Branch

DFO

- Todd Schwartz, Fisheries Protection Biologist, Fisheries Protection Program, Winnipeg Office, Central and Arctic Region

A Disposition Report has been prepared that provides CRP/OPG responses to all of the review comments from DFO, MNR and MOE (see Appendix A). All comments were deemed by the agencies as having been addressed in the responses.

6.2.4 Other CRP/OPG Consultation

CRP/OPG has also had regular and special communications with Members of Parliaments (MPs), Members of Provincial Parliament (MPPs), municipal representatives and similar agencies in northeastern Ontario. Outlined below are a list of communications updates and special events in which CRP/OPG communicated key aspects of the proposed New Post Creek Project.

- January 12, 2011 – Update letters to Charlie Angus, MP, Timmins-James Bay;
  Michel Arseneault, Mayor, Smooth Rock Falls;
  Gilles Bisson, MPP, Timmins-James Bay;
  Dan Cleroux, Mayor, Coleman Township;
  Carol Hughes, MP, Algoma-Manitoulin-Kapuskasing;
  Carman Kidd, Mayor, Temiskaming Shores;
  Tom Laughren, Mayor, Timmins;
  Victor Mitchell, Mayor, Moosonee;
  Peter Politis, Mayor, Cochrane;
  David Ramsay, MPP, Timiskaming-Cochrane;
  Anthony Rota, MP, Nipissing-Timiskaming; and
  Al Spacek, Mayor, Kapuskasing;
- December 10, 2012 – Update to Charlie Angus, MP, Timmins-James Bay;
  Michel Arseneault, Mayor, Smooth Rock Falls
  Jay Aspin, MP, Nipissing-Timiskaming;
  Gilles Bisson, MPP, Timmins-James Bay;
  Dan Cleroux, Mayor, Coleman Township;
  Carol Hughes, MP, Algoma-Manitoulin-Kapuskasing;

Carman Kidd, Mayor, Temiskaming Shores;
Tom Laughren, Mayor, Timmins;
George Lefebvre, Mayor, Latchford;
Victor Mitchell, Mayor, Moosonee;
Peter Politis, Mayor, Cochrane;
Al Spacek, Mayor, Kapuskasing; and
John Vanthof, MPP, Timiskaming Cochrane;

- March 19, 2013 – Timmins Economic Development Corporation board insight presentation;
- October 15, 2012 – Timmins Regional Economic Outlook Conference (annual conference put on by the Timmins Chamber of Commerce);
- June 9, 2012 – Temiskaming Shores and Area Chamber of Commerce Annual Dinner;
- May 20, 2010 – Timmins Regional Economic Outlook Conference (annual conference put on by the Timmins Chamber of Commerce);
- March 22, 2010 – Town of Cochrane Update (presentation to mayor and council);
- December 8, 2009 – Kapuskasing Community Dinner (presentation made to community leaders and businesses).

6.3 ABITIBI RIVER WMP ADMINISTRATIVE AMENDMENT

In 2000, the *LRIA* was amended to establish the statutory authority of the MNR to order the preparation of a WMP for operation of waterpower facilities and associated control structures and ensure compliance with that plan. The intent of the WMP is to provide certainty and clarity as to how waterpower facilities and control structures are operated with respect to levels and flows of the river system so as to balance environmental, social and economic objectives. The WMP for the Abitibi River system is a complex plan that includes the numerous waterpower structures and facilities located along the river system that have influence on levels and flows (see Section 3.4.3.6). The Abitibi River WMP was approved in 2005. As the proposed New Post Creek Project occurs within this system and with an approved plan in place, the Project is defined under the OWA Class EA as a “New Project on Managed River System”.

The proposed New Post Creek Project is expected to require changes to the Abitibi River WMP. As such, CRP/OPG will be pursuing an Administrative Amendment to the WMP in accordance with MNR requirements. CRP/OPG has met the intent of water management planning through the OWA Class EA process, including the consultation requirements and MNR’s subsequent review and approval of the proposed Project under the *LRIA*.

The water management planning requirements have been addressed through this ER and the TSDs but the key requirements for the Administrative Amendment are presented below.

6.3.1 Proposed GS Alternatives Analysis

As indicated in Section 2.1, in 1982, Ontario Hydro carried out an assessment of the hydroelectric potential of the diverted flows on New Post Creek. The study focused on two sections of the creek downstream of the New Post Creek Diversion Dam, one of which is similar to that presently proposed.

In 1996, Ontario Hydro revisited the site and conducted another review. This study used a head of 68 m, with a plant capacity of 26.4 MW and annual energy production of 175.8 GWh. The location is believed to have been near the New Post Creek waterfalls, located approximately 4.5 km downstream of the proposed Project intake weir location and 1.2 km upstream of the creek outlet to the Abitibi River, but few supporting details are currently available.

In 2006, following the signing of the MoU between OPG and TTN to jointly explore hydroelectric development opportunities within the Abitibi River drainage basin, a concept study was performed for four potential hydro development options (alternatives) on New Post Creek near the waterfalls and within LAPP (KGS Group, 2006). The previous studies maximized the available head by going to local topographic maximums using dykes up to 8 m in height, altering a portion (<1 km^2) of the watershed and shoreline. The 2006 concept study reduced the proposed forebay elevation to minimize flooding of the existing creek shoreline and the flooded shore area within LAPP, thereby also reducing potential impacts on those portions of the creek with erodible silt and sand banks. The locations of the four alternatives assessed by KGS Group (2006) are presented in Figure 2.1.

A summary description for each alternative is provided below:

- **Alternative 1**: Most of this option is located south of LAPP with only the intake and a small section of penstock located in the Park. The in-stream spillway and intake are located at a bedrock outcrop extending across the creek approximately 4.4 km upstream from the waterfalls.

- **Alternative 2**: Farther north of Alternative 1, Alternative 2 is entirely within LAPP. Compared to Alternatives 3 and 4, a smaller area of the Park would require deregulation. The spillway and intake for Alternative 2 are conceptually identical to Alternative 1. However, there is no exposed bedrock and the presence of an old river meander and oxbow indicates the bank and channel are erodible at this location.

- **Alternative 3**: This option required a smaller length of penstock; however, its location in the middle of LAPP and its proximity to the culturally significant HBC New Post site made it unattractive. The spillway and intake for Alternative 3 are conceptually identical to Alternative 1 and would be located on exposed bedrock.

- **Alternative 4:** This option is located at the northernmost section of the Park, adjacent to the New Post Creek waterfalls. This option had the smallest footprint, but was eliminated due to adverse impact to waterfalls aesthetics. In addition, this option would have required the deregulation of the largest area of LAPP. The spillway and intake for Alternative 4 are conceptually similar to that of Alternative 1.

The gross head available for each alternative decreases as one proceeds north along New Post Creek, with the riverbed at Alternative 1 being +59 m above the Abitibi River, while the riverbed at Alternative 4 is in the order of 53 m above the Abitibi River. The resulting loss of gross head with each alternative further downstream has a corollary effect on economic viability. While cost of construction is also a factor in economic viability, the loss of gross head has a negative effect on the ability to produce power at the site. Therefore, selecting an alternative that maximized the gross head allowed for a more economic alternative to be selected. In turn this allowed more flexibility with respect to possible water management options. In addition to the engineering considerations, minimizing the footprint within LAPP was also a key factor in the selection of the proposed site.

6.3.2 Preferred GS Alternative and Rationale

Based on the technical and environmental data collected and presented in the KGS Group (2006) concept study, preliminary ranking indicated that constructing a project within and just south of the Park (Alternative 1) was the preferred development alternative.

In 2009, a study was performed to update and refine the technical feasibility of the Alternative 1 option based on updated topography and surveys, field exploration and reconnaissance of the proposed site, updated project costs, and updated energy production estimates (KGS Group, 2010). On the basis of the 2009 geotechnical investigation (KGS Group, 2013a, b), as well as the feasibility update and review, the project layout was revised and updated. It confirmed that the hydroelectric development potential of New Post Creek at the preferred alternative location (the current proposed New Post Creek Project) appeared technically and economically feasible. In addition to technical benefits, this preferred option (Alternative 1) required the least amount of footprint to be located in LAPP, therefore having the least impact on the Park when compared to the other alternatives.

The proposed New Post Creek Project (Alternative 1) is a 25 MW facility utilizing historic flows diverted from the Little Abitibi River into New Post Creek by the New Post Creek Diversion Dam constructed in 1963 to augment hydroelectric generation at Otter Rapids GS, as well as the natural inflow originating within the New Post Creek catchment area. A small portion of the proposed Project was located within LAPP; however, with subsequent land deregulation and incorporation of the Replacement Lands, all of the proposed Project is located outside of LAPP (see Section 1.1). A transmission line approximately 7 km long will be constructed to the west of the proposed powerhouse to connect to the existing Hydro One 115 kV transmission line extending from Otter Rapids GS to Abitibi Canyon GS. The transmission line is also located outside of LAPP.

6.3.3 Water Management Options Analysis and Preferred Option

Once a decision was made on the proposed location for the proposed Project, work was initiated on water management options including minimum flows and operating levels of the forebay. Section 4.3.1.1 provides a lengthy discussion of the minimum flow deliberations for the proposed Project and is briefly summarized here.

A balance between power and other interests was considered by CRP/OPG to ensure the economic feasibility of the proposed New Post Creek Project. The base case operating scheme, as outlined in the feasibility update report (KGS Group, 2010), involves the passage of established minimum flow over the spillway and the remaining flow diverted from New Post Creek and passed through the turbine units to generate electricity.

The considerations used in the development of the options included: power production, fish spawning and egg incubation below the New Post Creek waterfalls, maintenance of fish habitat in New Post Creek, restoration of historic flow regime with respect to TTN interests, navigable waters and public safety, and waterfall aesthetics.

On October 20, 2011, MNR, Ontario Parks, DFO, OPG and CRP held initial discussions on minimum flow requirements for the proposed New Post Creek Project. During the meeting, MNR indicated that application of the Q_{80} approach to minimal flow for the proposed Project would be acceptable. This was effectively the first option considered. However, it was noted by CRP/OPG that this approach would effectively terminate the proposed Project since the Q_{80} approach uses the flow that is exceeded 80% of the time as a target IFN. If used on a monthly basis for the proposed Project, the Q_{80} would exceed the minimum flows typically observed in New Post Creek during the winter (see Table 3.4).

Following that meeting, CRP/OPG carried out an extensive exercise to assess habitat at various flow conditions in New Post Creek in order to define minimum flow requirements. This work resulted in CRP/OPG proposing minimum flow requirements of 10 m^3/s for the spring spawning period (May-June); 3 m^3/s to maintain basic ecological function for the summer period (July-September); and 1 m^3/s for the winter period (October-April). CRP/OPG also noted that these were minimum flow values that would be exceeded during many times of the year. These proposed values were then presented to MNR and Ontario Parks staff for their consideration, who expressed some concern. This was effectively the second option considered. These minimum flows were discussed during a meeting with MNR, Ontario Parks, DFO and MOE on April 11, 2012. A report on the minimum flow assessment findings and the proposed minimum flows was subsequently prepared (Coker and Portt, 2012e) and provided to the agencies in July 2012.

MNR presented a third alternative defined as the Q_{95} approach (flows equal to or exceeded 95% of the time). The minimum flow requirements were proposed as:

- 19.8 m^3/s for the spring spawning period of May and June, compared to 10.0 m^3/s proposed by CRP/OPG (it should be noted that at the time of this proposal there was uncertainty regarding Lake Sturgeon spawning in New Post Creek);
- 7.5 m^3/s for the summer period of July, August and September, compared to 3.0 m^3/s proposed by CRP/OPG;
- 9.8 m^3/s for the fall period of October and November, compared to 1.0 m^3/s proposed by CRP/OPG; and
- 5.0 m^3/s for the winter period of December to April, compared to 1.0 m^3/s proposed by CRP/OPG.

During a subsequent meeting on October 30, 2012, the MNR reiterated their position that the Q_{95} approach was scientifically defensible as an extreme low flow. However, the MNR did present revised (minimum acceptable) low flows and their rationale. These are presented in Table 6.1 and represented a modification to the third alternative.

Table 6.1 Revised MNR Flow Requirements for New Post Creek

	Minimum Flow (m^3/s)			
	Spring	**Summer**	**Fall**	**Winter**
Q_{95}	19.8	7.5	9.8	5.0
Minimum Acceptable	15	7.5	3.0	3.0
Difference from Q_{95}	-4.8	0	-6.8	-2.0
Pulsing	No	Yes (0.5 m)	Yes (0.5 m)	Yes (0.5 m)

The minimum flow of 15 m^3/s during the spring (May 1 to June 30) was considered to adequately protect aquatic values below the waterfalls. Based on the fisheries information and habitat modeling provided, MNR determined that it was acceptable to depart from the preferred Q_{95} value. However, at that time MNR was not convinced that Lake Sturgeon do not spawn below the waterfalls.

The minimum flow of 7.5 m^3/s during the summer (July 1 to September 30) is defensible as a required low flow. MNR and Ontario Parks indicated that it may or may not fully meet the summer aesthetics flow requirements. However, as the Q_{95}, a minimum flow of 7.5 m^3/s in the summer avoids the question of a net negative change in the ecological integrity of LAPP. A net negative change in ecological integrity would trigger an Ontario Parks review/compensation process that could be lengthy.

MNR agreed that the fall minimum flow should serve as a cap for winter flows and therefore proposed an increase of the low flow requirement during the months of October and November from 1 m^3/s to 3 m^3/s to correspond with that for the winter months (see below).

Being significantly less than the Q_{95}, MNR was uncertain that a minimum flow of 1 m^3/s during the winter (December 1 to April 30) would be sufficient to adequately protect aquatic values, particularly the provision of sufficient overwintering refuge above the waterfalls for benthic macroinvertebrate and fish communities to protect them from freezing and desiccation. However, MNR was also sensitive to the strategic importance the winter season has with respect to power production and proposed Project viability. Therefore, a moderate departure from the Q_{95} to a minimum flow of 3 m^3/s provides a balanced approach that meets both environmental protection and proposed Project viability objectives.

Following this meeting, further discussions on the operating regime occurred, resulting in the collective development of a fourth and preferred option.

With respect to the spring spawning period, CRP/OPG concluded, based on additional field work, that Lake Sturgeon were not spawning in New Post Creek downstream of the waterfalls. The spring spawning minimum flow of 15 m^3/s was agreed to with a timing period of approximately May 1 to mid-June, with timing dependent on Walleye and catostomid spawning and egg incubation period.

The minimum flow of 7.5 m^3/s during the summer was accepted by all parties as maintaining ecological production and based on observations made of the waterfalls at slightly higher flows that aesthetics would likely not be significantly affected.

A flow of 5 m^3/s during September was considered an acceptable transition for the end of summer/early fall from the perspective of ecological production and aesthetics.

A flow of 2 m^3/s was considered acceptable for the winter period based on physical observations of New Post Creek and minimal winter ecological requirements.

This preferred option, its rationale and associated analysis was presented to the public. Generally, there was little concern with what was proposed although there was on-going communications with two outfitters who indicated they were supportive of the proposed Project but were interested in discussing it further (no formal submissions were made by these outfitters as part of the EA process but CRP/OPG indicated that it was open to further discussions with key stakeholders on ecological, economic and social concerns prior to and during proposed Project operation). Both outfitters did communicate with the Project Team with respect to questions they had, and the Team responded to their inquiries (see Sections 6.2.1 and 6.2.2). Adaptive management will be a key principle moving forward (see Section 7.3).

Therefore, as described above, effectively four water management options were considered for the proposed Project.

1. Q_{80} Option – Rejected as this alternative would have flow that is exceeded 80% of the time as a target IFN and would exceed minimal winter flows on some occasions. It would also render the proposed Project uneconomic and therefore to be non-developable.
2. Original CRP/OPG Option – Not preferred by MNR and Ontario Parks for ecological and social reasons.
3. Q_{95} Option – Not preferred as it did not fully reflect actual ecological conditions on New Post Creek and was economically very challenging.
4. Preferred Option – A blended alternative that made the proposed Project economically viable, ecologically responsible and acceptable to agencies and the majority of the public.

In addition to the above four options, there could also be considered a “do nothing” or “null” alternative. However, this would not meet either TTN’s or OPG’s interests and for obvious reasons not considered by CRP/OPG.

The categorization of the first three options above tends to over accentuate the particular interests and mandates of the various stakeholders. Neither MNR/Ontario Parks nor CRP/OPG proposed their alternatives as unalterable final options. All of the first three options were presented as preliminary options that would be subject to rigorous assessment, discussion and deliberation. All the parties strove to come up with a water management option that would make the proposed Project economically viable, respect TTN historic and modern day interests, preserve important ecological functions, have regard for aesthetic and social interests, and promote public safety.

The proposed Project will result in changes to water levels on New Post Creek. Normal operation of the proposed Project will increase the water level in New Post Creek by 5 m at the intake to a FSL of 187.00 m.a.s.l., resulting in a total inundated area of approximately 170 ha (KGS Group, 2012a). The upstream extent of the inundated area (approximately 7,166 m from the proposed intake weir location) is limited by the rather steep gradient at the rapids (see Figure 2.6). Under normal operating conditions, the inundated area will occur within the deregulated park area of approximately 197 ha upstream of the proposed Project spillway (Figure 1.3). Most of the flooding outside of the deregulated area will encompass the unnamed permanent tributary (MNR ID#523) that discharges into New Post Creek approximately 150 m upstream of the proposed Project intake location (Figure 2.6). The size of inundated area associated with the proposed Project was not a concern raised by stakeholders during any public consultation session (see Sections 6.2.1 and 6.2.2).

Considering the planned dimensions of the spillway, the 1:100 year flood levels would be expected to rise by 0.5 m to 187.50 m.a.s.l. The corresponding discharge to the 1:100 year event is 296 m^3/s.

CRP/OPG considered options of further inundation upstream in order to increase the head for the proposed GS. However, this would have resulted in increased civil construction costs and negligible economic benefit.

6.3.4 Operating Plan

Operation of the New Post Creek Diversion Dam has been designed in a manner which requires minimal intervention by OPG personnel. Since 1974, the dam has been operated by leaving the stop logs set at elevation 218.80 m to maximize diversion flow while eliminating the need for ongoing log operations at the dam (OPG *et al*., 2006). When the headwater exceeds this elevation, water spills over the stop logs and flows downstream along the old channel of the Little Abitibi River. The New Post Creek Diversion Dam is critical to the operation of Otter Rapids GS; as a result, CRP/OPG will not be regulating flows downstream in New Post Creek.

Operation of the proposed New Post Creek Hydroelectric GS will be unmanned. No permanent staff will be stationed at the facility. Operating and maintenance personnel will visit the site only to perform specific periodic routine inspection and servicing tasks, or to deal with necessary investigations and repairs, when these are required.

Once placed into service, the proposed GS will be operated from the OPG NECC in Timmins. The station will be monitored on a continuous basis by OPG operators from a control room where all NEPG units are controlled. As well as monitoring the operation of the station, the NECC control room operators will initiate such operations as starting, synchronizing and stopping the turbine generators and adjusting their loads, opening and closing sluice gates as required to manage the forebay operations and downstream flows, and responding to malfunctions of the equipment brought to their attention.

Maintenance of the trash rack and intake, such as removal of timber debris, will be performed manually or with mobile equipment from the intake deck. There is an option to add automated equipment for this activity in the future.

The intake bay for each penstock will have self-closing vertical lift gates to ensure that the penstocks and powerhouse can be safely isolated and dewatered under all conditions.

Maintenance of the draft tubes or turbines will require the use of a draft tube bulkhead system. Consequently, the powerhouse will be equipped with one set of draft tube bulkhead gates (for one unit at a time), with the gates to be installed using a monorail hoist travelling across the tailrace deck. The gates will be stored in the gate slots above tailwater level.

The base case operating scheme, as outlined in the feasibility update report (KGS Group, 2010), involves the passage of minimum flows downstream to the New Post Creek waterfalls with the remaining flow diverted from the creek and passed through the turbine units to generate electricity. During high flow periods, flow diversion will meet the maximum flow capacity of the turbines. Plant capacity will be 50 m^3/s. During spring, significant flows will continue downstream of the intake weir to the waterfalls, as the estimated average New Post Creek flows for May and June are 131 m^3/s and 71 m^3/s, respectively. During the rest of the year, the minimum flow will be first released downstream of the weir, with the remaining flow diverted to the turbines to generate electricity.

When the diverted creek flow is less than the lowest plant operating flow of the smallest turbine unit (typically 40% of the unit capacity for a Francis turbine), pulsed operation would occur. It is expected to occur primarily during the low flow winter periods and would use the limited storage available in the forebay to provide additional generation. Using a FSL of 187.00 m.a.s.l., sufficient storage would be available to augment low creek inflow in order to operate one turbine unit for several hours. This operation could be repeated throughout the day as flow permits, thereby generating additional energy during a period when the plant would otherwise be shut down. The plant will release flow in any day equal to the volume of inflow. This pulsing operation provides additional technical (and cost) benefits such as ensuring continued flow through the penstocks and station heating in the winter months. For example, for two equal sized turbine units with a capacity of 25 m^3/s each, the plant would operate in pulsed mode at riparian flows between approximately 2 and 12 m^3/s during parts of February and March (based on a 2 m^3/s minimum flow for this period). Pulsing will be undertaken during other times of the year when there is not enough flow to provide the minimum flow and run the turbines.

Annual water levels in New Post Creek vary by approximately 3 m. With pulsing, water level fluctuations will be less, but occur more frequently over short periods of time. Water level fluctuations will be limited to 0.5 m below the usual full headpond water level. Pulsing will be permitted at any time during the year within this operating range of 0.5 m provided minimum flows are directed over the spillway and no negative effects due to pulsing, that can not be otherwise mitigated, are observed (G. Funnell, MNR, 2013, pers. comm.).

6.3.4.1 Operating Regime

The existing Abitibi River WMP (OPG *et al*., 2006) will need to be amended through an Administrative Amendment. Flows and levels for the proposed New Post Creek Hydroelectric GS will comply with the amended Abitibi River WMP.

As a pre-condition, it was agreed that the proposed Project will not change the total volume of water flowing into the Abitibi River, or the operating considerations for OPG's Abitibi Canyon GS and Otter Rapids GS. Total flows from New Post Creek into the Abitibi River will remain unchanged (except that there will now be two discharge locations, i.e., at the proposed GS tailrace and the existing New Post Creek outlet). As a result, flow magnitude, frequency, timing, duration and rate of change will be different than current flow conditions at the New Post Creek outlet.

The minimum flows that must be maintained downstream of the spillway structure at all times are provided below:

Period	**Minimum Flow (m^3/s)**
Approximately May 1 to mid-June[1]; timing dependent on spring spawning and egg incubation period[2]	15
Mid-June to August 31	7.5
September 1 to 30	5
October 1 to approximately April 30; timing dependent on Walleye spawning initiation	2

[1] To be expanded to include Lake Sturgeon spawning and egg incubation period if spawning occurrence is demonstrated.

[2] Brief transition of flows from 15 to 7.5 m^3/s from the end of egg incubation (based on thermal units accumulated) with the rampdown rate (m^3/s per day) to be determined in consultation with the MNR and DFO.

The proposed Project will have a relatively small headpond (approximately 170 ha) and will hold approximately 8,000,000 m^3 of water. However, all of the water within the headpond is not available to the proposed facility to use for generation since the facility is only permitted to vary the headpond water level by 0.5 m. Therefore, the headpond will have limited ability to store water and the intended operation of the facility is to utilize the water as it comes down New Post Creek, while maintaining a minimum flow through the downstream creek reach and over the waterfalls. For clarity, the proposed headpond will not be drained for generation and replenished.

The forebay fluctuations are intended to provide operation during low flow periods primarily in late winter and late summer. This pulsing will be an automatic process and will involve the following:

1. The turbines are expected to require a minimum of approximately 10 m^3/s to operate. Any time the total flow in New Post Creek is less than 10 m^3/s plus the minimum downstream flow requirement, the turbine units will not be able to operate.
2. In such situations, the proposed GS will be allowed to draw down the forebay within the prescribed range at a flow rate that will optimize efficiency.
3. When the water level reaches its lower limit, the units will shut down until the forebay returns to its high level. This will not be co-ordinated with the time of day for increasing revenue but will be an automatic process.
4. The fluctuation is expected to be lower in the winter to maintain an ice cover on the forebay.
5. This cycle will repeat most frequently in situations when flows are just below the required 10 m^3/s plus the minimum downstream flow requirement. The situation that would cause the most frequent starts/stops would be during the winter. In such cases the cycle could be expected to repeat every 8 to 48 h, depending upon riparian flow.
6. In the prescribed period where a 50 cm band is achievable, the cycle would be expected to repeat every 48 to 150 h, depending upon riparian flow.
7. The flows downstream of the dam would not change during this process as they will remain as the defined minimum flow requirement.

The 7.5 m^3/s requirement between mid-June and August 31 is used as an example to better illustrate the minimum flow operation. Depending on the available inflow, there are basically three scenarios:

1. When there is not enough flow to provide the minimum flow of 7.5 m^3/s **and** run the turbines (requires approximately 10 m^3/s), the minimum flow of 7.5 m^3/s will continue to be provided down New Post Creek and over the waterfalls. Any remaining water will be held back within the headpond. The headpond has limited capacity to hold water within the 0.5 m band. Therefore, once enough water has collected in the headpond to run the station for a reasonable duration, it will restart and begin generation. When the lower limit of the band is reached, generation will stop. This cycle could happen a few times a day during a low flow period; however, the 7.5 m^3/s minimum flow will be maintained.

2. For the majority of the summer period, it is expected that there will be enough flow to provide the 7.5 m^3/s and operate the proposed GS continuously. The proposed GS will be designed in a manner to run in low flow situations so that operations can continue as frequently as practical in order to minimize any stop/start cycles for the equipment. In this scenario, a constant flow of 7.5 m^3/s is provided down New Post Creek.

3. In situations where the flow exceeds the amount required to provide the 7.5 m^3/s minimum flow and the maximum flow that the proposed GS can utilize (approximately 50 m^3/s), the additional water will be spilled through New Post Creek increasing the flow above 7.5 m^3/s.

In all cases (other than a natural drought condition in which all available flow will be released down the creek), a minimum flow of 7.5 m^3/s will be provided during the summer period downstream in New Post Creek and over the waterfalls.

With respect to water levels, it is proposed that the upper FSL of 187.00 m.a.s.l. be used as the normal maximum operating level with a minimum operating level of 182.00 m.a.s.l. The proposed headpond water levels are summarized below:

- Maximum Operating Level (flood conditions): 187.50 m.a.s.l.
- Normal Maximum Operating Level: 187.00 m.a.s.l.
- Normal Minimum Operating Level: 186.50 m.a.s.l.
- Absolute Minimum Level: 182.00 m.a.s.l.
- Minimum Level for Periodic Headpond Maintenance: 182.30 m.a.s.l.

The proposed New Post Creek Project Operating Plan is summarized below:

Operating Range:	186.50 – 187.00 m.a.s.l.
Absolute Range:	182.00 – 187.50 m.a.s.l.
Energy Emergency:	None
Summer Band:	None

Fisheries Constraint:	During the spring spawning and egg incubation period, a minimum flow of 15 m^3/s shall be directed through the spillway. Following the completion of the egg incubation period, the minimum flow through the spillway shall be reduced from 15 to 7.5 m^3/s at a rate (m^3/s per day) to be determined in consultation with the MNR and DFO. The start date (~May 1) of spring spawning and completion date (~June 15) of egg incubation shall be determined by the Cochrane District MNR Area biologist and communicated to OPG Operations group via the Cochrane District MNR Area Supervisor.
Wildlife Constraint:	None
Winter Range:	None
Flood Allowance:	None
Maximum Discharge:	None
Minimum Discharge:	Summer: Minimum flow of 7.5 m^3/s shall be directed through the spillway at all times between the completion of the egg incubation period (~June 15) and August 31. Fall: Minimum flow of 5 m^3/s shall be directed through the spillway at all times between September 1 and September 30. Winter: Minimum flow of 2 m^3/s shall be directed through the spillway at all times between October 1 and the onset of the Walleye spawning period (~May 1).
Natural Water Level Regime:	Not applicable.
Others:	Educate the Public – WMP consultation program (scoping, options and Draft Plan stages), Public Waterway Safety, and Cottage Association meetings. OPGI website: **www.OPGI.com/envcomm/wateruse/riversystems.asp**, OPGI Public Affairs tel: 1-705-267-7033

The New Post Creek Project operational water levels and minimum flow requirements are shown in Figures 6.1 and 6.2, respectively.

6.3.5 Effectiveness Monitoring

Monitoring measures relevant to the proposed GS and its operations are described below.

Flow discharge, water levels and water temperature will be monitored throughout proposed Project operation. As required by the Abitibi River WMP, CRP/OPG will collect and maintain hourly water level and flow data which will be provided to the MNR as requested for audit purposes.

Figure 6.1 Proposed New Post Creek Project Operational Water Levels

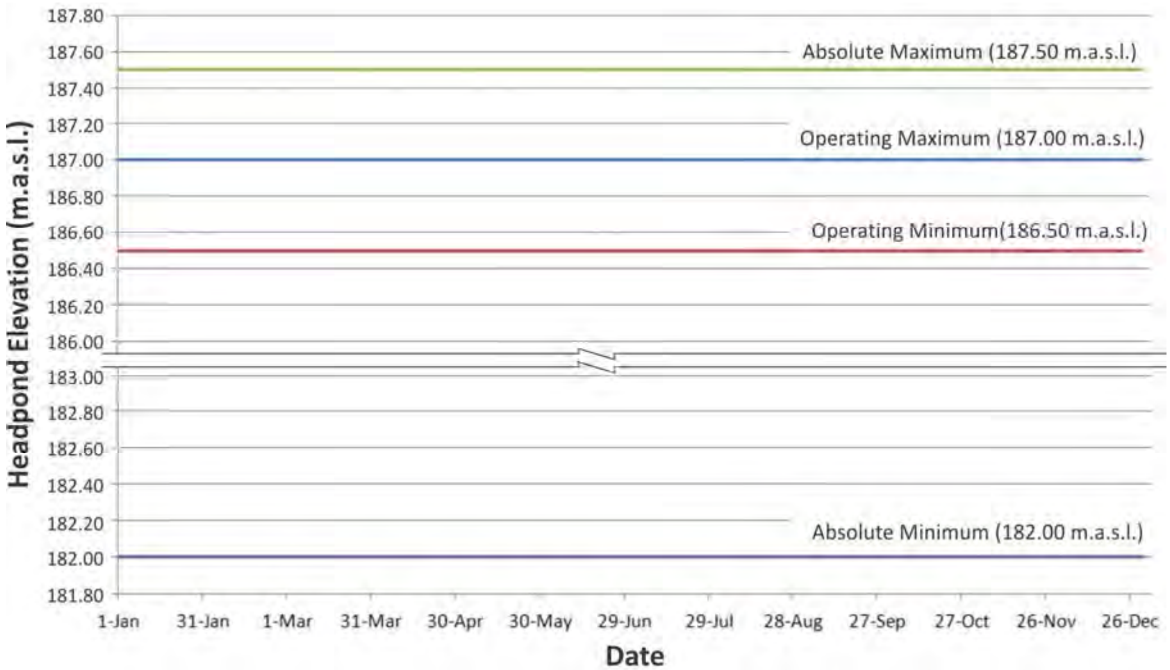
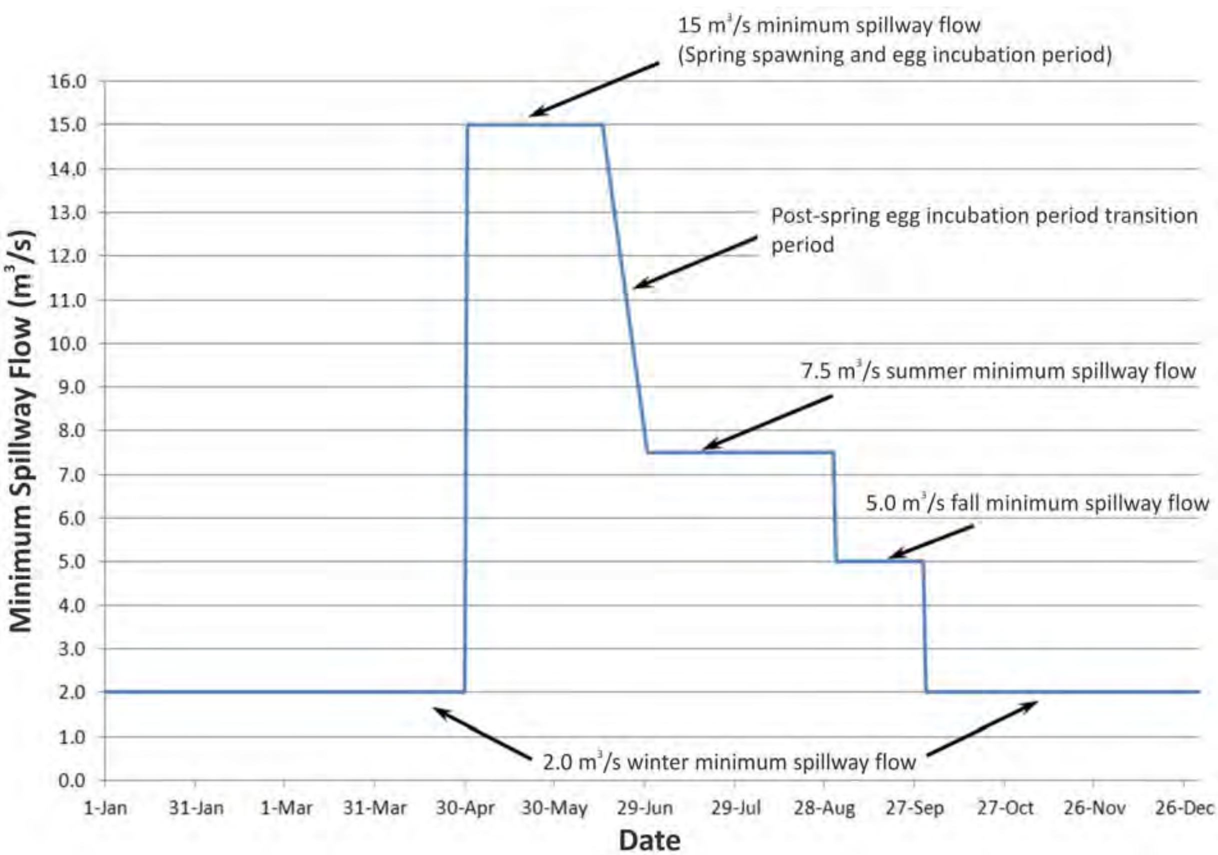


Figure 6.2 Proposed New Post Creek Project Minimum Flow Requirements



As indicated in Section 7.3 under the sub-heading **Operations**, a number of environmental monitoring programs are proposed to be undertaken during operation, including:

- visual monitoring (with photographic documentation) of shoreline erosion and sedimentation upstream and downstream of the proposed dam, at the proposed tailrace and in the watercourses traversed by the proposed transmission line ROW after one complete growing season after initiation of proposed GS operation (water samples for TSS analysis to be collected in any areas of visible turbidity and water temperature to be measured in Pinard Creek) with subsequent monitoring of any sites requiring additional stabilization mitigation;
- temperature/D.O. profile monitoring in the proposed headpond during the summer one and five years after initiation of proposed GS operation to confirm anticipated isothermal conditions, together with the water sample collection for metal (including low-level THg and MeHg) analysis;
- benthic macroinvertebrate community sampling program (using standard techniques) to be undertaken in September in the proposed headpond and at locations previously sampled downstream of the proposed intake weir location one, five and ten years after initiation of proposed GS operation;
- benthic macroinvertebrate community and drift sampling program (using standard techniques) to be undertaken in September in New Post Creek below the waterfalls prior to proposed Project construction initiation to provide a baseline for a subsequent identical sampling program to be undertaken one and five years after initiation of proposed GS operation;
- confirmation and quantification (based on relative abundance) of fish spawning and spawning success (including the Lake Sturgeon spawning period) based on gillnetting, egg collection mat deployment and drift netting in New Post Creek below the waterfalls during the first year of proposed GS operation with minimum flow (15 m^3/s);
- assessment of effects on fish populations and species richness in the proposed headpond based on gillnetting, seining and/or electroshocking approximately one, five and ten years after initiation of proposed GS operation, with frequency established in the finalized Monitoring Program (see below);
- monitoring of THg body burden in Walleye in New Post Creek below the waterfalls and Slimy Sculpin (and any piscivorous fish population, if established) in the inundated area upstream of the proposed Project intake weir location one year after the start of operations and based on findings of significantly elevated fish body burden every five years until mercury concentrations decline to previous background;
- monitoring of TSS concentrations in New Post Creek during the initial two sediment trap evacuation events;
- monitoring of vegetation growth along the transmission line ROW after one complete growing season as part of the vegetation monitoring program;
- monitoring the success of re-planting programs on areas temporarily disturbed during construction after one complete growing season with subsequent monitoring of any sites requiring additional re-planting; and

- photographic and video documentation of minimum flows over the New Post Creek waterfalls, particularly with respect to aesthetics (e.g., mist generation), in July/August (7.5 m^3/s) and September (5 m^3/s) of the first year of proposed GS operation.

CRP/OPG will prepare a draft Monitoring Program document incorporating clearly stated monitoring objectives, identification of performance indicators and measurement endpoints, data collection methods and protocols, monitoring frequency and reporting requirements. The draft document will also include specific commitments around the indicators, methods/procedures, frequency and duration of monitoring, reporting commitments, and proposed actions to be taken in response to the findings. The draft Monitoring Program will be provided to MNR, DFO, MOE and JWG for review and comment. The final Monitoring Program will be submitted to MNR, DFO, MOE and JWG prior to the Location Approval stage of permitting.

CRP/OPG will report the findings of these monitoring studies to the JWG and all relevant government regulatory bodies. Based on review of these findings, any required operational/monitoring changes can be devised and implemented.

In addition to the above recommended mitigation and monitoring measures, CRP/OPG will develop an overall Adaptive Management Program (AMP) for the proposed New Post Creek Project that will consider effects monitoring, adaptive management measures and adjustments to mitigation measures based on observed conditions (e.g., potential adjustment up or down of minimum summer flows to meet waterfalls aesthetics objectives, mitigation of fish entrainment if adverse effects on fisheries resources are determined).

The AMP will be implemented once the proposed GS becomes operational and maintained at least until THg fish body burdens decline to previous backgrounds. The AMP will take into consideration the findings of the environmental monitoring during operation and in consultation with MNR, DFO, MOE and JWG monitoring components will be modified or discontinued. The AMP will address any circumstance indicating that proposed GS operation is having an adverse effect on fisheries resources. The AMP may be combined and/or coordinated with the effectiveness monitoring program of the amended WMP.

6.4 SUMMARY

The two open houses demonstrated that the vast majority of individuals that attended indicated their support for the proposed Project. Two outfitters have expressed concerns about the proposed operating regime. They have submitted their concerns in writing and the CRP/OPG team has provided a response. At least one other individual indicated a concern about the proposed Project but was less concerned following the answers provided. This individual did not submit a Comment Sheet.

Overall, the public and agency consultation process for the proposed New Post Creek Project has been comprehensive and inclusive of all interested individuals and government representatives. In general, the public has been very supportive of the proposed Project recognizing its energy and economic benefits, as well as its importance to TTN.

No individual has indicated an outright opposition to the proposed Project. A few individuals have expressed some questions and concerns and efforts have been made to address these questions and concerns.

It is our opinion that all public comments raised have been addressed and that comprehensive consultation has taken place with relevant agency and government regulators.

7.0 SUMMARY EVALUATION OF THE PROPOSED UNDERTAKING

7.1 ASSESSMENT OF THE SIGNIFICANCE OF EFFECTS

The OWA (2012a) Class EA requires that following the assessment of effects and application of mitigation measures there be an assessment of net effects and their significance (Table 7.1). The environmental components are generally the same as those shown in Table 4.1. The assessment of significance is based on:

- value of the resource affected;
- magnitude of effect;
- geographic extent of the effect;
- duration or frequency of the effect;
- whether it can be reversed; and
- ecological/social context.

The OWA (2012a) Class EA provides some guidance on the definition and meaning of most of these terms:

- value of the resource affected: some values may be given a higher priority than others. For example, an effect on public safety would most often be of more importance than an effect on recreational use.
- magnitude of effect: the size or greatness of the effect (determination of effect magnitude is based on EA practitioner experience and judgement).
- geographic extent of the effect: while the categorization of projects is premised on the environmental context within which projects will occur, potential impacts and benefits should nonetheless be considered based on their geographic extent.
- duration and frequency of the effect: longer term or more frequent effects may be greater.
- irreversibility of the effect: some potential effects may not be easily remedied or mitigated. Some effects can be reversed over a period of time. The potential irreversibility of an effect should be considered.
- ecological/social context: all potential effects should be assessed in both an ecological and social context. The potential impacts or benefits of projects may be significant. For example, impacts that occur in areas or regions that are ecologically fragile and have little resilience to imposed stresses that may be of particular importance. Similarly, benefits to local communities (e.g., flood/drought mitigation) may provide value above and beyond electricity production.

Table 7.1 Assessment of the Significance of Effects

General Natural Environment Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Air quality: exhaust emissions and dust from equipment and vehicles	High	Medium	Low	Primarily localized around construction site	Construction (up to 36 months)	Reversible	Nearest receptor is 500 m from transmission line interconnection and 7 km from proposed GS site (seasonal trapper's cabin)	Not significant	Neutral
Air quality: odour	Low	Medium	Low	Primarily localized around construction site	Construction (up to 36 months)	Reversible	Nearest receptor is 500 m from transmission line interconnection and 7 km from proposed GS site	Not significant	Neutral
Air quality: GHG offsets	Certain	High	Low	>10,000 km	Life of facility	Reversible	Roaded wilderness and resource extraction area	Positive	Positive
Surface water – general construction activities along shoreline of waterway	Low	High	Low	Primarily localized around construction site	Construction (up to 36 months)	Reversible	Roaded wilderness and resource extraction area; no water supply systems	Not significant	Neutral
Surface water - in-water works including construction and removal of the cofferdams	Low	High	Low	Primarily localized around construction site	Construction (up to 36 months)	Reversible	Roaded wilderness and resource extraction area; no water supply systems	Not significant	Neutral

Table 7.1 Assessment of the Significance of Effects (Cont'd)

General Natural Environment Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Contamination from spills or leaks of fuels, hazardous substances, sanitary wastes	Low	High	Low	Primarily localized around construction site	Construction (up to 36 months)	Reversible	Roaded wilderness and resource extraction area; no water supply systems	Not significant	Neutral
Soils and sediment quality	Low	Low	Low	Primarily localized around construction site	Construction (up to 36 months)	Reversible	Roaded wilderness area	Not significant	Neutral
SAR and their habitat	Low	High	No Woodland Caribou observed within 5 km; no other records of Threatened or Endangered species	Possibly within the local study area	Construction (up to 36 months)	Reversible	Much of the habitat loss or transformation is in areas already affected by human disturbance	Not significant	Neutral
Significant earth or life science features	None	High	Low	Pinard Moraine CR located 8 km from proposed GS location and 30 m from transmission interconnection. Access to interconnection by existing roads in CR.	Construction (up to 36 months)	Reversible	Roaded wilderness area	Not significant	Neutral

Table 7.1 Assessment of the Significance of Effects (Cont'd)

General Natural Environment Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Significant natural heritage features and areas	None	-	-	-	-	-	-	-	Neutral
Lands subject to natural or human-made hazards	Low (positive and negative)	Medium	Medium	Localized to some of the shoreline along Abitibi River and New Post Creek	Permanent	Reversible	New Post Creek affected by Little Abitibi River diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapids	Not significant	Neutral
Permanent terrestrial wildlife habitat loss or transformation	Certain	Medium	Medium	$\pm$ 200 ha	Permanent	Not Reversible	Area is part of contiguous boreal forest in northern Ontario; most of the habitat loss is in areas already affected by human disturbance	Insignificant	Very minor negative

Table 7.1 Assessment of the Significance of Effects (Cont'd)

General Natural Environment Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Temporary terrestrial habitat loss	Certain	Medium	Medium	24 ha	Construction (up to 36 months)	Reversible	Area is part of contiguous boreal forest in northern Ontario; most of the habitat loss is in areas already affected by human disturbance	Insignificant	Very minor negative
Loss of significant terrestrial habitat	Certain	High	Medium	Few ha	Permanent	Not reversible	Under-represented in Ecoregion 3E-1	Not significant	Neutral
Loss and degradation of vegetation	Certain	Medium	Medium	± 200 ha	Permanent	Not reversible	Area is comprised of contiguous forest in northern Ontario	Insignificant	Very minor negative
Shoreline dependent species	Low	Medium	Low	Around the proposed GS and intake weir location	Few months during construction at most	Reversible	New Post Creek affected by Little Abitibi River diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapids	Not significant	Neutral
Wetland dependent species	Medium	Medium	Low	Proposed headpond	Permanent	Not reversible	New Post Creek affected by Little Abitibi River diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapids	Not significant	Neutral

Table 7.1 Assessment of the Significance of Effects (Cont'd)

General Natural Environment Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
General disturbance to wildlife	High	Medium	Medium	Approximately 500 ha	Construction (up to 36 months)	Reversible	Most of the area is already subject to human disturbance	Insignificant	Very minor negative (localized)
Fish habitat	High (positive and negative)	High	High	New Post Creek	Permanent	Reversible	New Post Creek affected by Little Abitibi River diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapids	Not significant (positive ≥ negative)	Neutral
Fish movement	High	Low	High	New Post Creek upstream of waterfalls	Permanent	Not reversible	New Post Creek affected by Little Abitibi River diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapids	Not significant (positive ≥ negative)	Neutral
Fisheries	Low-Medium	Low	High	New Post Creek upstream of waterfalls	Permanent	Not reversible	New Post Creek affected by Little Abitibi River diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapids	Not significant (positive ≥ negative)	Neutral
Fish injury or mortality	Low (initially); Uncertain (future)	Low	Low	Powerhouse	Permanent	Irreversible	New Post Creek affected by Little Abitibi River diversion; Abitibi River dammed at Abitibi	Insignificant	Negligible

Table 7.1 Assessment of the Significance of Effects (Cont'd)

General Natural Environment Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
							Canyon and Otter Rapids		
Erosion and sedimentation	Low (positive and negative)	Medium	Low	Around the proposed GS and intake weir location	Permanent	Reversible	New Post Creek affected by Little Abitibi diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapid	Not significant (positive $\geq$ negative)	Neutral
Water levels, flows and movement	Low (positive and negative)	High	High	New Post Creek	Permanent	Reversible	New Post Creek affected by Little Abitibi diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapid	Not significant (positive $\geq$ negative)	Neutral
Drainage, flooding and drought patterns	Low (more positive than negative)	High	Medium	New Post Creek	Permanent	Irreversible	New Post Creek affected by Little Abitibi diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapid	Not significant	Positive
Water temperature	Certain	High	Low	Headpond	Permanent	Irreversible	New Post Creek affected by Little Abitibi diversion; Abitibi River dammed at Abitibi Canyon and Otter Rapid	Insignificant	Minor negative (localized effect)

Table 7.1 Assessment of the Significance of Effects (Cont'd)

Aboriginal Community Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Mercury (in fish)	Certain	High	Medium	Primarily in headpond	10 – 30 years	Reversible	Resident fish are non-sport and primarily benthivores/ planktivores	Significant (Long-term but temporary effect); not significant with respect to aquatic food chain	Minor negative (localized effect)
First Nation Reserves or other Communities	None	-	-	-	-	-	-	-	Neutral
Spiritual, ceremonial, cultural, archaeological or burial sites	None	-	-	-	-	-	-	-	Neutral
Traditional land or resources used for harvesting activities	None	-	-	-	-	-	-	-	Neutral
First Nation employment	High (positive)	High	High	Northeastern Ontario	3 year construction period	Reversible	Northeastern Ontario First Nations have experienced high unemployment and population emigration	Significant	Positive
Lands subject to land claims	None	-	-	-	-	-	-	-	Neutral

Table 7.1 Assessment of the Significance of Effects (Cont'd)

Aboriginal Community Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Economic development	High (positive)	High	High	Northeastern Ontario	3 year construction period and permanent	Reversible	First Nation Communities are economically weaker than the general population	Significant	Positive
Other (training and education)	Low (positive)	High	Low	Northeastern Ontario	3 year training period	Reversible	First Nation communities have lower levels of education and training than the general population	Significant	Positive
Access to inaccessible areas (land or water)	Very low	Low	Low	Proposed Project footprint	Permanent	Reversible	Roaded wilderness and resource extraction area	Not significant	Neutral
Navigation	None	-	-	-	-	-	-	-	Neutral
Riparian rights or privileges	None	-	-	-	-	-	-	-	Neutral
Recreational use – land or water	Low	Medium	Low	Primarily localized around proposed Project footprint	3 year construction period	Reversible	Most of the area already affected by human disturbance	Not significant	Neutral

Table 7.1 Assessment of the Significance of Effects (Cont'd)

Land and Resource Use Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Angling and hunting opportunities (Crown land, not remote tourism)	Low	Medium	Low	Primarily localized around proposed Project footprint	Permanent	Reversible	Most of the area already affected by human disturbance	Not significant	Neutral
Trapping activities	Low	Low-Medium	Very low	Proposed Project local study area	Permanent	Irreversible	Trapping occurs throughout northern Ontario	Not significant	Neutral
Baitfish harvesting activities	None	-	-	-	-	-	-	-	Neutral
Views or aesthetics	High	High	Low	New Post Creek waterfalls	Permanent	Irreversible	Minimum flows anticipated to continue to generate appreciable mist and provide rewarding experience for visitors	Not significant	Neutral
Existing land or resource management plan	None	-	-	-	-	-	-	-	Neutral

Table 7.1 Assessment of the Significance of Effects (Cont'd)

Environmental Component and Issue	Likelihood of Net Effect (after mitigation)	Value of Resource	Magnitude	Geographic Extent	Duration or Frequency	Reversibility	Ecological / Social Context	Significance	Overall Assessment & Discussion
Land and Resource Use Considerations									
Protected areas	High	High	Low	Loss of 197 ha; Gain of 440 ha	Permanent	Irreversible	Area gain of 243 ha and enhancement of overall ecological integrity; disjunction of LAPP as waterway class portion is no longer a continuous system	Insignificant	Negligible
Archaeological sites	None	-	-	-	-	-	-	-	Neutral
Building or structures	None	-	-	-	-	-	-	-	Neutral
Cultural Heritage Landscapes	None	-	-	-	-	-	-	-	Neutral
Social and Economic Considerations									
The location of people, businesses, institutions, or public facilities	None	-	-	-	-	-	-	-	Neutral
Community character, enjoyment of property, or local amenities	None	-	-	-	-	-	-	-	Neutral

Table 7.1 Assessment of the Significance of Effects (Cont'd)

Land and Resource Use Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Employment	High (positive)	High	High	Northeastern Ontario	Construction (up to 36 months)	Reversible	Northeastern Ontario First Nations have experienced high unemployment and population emigration	Significant	Positive
Public health and/or safety	Low	High	High	Around construction areas	Construction (up to 36 months)	Reversible	Construction will occur in an area 75 km from the nearest community and where very few people visit	Not Significant	Neutral
Local, regional or provincial economies	High	High	High	Northeastern Ontario and Province	3 years and permanent	Irreversible	Economic growth has declined in northern Ontario in recent years; local, regional and provincial economies would benefit from additional revenue	Not Significant	Positive

Table 7.1 Assessment of the Significance of Effects (Cont'd)

Cultural Heritage Resource Considerations									
Environmental Component and Issue	**Likelihood of Net Effect (after mitigation)**	**Value of Resource**	**Magnitude**	**Geographic Extent**	**Duration or Frequency**	**Reversibility**	**Ecological / Social Context**	**Significance**	**Overall Assessment & Discussion**
Tourism values	Low	Medium	Low	Proposed Project local study area	Permanent	Reversible	Area is part of contiguous boreal forest in northern Ontario; most of the habitat loss is in areas already affected by human disturbance	Not significant	Neutral
Water supply	None	-	-	-	-	-	-	-	Neutral
Reliability (e.g., voltage support)	None	-	-		-	-	-	-	Neutral
Security (e.g., black start)	None	-	-	-	-	-	-	-	Neutral
Electricity Flow Patterns	-	-	-	-	-	-	-	-	Neutral
Other (pulsing)	High	High	High	Proposed headpond	Permanent	Irreversible	Intermittent operation of proposed GS will increase electricity output and mitigate sudden and potentially frequent flow increases	Positive	Positive

7.2 ADVANTAGES AND DISADVANTAGES OF THE UNDERTAKING AND DISCUSSION OF THE BENEFITS

As per Section 4.3 of the OWA (2012a) Class EA an overall assessment of the advantages and disadvantages of the proposed Project is provided below, including a discussion of any benefits that may offset potential negative environmental effects.

7.2.1 Advantages

The proposed New Post Creek Project will produce a wide variety of benefits for the people of northeastern Ontario, TTN, MCFN and local communities such as Smooth Rock Falls, Cochrane, Timmins and Kapuskasing.

Economic, Employment and Social Advantages

The proposed Project will have an installed capacity of 25 MW and is expected to annually produce approximately 125 GWh of clean renewable power. At full capacity, the proposed Project will generate enough electricity to power approximately 25,000 homes (at full capacity). The proposed Project would have an asset life of over 90 years.

In addition, over its projected asset life, the proposed Project will also contribute about $150 million in Gross Revenue Charges to the provincial economy for water rental payments.

The development of the proposed Project will require a direct workforce equivalent of 150 to 200 PYs of employment over the two and a half years of construction. Based on OPG's experience during the construction of the Lower Mattagami Project it is expected that approximately 60% of employment will be drawn from northeastern Ontario. It would be expected that some of the local workforce that has been employed on the Lower Mattagami Project would likely work at the New Post Creek site. This could include workers from Smooth Rock Falls, Cochrane, Kapuskasing, TTN, Timmins and MCFN.

Additional indirect and induced employment will also be created as a result of the proposed Project, particularly in sectors associated with the supply of construction materials and the provision of goods and services to the Project and associated workforce. Based on other recent OPG hydroelectric projects in northern Ontario, for every direct job associated with the proposed Project another 0.65 person years of employment will be generated elsewhere in northeastern Ontario.

Based on other socio-economic studies on hydroelectric projects in northern Ontario, it is estimated that that the sales multiplier associated with the proposed Project will be $1.50, i.e., for every dollar expended on the Project an additional $0.50 will be spent within northeastern Ontario.

The proposed New Post Creek Project provides some unique opportunities for economic and social development of TTN and its members. TTN's equity share in the proposed Project will provide a steady flow of revenue to use as a source on which to build future development within TTN Traditional Territory. There will also be opportunities for employment during the Construction Phase of the proposed Project.

Environmental Advantages

The utilization of water resources and the establishment of a generating station in an area already manipulated by human influence represent a preferred option over a project proposed on an unaffected watercourse.

Electricity produced by hydroelectric stations in Ontario often displaces power that may otherwise be generated using fossil fuels. Based on anticipated annual energy production of 125 GWh and assuming this energy would displace production from a typical natural gas-fired plant, it is estimated that the proposed Project could offset about 77,000 tonnes of CO_2 annually from normal operations.

The EA and the proposed Environmental Effects Monitoring Program has and will continue to enhance the knowledge level on fisheries resources in New Post Creek and in the Abitibi River between Abitibi Canyon and the creek outlet.

7.2.2 Disadvantages and Benefits Offsetting Disadvantages

The OWA Class EA requires that the disadvantages of the proposed Project also be described along with the benefits offsetting such disadvantages.

It is expected that there will negligible net aquatic ecological disadvantages associated with the proposed Project once all proposed mitigation and monitoring measures are carried out.

The proposed New Post Creek Project will not have a negative effect upon the fish communities of New Post Creek or the Abitibi River, although local shifts in community structure are expected. Upstream of the proposed intake weir, the headpond will create an additional 131.9 ha of aquatic habitat, and alter an existing 37.5 ha of riverine habitat to be slower flowing and deeper. This will provide a greater area and diversity of habitats that could potentially result in a more productive and diverse fish community. Downstream of the proposed intake weir a set of seasonally appropriate minimum flows will ensure that the habitat components and functions in New Post Creek are maintained, including the important Walleye spawning habitat below the waterfalls. The downstream area altered is approximately 32.8 ha. Reductions in downstream habitat area under minimum flows cannot be quantified with the available information, but are considered to be minor. The tailrace discharging to the Abitibi River will not result in the loss of habitat, but will increase habitat diversity in the vicinity of the tailrace.

The total land area to be permanently cleared for the proposed Project is approximately 55 ha, of which 34 ha will involve vegetation community transformation along the transmission line ROW. Much of the land has already been previously disturbed by forest harvesting or road building activities.

Flow reduction downstream of the proposed intake weir location and upstream inundation will result in the diminution of some significant habitat (Active Cliff and Hardwood Swamp) but also an increase in area of Intolerant Hardwood Marsh.

No population level effects are expected on wildlife as a result of the proposed Project. There would likely be a minor localized disturbance effect on wildlife during the construction period.

For the most part the proposed Project will have minimal effect on other land and resource uses with the exception of two small outfitting businesses which occasionally visit the New Post Creek waterfalls with clients. Minimum flows of 7.5 and 5 m^3/s in New Post Creek have been proposed for July/August and September, respectively, that will be less than that currently flowing over the waterfalls (mean summer flow of ~34 m^3/s). Reduction of flows over the waterfalls may possibly diminish visitor experience appreciation value, particularly with respect to most generation. However, this reduction would result in flows more typical of natural conditions as recalled by TTN Elders prior to the diversion of the Little Abitibi River (estimated mean historic summer flow of 3.6 m^3/s). It is anticipated that the minimum flows of 7.5 and 5 m^3/s over the New Post Creek waterfalls will continue to generate appreciable mist and provide a rewarding experience for visitors. Maintaining the current summer flows would make this proposed Project not viable and therefore should the Project not be constructed, the positive benefits noted above, including those potentially accruing to TTN and the local, regional and provincial economy, would not materialize.

7.2.3 Summary of Advantages and Disadvantages

The proposed New Post Creek Hydroelectric Project offers significant advantages to northeastern Ontario communities and TTN. The construction economic benefits would come at a time when the northern Ontario economy has downsized owing to the substantial reduction of the region’s forest products industry.

The proposed Project will benefit Ontario in terms of the gross revenue charges that would be paid to the Province, and by providing a long-term, renewable and reliable energy source that supports provincial green energy, climate change and Aboriginal policies, and aligns well with the needs (e.g., storage) of the provincial electrical system. The Province would also benefit by the related taxes and charges that result from all aspects of the proposed Project.

Any negative environmental effects associated with the proposed Project are minor and/or temporary and most if not all can be addressed through appropriate mitigation and monitoring measures. Lower flows over New Post Creek waterfalls may result in a negative effect on the aesthetic values and tourism, but this effect is considered to be minor.

Finally, this ER presents the view that developing a 25 MW hydroelectric GS on a river system affected by human disturbance is preferable to developing multiple greenfield sites on natural river systems. This proposed Project will have a positive net benefit for the people of Ontario.

7.3 SUMMARY OF MONITORING PROGRAMS

This section contains a summary of planned monitoring programs for the proposed Project for both the construction and operation periods. It also provides general information on the mechanisms for their implementation and reporting although these would be expanded as the proposed Project progresses.

Construction

During construction there will be an Environmental Compliance Monitoring Program (Monitoring Program) in effect to ensure all construction related commitments are met. OPG handles this in a multi-faceted way and has been implemented in hydroelectric construction projects that OPG has completed over the last few years (e.g., re-development of generating stations on the Upper Mattagami and Montreal River systems) and is currently undertaking (the Lower Mattagami Project).

CRP/OPG will retain a DBC for the proposed Project who will have overall responsibility for the proposed Project and environmental management of construction activities. The DBC will be required to ensure that all construction related activities meet all EA commitments, regulatory requirements, permit terms and conditions, and other related environmental guidance. In order to do that the DBC will prepare an Environmental Management Plan (EMP) that will outline how this is to be done, as well as identify all monitoring activities to be undertaken during construction.

This work will require the DBC to monitor the environmental effects of the construction of the proposed Project including among other things adherence to the following:

- EMP in general;
- Erosion and Sediment Control Plan;
- Spills Emergency Preparedness and Response Plan;
- Hazardous Materials Management Plan;
- Waste Management Plan;
- environmental water use;
- noise control;
- any SAR requirements;
- use of explosives;
- requirements outlined in permits such as PTTWs;
- DFO guidelines and blasting engineer recommendations;
- in-water construction timing restrictions;
- Cultural Heritage Monitoring Plan; and
- commitments made in this ER and associated TSDs.

CRP/OPG typically will have an oversight program in place to track and assess DBC compliance with such measures. As well, government regulators will require information as per the specific permits. CRP/OPG will also ensure it has a monitoring program in place to ensure that all mitigation and compensation measures are being implemented whether they pertain to the DBC or CRP/OPG.

CRP/OPG will also require the DBC to have an on-site health and safety coordinator who will review and monitor health and safety issues which arise during the course of construction.

During the construction period three cultural heritage monitoring recommendations have been made:

- Further Stage 3 mitigation assessments be undertaken if the historic archaeological site (DlHi-1 – Borden number pending) is determined to be within the final headpond inundation limits;
- Should previously undocumented archaeological resources be discovered, they may be considered a new archaeological site and therefore subject to section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with section 48(1) of the *Ontario Heritage Act*; and
- The *Cemeteries Act* requires that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries, Ministry of Small Business and Consumer Services.

Operations

Flow discharge, water levels and water temperature will be monitored throughout proposed Project operation. As required by the Abitibi River WMP, CRP/OPG will collect and maintain hourly water level and flow data which will be provided to the MNR as requested for audit purposes.

Recommended environmental monitoring during operation includes:

- visual monitoring (with photographic documentation) of shoreline erosion and sedimentation upstream and downstream of the proposed dam, at the proposed tailrace and in the watercourses traversed by the proposed transmission line ROW after one complete growing season after initiation of proposed GS operation (water samples for TSS analysis to be collected in any areas of visible turbidity and water temperature to be measured in Pinard Creek) with subsequent monitoring of any sites requiring additional stabilization mitigation;
- temperature/D.O. profile monitoring in the proposed headpond during the summer one and five years after initiation of proposed GS operation to confirm anticipated isothermal

conditions, together with the water sample collection for metal (including low-level THg and MeHg) analysis;

- benthic macroinvertebrate community sampling program (using standard techniques) to be undertaken in September in the proposed headpond and at locations previously sampled downstream of the proposed intake weir location one and five years after initiation of proposed GS operation;
- benthic macroinvertebrate community and drift sampling program (using standard techniques) to be undertaken in September in New Post Creek below the waterfalls prior to proposed Project construction initiation to provide a baseline for a subsequent identical sampling program to be undertaken one and five years after initiation of proposed GS operation;
- confirmation and quantification (based on relative abundance) of fish spawning and spawning success (including the Lake Sturgeon spawning period) based on gillnetting, egg collection mat deployment and drift netting in New Post Creek below the waterfalls during the first year of proposed GS operation with minimum flow (15 m^3/s);
- assessment of effects on fish populations and species richness in the proposed headpond based on gillnetting, seining and/or electroshocking approximately one, five and ten years after initiation of proposed GS operation, with frequency established in the finalized Monitoring Program (see below);
- monitoring of THg body burden in Walleye in New Post Creek below the waterfalls and Slimy Sculpin (and any piscivorous fish population, if established) in the inundated area upstream of the proposed Project intake weir location one year after the start of operations and based on findings of significantly elevated fish body burden every five years until mercury concentrations decline to previous background;
- monitoring of TSS concentrations in New Post Creek during the initial two sediment trap evacuation events;
- monitoring of vegetation growth along the transmission line ROW after one complete growing season as part of the vegetation monitoring program;
- monitoring the success of re-planting programs on areas temporarily disturbed during construction after one complete growing season with subsequent monitoring of any sites requiring additional re-planting; and
- photographic and video documentation of minimum flows over the New Post Creek waterfalls, particularly with respect to aesthetics (e.g., mist generation), in July/August (7.5 m^3/s) and September (5 m^3/s) of the first year of proposed GS operation.

CRP/OPG will prepare a draft Monitoring Program document incorporating clearly stated monitoring objectives, identification of performance indicators and measurement endpoints, data collection methods and protocols, monitoring frequency and reporting requirements. The draft document will also include specific commitments around the indicators, methods/procedures, frequency and duration of monitoring, reporting commitments, and proposed actions to be taken in response to the findings. The draft Monitoring Program will be provided to MNR, DFO, MOE and JWG for review and comment. The final Monitoring Program will be submitted to MNR, DFO, MOE and JWG prior to the Location Approval stage of permitting.

CRP/OPG will report the findings of these monitoring studies to the JWG and all relevant government regulatory bodies. Based on review of these findings, any required operational/monitoring changes can be devised and implemented.

Adaptive Management Program

In addition to the above recommended mitigation and monitoring measures, CRP/OPG will develop an overall AMP for the proposed New Post Creek Project that will consider effects monitoring, adaptive management measures and adjustments to mitigation measures based on observed conditions, e.g., potential adjustment up or down of minimum summer flows to meet waterfalls aesthetic objectives, mitigation of fish entrainment if adverse effects on fisheries resources are determined.

The AMP will be implemented once the proposed GS becomes operational and maintained at least until THg fish body burdens decline to previous backgrounds. The AMP will take into consideration the findings of environmental monitoring during operation and in consultation with MNR, DFO, MOE and JWG monitoring components will be modified or discontinued. The AMP will address any circumstance indicating that proposed GS operation is having an adverse effect on fisheries resources. The AMP may be combined and/or coordinated with the effectiveness monitoring program of the amended WMP.

7.4 POST ENVIRONMENTAL ASSESSMENT APPROVALS

Approval under the provincial *EA Act* via the OWA Class EA is the first approval in a series of permits, licences and approvals required for the proposed Project. This EA process concludes the planning stage for the proposed Project.

Following the provincial EA process, the detailed design process may continue. Other legislation will apply that grants authority to designated agencies to review and approve components of the proposed Project prior to its construction and/or operation. This includes the detailed design of the undertaking itself, as well as other activities and facilities that either support construction or supplement the proposed Project.

Section 1.4 of the OWA (2012a) Class EA lists the other key legislative considerations for waterpower projects. From this list, legislation that is likely to apply to the proposed Project includes the *EPA*, *OWRA*, *LRIA* and *Fisheries Act*. The *EA Act* specifically prohibits granting of these other approvals (except for study/research approvals such as the Fish Collectors Permit) prior to *EA Act* approval.

A preliminary list of known environmental permits, licences, clearances and approvals for this proposed Project is provided in Table 7.2. This list will need to be re-confirmed once the final designs and construction plans are developed by the DBC. The permits will also need to be reflective of any regulatory changes to federal and provincial environmental regimes. Depending on the final design and changes to applicable federal and provincial legislation and policies many of these approvals may or may not be required; however, the list is provided for illustrative purposes.

Table 7.2 List of Permits, Licences and Approvals Possibly Required for the Proposed New Post Creek Project

Agency	Statute	Likely Permits, Licences or Approvals	Applicability
PROVINCIAL APPROVALS			
Ontario Energy Board	*Ontario Energy Board Act*	Section 92 approval	Construction of Transmission Line: Order granting leave to construct the 230 kV transmission line and associated infrastructure.
MOE	*EPA*	Environmental Compliance Approvals/ Environmental Activity Sector Registry for emissions or discharge of any contaminants into any part of the natural environment other than water (Part II, Section 8 and Regulations).	Potential Batch Plant Operation: Approval for dust and other emissions from potential batch plant operation. Operation of GS: Approval for backup generators for operational and emergency use. Approval or registration of comfort heating systems.
MOE	*EPA*	Ontario Regulation 347, General Waste Regulation. Transport documentation including Waste Management System	Waste generator registration for hazardous waste generated and ensuring all requirements of Reg. 347 are met during construction. Construction of GS: Approvals for carrier and disposal to an approved waste disposal or transfer site. Operation of GS: OPG would complete its own registration for waste disposal.
PROVINCIAL APPROVALS			
MOE	*OWRA*	PTTW	Construction of GS: For dewatering activities during construction, such as cofferdams or any other activity requiring the taking of more than a total of 50,000 L/day from a lake, stream, river or groundwater source, with some exceptions.
MOE	*OWRA*	PTTW	Operation of GS: For the dam and intake structures. At the time of writing, the permit requirements are not finalized by the MOE.

Table 7.2 List of Permits, Licences and Approvals Possibly Required for the Proposed New Post Creek Project

Agency	Statute	Likely Permits, Licences or Approvals	Applicability
PROVINCIAL APPROVALS			
MOE	*OWRA*	Environmental Compliance Approval	Construction of GS: For temporary settling ponds and any cofferdams requiring pump out. Operation of GS: For any sewage works such as oil containment systems in the powerhouse Approval for stormwater management facility.
MNR	*LRIA*	Approvals under *LRIA*	In-water work not covered under *Public Lands Act.*
MNR	*LRIA*	Section 14 approval	Location Approval for the approved use of the site for waterpower generation (not construction).
MNR	*LRIA*	Section 14 approval	Plans and Specifications Approval for works involving the construction of the new dam and GS.
MNR	*LRIA*	Section 23 approval	Administrative amendment approval to the existing WMP to incorporate the Operating Plan for the new and altered facilities. At the time of writing, the WMP process is under review by MNR and this approval may need to be reconsidered after the EA process.
MNR	*Public Lands Act*	Crown Lease	Short term Crown lease for sediment pond location. Construction Lease Interim Tenure during dam construction.
MNR	*Public Lands Act*	Land Use Permits	Land Use Permits for the occupation of land to support the temporary construction works, concrete batch plant and temporary access roads.
MNR	*Public Lands Act*	Land Use Permit or Easement	Land Use Permit or Easement for the transmission line ROW. A Letter of Authority can be given for the construction of the transmission line ROW in correspondence with the Land Use Permit or an Easement.

Table 7.2 List of Permits, Licences and Approvals Possibly Required for the Proposed New Post Creek Project

Agency	Statute	Likely Permits, Licences or Approvals	Applicability
PROVINCIAL APPROVALS			
MNR	*Public Lands Act*	Section 2(1) Regulation 975	<u>Construction of GS:</u> A Work Permit is required for various construction related activities such as road construction, trails, water crossings and work on shorelands. <u>Operation of GS:</u> Approvals required as needed to maintain the new and altered facilities.
MNR	*Public Lands Act*	Easement Waterpower Lease	Easement required for the inundation. New Waterpower Lease Agreement for the operation and maintenance of the new GS.
MNR	*Fish and Wildlife Conservation Act*	Licence to Collect Fish for Scientific Purposes	<u>Construction of GS:</u> For the capture and transfer of fish following construction of cofferdams and during de-watering. <u>Operation of GS:</u> For aquatic monitoring programs committed to as part of the EA process.
MNR	*Crown Forest Sustainability Act*	FRL	FRL for clearance to harvest and authority to haul timber on Crown land. This includes an assessment of the loss of merchantable timber.
MNR	*Forest Fire Prevention Act*	Permits	Burning of non-merchantable wood material and management of forest fuels left on site (i.e., slash and chipper/mulch piles).
MTCS	*Ontario Heritage Act*	Further MTCS approval may be required	<u>Operation of GS:</u> Stage 3 mitigation assessments required if historic archaeological site (DlHi-1 – Borden number pending) is determined to occur within the final headpond inundation limits.

Table 7.2 List of Permits, Licences and Approvals Possibly Required for the Proposed New Post Creek Project

Agency	Statute	Likely Permits, Licences or Approvals	Applicability
FEDERAL LEGISLATION			
DFO	*Fisheries Act*	Section 32 and 35 authorization Section 22(3) authorization	HADD of fish habitat and destruction of fish that is not caused by fishing. At the time of writing this Environmental Report, amendments to the *Fisheries Act* are under consideration by the federal government. Any approved amendments will require reconsideration following the EA process.
Transport Canada	*Transportation of Dangerous Goods Act*	Explosives Transportation Permit	Required if transporting up to 2,000 kg of explosives during construction. This would be DBC's responsibility to assess need and then obtain if required. However, it is likely not required.
Natural Resources Canada	*Explosives Act*	Paragraph 7(1) (a) of the Law List Regulations occurs when the Minister issues licences for factories and magazine.	Licence if the DBC decides to store a certain quantity of explosives on-site. This is unknown at this point but not probable given the limited size of the proposed Project.

As indicated in Section 2.4.1.2, identification of the specific borrow areas to be used during the construction phase is not possible at the EA stage. Figure 2.2 shows the locations of potential borrow areas. For new aggregate permits, the DBC must comply with *Aggregate Resources Act* and *EA Act* requirements.

The purposes of the Ontario *Environmental Bill of Rights* (*EBR*) are to:

- protect, conserve and where reasonable, restore the integrity of the environment;
- provide sustainability of the environment by the means provided in the Act; and
- protect the right to a healthful environment by the means provided in the Act.

The *EBR* requires a Statement of Environmental Values (SEV) from all designated ministries, including MNR, MOE and MTCS. Prior to permit, licence or other approval issuance for environmentally significant projects, the ministries ensure that their SEVs are met. For example, MNR has developed 11 principles in its SEV that are applied when decisions that might significantly affect the environment need to be made:

1. A sound understanding of natural and ecological systems and how our actions affect them is key to achieving sustainability.
2. As our understanding of the way the natural world works and how our actions affect it is often incomplete, MNR staff should exercise caution and special concern for natural values in the face of such uncertainty.
3. The finite capacity of our natural systems should be recognized in planning and allocation decisions.
4. Natural resources should be properly valued to provide a fair return to Ontarians and to reflect their ecological, social and economic contributions.
5. Participation in resource management by all those who share an interest is a necessary ingredient, particularly in support of communities who must balance economic diversity with other needs. Those affected by proposed changes must have access to information and opportunities to provide input to decisions that affect their lives.
6. Applied research and sharing of scientific and technological knowledge and innovative technologies must be fostered to support the sustainable development of natural resources.
7. An ecosystem approach to managing our natural resources enables a holistic perspective of social, economic and ecological aspects and provides the context for integrated resource development.
8. The planning for and management of natural resources should strive for continuous improvement and effectiveness through adaptive management of natural resources.
9. In order to achieve sustainable development, environmental protection must be an integral part of the development process and cannot be considered in isolation.
10. From both a sound business and environmental perspective, it is less costly and more effective to anticipate and prevent negative environmental impacts before undertaking new activities than it is to correct environmental problems after the fact.
11. Rehabilitating degraded environments is an important aspect of resource stewardship.

The *EBR* requires MNR to ensure that the 11 SEV principles have been considered prior to the issuance of any permits or authorizations for an environmentally sensitive project, such as the proposed New Post Creek Project. This is undertaken by reviewing and documenting the 11 SEV principles and addressing the relevant ones. Once addressed, the document is signed by the District Manager and placed on the project file prior to permitting.

CRP/OPG is of the opinion that the information provided in the ER and associated TSDs for the proposed New Post Creek Project meets the relevant principles of the MNR SEV as well as those of other ministries. This opinion is based on the comprehensive aquatic and terrestrial environmental studies undertaken as part of the EA and their findings. These field studies included:

- flow measurements in New Post Creek (including WSC gauge installation);
- water quality monitoring in New Post Creek;

- benthic macroinvertebrate community assessments in the Abitibi River and New Post Creek;
- fisheries resources assessments in the Abitibi River and New Post Creek (including fish habitat delineation, fish species composition determination and spawning habitat utilization);
- baseline fish mercury body burden determination;
- assessment of minimum flows on fish spawning habitat (utilizing 2D modeling), as well as on other fish habitat and water uses;
- forestry resources assessment;
- vegetation community surveys including mapping of ELC vegetation units and inventories of vascular plants, mosses and lichens; and
- incidental wildlife observations.

Based on the aquatic environment studies, it was determined that the proposed Project will have negligible effects on the aquatic environment, with no adverse residual effects. Walleye spawning may be enhanced due to flow reduction in the spring. Increased fish habitat area and diversity of habitats could potentially result in more productive and diverse fish communities.

Similarly, based on the terrestrial environment studies, it was determined that the proposed Project will have negligible effects on the terrestrial environment, with no adverse residual effects. The loss of some significant wildlife habitat (considered to be underrepresented in Ecoregion 3E-1) will be offset by increases in other significant wildlife habitat area.

Stage 2 archaeological and cultural heritage resources assessments were also undertaken for the proposed Project area, including the former HBC New Post site. No archaeological or cultural heritage resources or sites were located that would be directly affected by the proposed Project.

CRP/OPG is of the opinion that the public and agency consultation process for the proposed Project has been comprehensive and inclusive of all interested individuals and agency representatives. In general, the public has been very supportive of the proposed Project recognizing its energy and economic benefits, as well as its importance to TTN.

Similarly, CRP/OPG is of the opinion that all First Nations and Métis interests have been adequately consulted on the proposed Project.

The operation and monitoring of the proposed Project will be in compliance with the approved Abitibi River WMP. The requirements of the Abitibi River WMP Administrative Amendment process are being met and documented by the EA process.

7.5 Anticipated Timeline for Project Implementation

The proposed New Post Creek Project is currently completing the Definition Phase, which includes:

- completing the OWA Class EA Process;
- selection of a DBC for construction; and
- obtaining a revenue agreement or contract with the Ontario government to purchase the electricity generated from the proposed Project.

When all Definition Phase tasks are complete, CRP/OPG will complete a final review of the proposed Project and make a decision to proceed into the Execution Phase. This phase includes CRP and OPG obtaining respective board approval to proceed.

The earliest time frame in which construction would start is 2014 and it is expected that construction phase will last approximately 30 months.

A more detailed schedule for construction of the proposed Project components and implementation of associated activities will be provided after the EA process is complete, upon request, since the schedule is frequently adjusted based on many other aspects of Project development planning and decision making.

7.6 Conclusions

This ER provides a description of the proposed Project, rationale for its location, description of EA approach and methodology, description of the existing environment, an assessment of effects and proposed mitigation and monitoring measures, a description of public and agency consultation, description of First Nations and Métis consultation, and this summary evaluation of the proposed Project including the overall advantages and disadvantages.

Opportunities have been given for input from government reviewers in the scoping of field studies, the identification of effects, selection of potential mitigation measures and review of technical studies. Over the last 3 years or so, through meetings, discussions and information centres/open houses and web site, substantial effort has been made to regularly inform and involve the public on the proposed Project and to develop a clear understanding of their concerns.

The proposed New Post Creek Project lies within the heart of the Traditional Territory of TTN. This land is of high importance to TTN. TTN has been trying to pursue the development of a hydroelectric project for New Post Creek for many years; and therefore, has made a decision to partner with OPG in order to bring this to fruition. The proposed Project has tremendous support within the community and has been endorsed by membership and the Chief and

Council. Consultation with TTN members has been on-going for many years. Most of the members are anticipating the economic opportunities associated with the proposed Project.

The proposed Project provides some unique opportunities for economic and social development of TTN and its members. TTN's equity share in the proposed Project will provide a steady flow of revenue to use as a source on which to build future development within TTN Traditional Territory. There will also be opportunities for employment during the Construction Phase of the proposed Project. Employment and contracting opportunities will also be available for other First Nation and Métis Communities.

As previously described, it is the view of CRP/OPG that the proposed New Post Creek Hydroelectric Project offers substantial advantages to northeastern Ontario communities and TTN. The economic benefits associated with construction would come at a time when the northern Ontario economy has downsized owing to the substantial reduction of the region's forest products industry.

The proposed Project will benefit Ontario in terms of the gross revenue charges that would be paid to the Province and by providing a long-lived, clean and renewable energy source that will enhance operating flexibility of the regional electricity system and support the needs of the provincial grid. The Province would also benefit by the related taxes and increased local and regional spending that will result from all aspects of the proposed Project.

Most of the potential negative environmental impacts associated with the proposed Project are temporary or can be mitigated or negated by various measures and/or direct compensation measures that CRP/OPG will undertake as part of the proposed Project. There is little in the way of permanent significant adverse residual effect. The proposed Project may have a minor negative effect on aesthetics as there will be less flow over New Post Creek waterfalls. In turn, this may have a minor negative effect on visitor experience appreciation and the two local outfitters who utilize the waterfalls as a tourism attraction for a portion of their businesses.

Finally, CRP/OPG is of the view that developing a hydroelectric project on a river system affected by human disturbance, where the incremental impact is minor, in comparison to developing greenfield sites on natural river systems represents the best net benefit solution for the people of Ontario.

A key objective of this assessment was to identify and resolve all proposed Project issues, in advance of the 30 day review period. CRP/OPG has made efforts to make this happen throughout the process. If outstanding concerns remain after submission of this ER, an elevation request procedure is available for consideration of those concerns. The final result may be resolution of the issues, agreement to deal with the issues through another process, possible amendments to the document, or, if necessary, formal submission of the EA for review and approval as an individual EA under the terms and conditions of the *EA Act*.

CRP/OPG respectfully requests acceptance of the proposed Project as described herein, prepared pursuant to the OWA (2012) Class Environmental Assessment for Waterpower Projects under the Ontario *EA Act*.

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9.0 ACRONYMS AND ABBREVIATIONS

&	And (ampersand)
~	Approximately
$	Dollar
=	Equals
>	Greater than
<	Less than
#	Number
+	Plus
x	Times
2D	Two-dimensional
AANDC	Aboriginal Affairs and Northern Development Canada
A/Assistant	Acting Assistant
ABA	Acid Base Accounting
AMP	Adaptive Management Program
AP	Acid Potential
AoC	Area of Concern
APLIC	Avian Power Line Interaction Committee
ARD	Acid Rock Drainage
ARFMI	Abitibi River Forest Management Inc.
ATV	All-terrain vehicle
Beacon	Beacon Environmental
BMA	Bear Management Area
BMP	Best Management Practice
B.P.	Before present
c.	Chapter
$CaCO_3$	Calcium carbonate
CAO	Chief Administrative Officer
CEAA	*Canadian Environmental Assessment Act*
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
Cheminfo	Cheminfo Services Inc.
circa	At approximately; around; used of dates
CLI	Canada Land Inventory
CO	Carbon monoxide
CO_2	Carbon dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CR	Conservation Reserve
CRP	Coral Rapids Power Inc.
CWS	Canadian Wildlife Service
DBC	Design Build Contractor
DFO	Department of Fisheries and Oceans

e.g.	For example (exempli gratia)
EA	Environmental assessment
EA Act	*Environmental Assessment Act*
EAG	The Environmental Applications Group Limited
EBR	*Environmental Bill of Rights*
ECA	Environmental Compliance Approval
Ed.	Editor
ELC	Ecological Land Classification
EMF	Electric and magnetic fields
EMP	Environmental Management Plan
EPA	*Environmental Protection Act*
EPRI	Electric Power Research Institute, Inc.
EPSCA	Electrical Power Systems Construction Association
ER	Environmental Report
ERDE	Environmental and Resource Development Engineering Inc.
ESA	*Endangered Species Act*
et al.	And others (et alia)
etc.	And so on (et cetera)
FMP	Forest Management Plan
FRI	Forest Resource Inventory
FRL	Forest Resource Licence
FSL	Full Supply Level
GHG	Greenhouse gas
Golder	Golder Associates Limited
GPS	Global Positioning System
GS	Generating Station
H	Horizontal
HBC	Hudson's Bay Company
HHRA	Human Health Risk Assessment
HSI	Habitat Suitability Index
Hydro One	Hydro One Networks Inc.
i.e.	That is (id est)
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ID	Identification
ID#	Identification number
IESO	Independent Electricity System Operator
IFN	In-stream Flow Need
INAC	Indian and Northern Affairs Canada
Inc.	Incorporated
IR	Indian Reserve
JRP	Joint Review Panel
JWG	Joint Working Group
KGP	Keeyask Generation Project

KGS Group	Kontzamanis, Graumaun, Smith, MacMillan Inc.
LAPP	Little Abitibi Provincial Park
LO	Licence of Occupation
LP	Limited Partnership
LRIA	*Lakes and Rivers Improvement Act*
Ltd.	Limited
L/V	Landform/vegetation
Max	Maximum
MCFN	Moose Cree First Nation
MeHg	Methylmercury
Min	Minimum
MNDMF	Ontario Ministry of Northern Development, Mines and Forestry
MNO	Métis Nation of Ontario
MNR	Ontario Ministry of Natural Resources
MNR Class EA	Class Environmental Assessment for Provincial Parks and Conservation Reserves
MoCreebec	MoCreebec Council of the Cree Nation
MOE	Ontario Ministry of the Environment
MOEE	Ontario Ministry of Environment and Energy
MOI	Ontario Ministry of Infrastructure
Monitoring Program	Environmental Compliance Monitoring Program
MoU	Memorandum of Understanding
MP	Member of Parliament
MPP	Member of Provincial Parliament
MTCS	Ontario Ministry of Tourism, Culture and Sport
N	North or Nitrogen
NA	Not applicable
NECC	North East Control Centre
NEPG	North East Plant Group
NHIC	Natural Heritage Information Centre
NLMC	Northern Lights Métis Council
NO_x	Nitrogen oxides
NP	Neutralization Potential
NP/AP	Neutralizing Potential to Acid Potential
NRVIS	Natural Resources Values Information Centre
OGS	Ontario Geological Survey
OMMAH	Ontario Ministry of Municipal Affairs and Housing
ONR	Ontario Northland Railway
OPG	Ontario Power Generation Inc.
O.Reg.	Ontario Regulation
OWA	Ontario Waterpower Association
OWA Class EA	Class Environmental Assessment for Waterpower Projects

OWRA	*Ontario Water Resources Act*
P	Phosphorus
PCBs	Polychlorinated biphenyls
pers. comm.	Personal communication
PM	Particulate matter
PPCRA	*Provincial Parks and Conservation Reserves Act*
PPS	Provincial Policy Statement
Project	New Post Creek Hydroelectric Project or New Post Creek Project
PTTW	Permit-To-Take-Water
PWQO	Provincial Water Quality Objective
PY	Person year
Q_{80}	Flows equal to or exceeded 80% of the time
Q_{95}	Flows equal to or exceeded 95% of the time
ROW	Right-of-way
S3	Vulnerable – due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
S3S4	Vulnerable to apparently secure
S4	Apparently secure – uncommon but not rare with some cause for long-term concern due to declines or other factors
S4?	Apparently secure – uncommon but not rare with some cause for long-term concern due to declines or other factors – rank uncertain
S4S5	Apparently secure to secure
S5	Secure – common, widespread and abundant in the Province
SAR	Species at risk
SARA	*Species at Risk Act*
SARO List	Species at Risk in Ontario List
S.C.	Statutes of Canada
SENES	SENES Consultants
SEV	Statement of Environmental Values
SFL	Sustainable Forest Licence
SIA	System Impact Assessment
SNA	Not applicable – a conservation status rank not applicable because the species is not a suitable target for conservation activities
SNR	Not ranked, conservation status not yet assessed
SO_2	Sulphur dioxide
sp.	Species
spp.	Two of more species
Sr.	Senior
THg	Total mercury
TP	Total phosphorus
TSD	Technical Support Document
TSS	Total suspended solids
TTN	Taykwa Tagamou Nation

U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
V	Vertical
VOCs	Volatile organic compounds
W	West
Wahgoshig	Wahgoshig First Nation
WMP	Water Management Plan
WMU	Wildlife Management Unit
WSC	Water Survey of Canada
YOY	Young-of-the-year

Measurement Units

°	degree
‘	minute
“	second
cm	centimetre
dBA	A-weighted sound pressure level
°C	degree Celsius
g	gram
GWh	gigawatt hour
h	hour
ha	hectare
kg	kilogram
kg $CaCO_3$/t	kilogram calcium carbonate per tonne
km	kilometre
km^2	square kilometre
kV	kilovolt
kw	kilowatt
L	litre
L/s	litre per second
m	metre
m.a.s.l.	metre above sea level
m^2	square metre
m^3	cubic metre
m/km	metre per kilometre
m^3/s	cubic metre per second
µg/g	microgram per gram
µg/L	microgram per litre
µS/cm	microsiemens per centimetre
mg/L	milligram per litre
mm	millimetre
mm/s	millimetre per second

MW	megawatt
NMm^3	net merchantable cubic metres
NTU	Nephelometric Turbidity Unit
%	percent
rpm	revolution per minute
TCU	True Colour Unit

10.0 GLOSSARY

Aerobic	Denotes the presence of gaseous or dissolved oxygen.
Algae (Algal)	A group of unrelated simple plant organisms that live in aquatic habitats.
Alkalinity	Measure of a water's capacity to neutralize an acid.
Allochthonous	Organic matter derived or created in a community external to the one in which it is eventually deposited.
Alluvial (alluvium)	Of material deposited by rivers.
Amphibole	A group of double chained inosilicate minerals whose basic chemical unit is the tetrahedron (SiO_4); they are common rock forming minerals and are found in most igneous and metamorphic rocks.
Anaerobic	Denotes the absence of gaseous or dissolved oxygen.
Anode Cathodic Protection	Technique use to control corrosion of a metal surface by making it a cathode of an electrochemical cell by connecting the metal to be protected with another more easily corroded metal to act as the anode of the electrochemical cell.
Anoxic	See anaerobic.
Anthropogenic	Human-caused; due to human activities.
AoC Prescription	Mitigation direction prescribed by the MNR to minimize or obviate a potential adverse effect on a habitat value or feature.
Aquatic macrophyte	Rooted, usually vascular, aquatic plants, such as water lily, cattail, coontail, etc.
Avifauna	Birds.
Basalt	A fine-grained, dark-coloured volcanic rock, the extrusive equivalent of gabbro.
Bedload	The solid debris transported in a stream on or near its bed; because this material is too heavy to be carried in suspension, it is moved by rolling, sliding or saltation (sudden jumps) along the bottom.
Benthic	Pertaining to the bottom of aquatic habitats and the organisms that inhabit the bottom.
Benthic macroinvertebrates	Larger bottom-dwelling organisms, e.g., snails, clams, worms, insect larvae, crustaceans, etc. living on or within the sediment substrate of waterbodies.
Benthivorous (benthivores)	Bottom-feeding.

Biotite	Common rock-forming mineral of the mica group
Bog	Peatland with the water table at or near the surface with the surface often raised above the surrounding terrain; strongly acidic and extremely nutrient-poor; ground cover of *Sphagnum, usually with ericaceous shrubs (of the family Ericaceae).*
Boreal	Of the north.
Breccia	A clastic rock composed of broken, angular rock fragments larger than 2 mm in diameter and enclosed in a fine-grained matrix.
Brownian movement	The random movement of microscopic particles suspended in a gas or liquid.
Bryophyte	Moss.
Bulkhead	A steep or vertical wall retaining an embankment, often used to line shorelines, maintain embankment stability and absorb the energy of waves and currents.
Cambrian Period	The oldest period of the Paleozoic Era; it began about 600 million years ago and lasted perhaps 100 million years; during this time, the seas teemed with primitive invertebrate fish.
Canal	A channel dug or built to carry water.
Capacity	The greatest load which a unit, station or system can supply (usually measured in kilowatts, megawatts, etc.).
Catastomidae (catastomid)	Sucker family.
Cenozoic Era	The most recent geologic era which began with the end of the Cambrian Period, about 70 million years ago.
Centrarchidae (centrarchid)	Sunfish family.
Cervid	Pertaining to the deer family (Cervidae).
Chlorophyll	A class of pigments found in all photosynthetic organisms; chlorophyll molecules are the principal sites of light absorption in the light reaction of photosynthesis.
Chlorosis	Loss or reduction of green plant pigment or chlorophyll; generally, yellowing.
Clastic	Rock typically composed of broken rock fragments, e.g., conglomerate and sandstone.

Cofferdam	A temporary dam made of concrete, rockfill, sheet-steel piling, timber/timber-crib or other non-erodible material and commonly utilized during construction to exclude water from an area in which work is being executed.
Coldwater habitat	Habitat for fish having a water preference of 10 to 18ºC.
Conductivity	Numerical expression of a water's ability to conduct an electric current; the conductivity of water is dependent on its ionic concentrations and temperature.
Conglomerate	A clastic sedimentary rock consisting of more or less rounded rock particles at least 2 mm in diameter, embedded in a fine-grained matrix of sand or silt.
Coniferous Forest	The largest terrestrial biome on earth (also known as the Taiga or boreal forest) extending in a broad band across North America, Europe and Asia to the southern border of the arctic tundra and usually dominated by one or two species of evergreen trees.
Coolwater habitat	Habitat for fish having a water temperature preference of 18 to 25ºC.
Coregonidae (coregonid)	Family of soft-finned fishes comprising the freshwater whitefishes.
Cottidae (cottid)	Sculpin family.
Crepuscular	Appearing (active) in twilight.
Crest gate (Control gate)	The gate that controls water flow into a hydroelectric dam.
Cyprinidae (cyprinid)	Minnow or carp family.
Dam	A concrete or earthen barrier constructed across a river and designed to control water flow or create a reservoir.
Deciduous Forest	In the Northern Hemisphere, this forest type occurs to the south of the coniferous forest and is dominated by broadleaved deciduous hardwood trees typically with a five- to six-month growing period.
Diabase	Fine-grained intrusive igneous rock of a composition similar to basalt, but is slightly more coarse-grained.
Diatoms	Unicellular algae, usually microscopic, that are characterized by having a cell wall of silica.
Dike	The vertical veins of igneous rock that form when magma enters and cools in fractures found within the crust.
Draft tube	The flared passage leading vertically from a turbine to its tailrace.

Drawdown	The release of water from a reservoir for power generation, flood mitigation, irrigation or other water management activity.
Dyke	Embankment against flooding.
Ecodistrict	A subdivision of an ecoregion based on distinct assemblages of relief, geology, landform, soils, vegetation, water and fauna; an ELC system mapping unit usually mapped at a scale of 1:500,000 to 1:125,000.
Ecological Land Classification (ELC)	The Canadian classification of lands from an ecological perspective; an approach that attempts to identify ecologically similar areas.
Ecoregion	An area characterized by a distinctive regional climate as expressed by vegetation; an ELC system mapping unit usually mapped at a scale of 1:3,000.000 to 1:1,000,000.
Ecosite	A landscape area consisting of typical, recurring associations of vegetation types and substrate types combinations; an ELC system mapping unit usually mapped at a scale of 1:50,000 to 1:10,000.
Electric and Magnetic Fields (EMF)	Electric fields are produced by voltage and increase in strength as the voltage increases. Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as current increases.
End (Terminus) Moraine	Ridge of till deposited at the terminus of a glacier.
Endangered	A species facing imminent extirpation (no longer existing in the wild in Canada, but occurring elsewhere) or extinction (no longer exists).
Ephemeroptera	Mayfly nymphs.
Epilithic	Attached to rocks.
Epipelic	Associated with (attached to) bottom sediments in waterbodies.
Epiphytic	Attached to vegetation, e.g., larger filamentous algae, mosses and aquatic macrophytes.
Ericaceous	Plants belonging to the Heath (Ericaceae) family; require acidic soil with pH less than 7.
Esker	A long, narrow ridge of poorly stratified glaciofluvial sand and gravel, usually deposited by a subglacial stream between banks of ice.
Extirpation	Elimination of a species in the wild of a particular area (e.g., Ontario), but occurring elsewhere.

Feldspar	A group of common aluminum silicate minerals that contains potassium, sodium or calcium; the most important group of rock-forming minerals, making up about 60% of the rocks of the earth's crust.
Feldspathoid	A mineral chemically similar to feldspar but containing less silica.
Felsic igneous	An igneous rock having abundant light-coloured minerals (quartz, feldspars, feldspathoids, muscovite) in its mode.
Fen	Peatland with water table at or just above the surface and with very slow internal drainage by seepage; more nutrient-rich than bogs; sometimes occurs as a floating mat; vegetation consists of sedges, mosses, shrubs and sometimes a sparse tree layer.
Ferro-humic Podzols	Well and imperfectly drained soils that have developed under coniferous and mixed-forest vegetation and intermediate moisture conditions and usually found in cold to temperate climates on acid parent materials.
Forb	A herbaceous flowering plant that is not a graminoid (rushes, grasses and sedges).
Forebay	The part of a dam's reservoir that is immediately upstream from the powerhouse.
Freshet	High flows caused by snow melt, runoff, heavy rains or high inflows.
Gabbro	A coarse-grained plutonic rock containing plagioclase feldspar, most commonly labradorite.
Garnetiferous	Exhibiting a common crystal structure but varying in occurrence and also in chemical and physical properties.
Generator	A machine that changes water power, steam power, or other kinds of mechanical energy into electricity.
Geotechnical	Concerned with the physical properties of soil, rock and groundwater usually in relation to the design, construction and operation of engineered works.
Glaciofluvial	Of glacial watercourses.
Glaciolacustrine	Of glacial lakes.
Gleysol	An order of soils developed under wet conditions and permanent or periodic reduction.
Gneiss	A coarse-grained metamorphic rock commonly composed of quartz and feldspar, with lesser amounts of mica.

Graminoid	Includes rushes (Juncaceae), grasses (Poaceae) and sedges (Cyperaceae).
Granite	Medium to coarse grained igneous rock that is rich in quartz and potassium feldspar.
Granodiorite	A plutonic rock consisting essentially of quartz, sodic plagioclase and lesser amounts of hornblende and biotite.
Granulite complex	Metamorphic rock formation composed of equal-sized interlocking grains.
Habitat	The environment in which the life needs of a plant or animal is supplied.
Hardness	Related to a water's capability to produce lather from soap (the harder the water, the more difficult it is to lather soap), principally determined by the sum of calcium and magnesium.
Head	The difference in elevation between the water surface at the intake and tailrace.
Headpond	The reservoir from which the hydroelectric facility draws water flow for generation.
Headwater	The section of a river or stream with the highest elevation above sea level.
Herb (Herbaceous)	A non-woody vascular plant.
Hibernacula	A protected area with stable non-freezing temperatures, such as a burrow, where snakes survive the winter.
Holocene Epoch	The last (recent; postglacial) epoch of the Quaternary Period; it began at the end of the Pleistocene Epoch, about 10 million years ago and continues to the present.
Hornblende	Dark green to black rock-forming mineral of the amphibole group found in both igneous and metamorphic rocks.
Hydraulic	Of water conveyed through a pipe or channel.
Hydric	Containing water.
Hyporheic	After burial.
Igneous	Rocks formed from the solidification of molten magma either beneath (intrusive igneous rock) or at (extrusive igneous rock) the earth's surface.
Intake	A structure which regulates the flow of water into a water-conveying conduit.
Ion	An atom that is either negatively or positively charged.

Labradorite	A plagioclase feldspar that is the major constituent of gabbro and basalt.
Lacustrine	Of lakes.
Lek	A communal display ground or mating arena where males of a species display to attract females during the breeding season.
Lentic	Slow flowing or still water, e.g., in ponds and lakes.
Lithification	Process by which sediments are consolidated into sedimentary rock.
Littoral	The shoreward region of a body of water.
Lotic	Flowing water, e.g., in streams and rivers.
Luvisols	Well and imperfectly drained soils that have developed under deciduous or mixed forest cover in moderate and cool climates.
Mafic	Rock that is rich in calcium, magnesium and iron content.
Magma	Molten or fluid material generated from rock deep within the earth that may force its way upward into the crust (as igneous rock) or onto the surface (as lava).
Marsh	Standing or slowly-moving water with emergent plant cover >25%; permanently flooded, intermittently exposed, or seasonally flooded.
Mesozoic Era	The era of geologic time from the end of the Paleozoic, 225 million years ago, to the beginning of the Cenozoic, about 70 million years ago (called the “Age of Reptiles”).
Metamorphic	A rock that forms from the recrystallization of igneous, sedimentary or other metamorphic rocks through pressure increase, temperature rise, or chemical alteration.
Metamorphism	A process that produces a change in the chemistry, structure or mineralogic composition of solid rock, usually due to temperature and/or pressure changes.
Metasedimentary	Metamorphosed sedimentary rock (despite metamorphism, the original sedimentary rock protolith can be recognized).
Metavolcanic	Metamorphosed volcanic rock (despite metamorphism, the original igneous rock protolith can be recognized).
Methylation	Addition of a methyl (CH_3) group to a metal, e.g., mercury, via chemical or biological (microbial) processes.
Mica	Silicate mineral that exhibits a platy crystal structure and perfect cleavage.

Migmatite	A rock of both metamorphic and igneous origin that exhibits characteristics of both rocks, probably formed through the heating (but not melting) of rocks in the presence of abundant fluids.
Mixwoods Forest	A mixture of coniferous and deciduous forests.
Moraine	A landform generally composed of till and created by glacial action.
Muscovite	A mineral, hydrous potassium aluminum silicate, a member of the mica group of minerals and commonly known as white mica.
Muskeg	A term describing a type of landscape, environment, vegetation and deposit; peatland and organic terrain are equivalent terms generally referring to northern landscapes characterized by a wet environment and vegetation (e.g., Black Spruce) botanically classified as mire (subdivided into bogs and fens).
Necrosis	Death of living tissues, characterized by browning and drying.
Oligotrophic	Waters with a small supply of nutrients and therefore a small organic production.
Organic	Soils that have developed from accumulations of organic materials such as grasses, reeds, rushes, sedges, mosses and ferns.
Outwash	Detritus and waste materials carried away by the water of melting glaciers.
Overburden	The soil, rock and other material which lie on top of the underlying mineral or other deposit, e.g., bedrock.
Paleozoic Era	The era of geologic time from the end of the Precambrian, 600 million years ago, to the beginning of the Mesozoic Era, about 225 million years ago; the beginning of Paleozoic time, which marks the start of the first accurate records in geologic history, is characterized by the appearance and development of the major types of invertebrates.
Passerines	Perching birds (of the Order Passeriformes).
Peaking	Generating stations that are normally operated only to provide power during maximum load periods.
Peat	Partly decomposed plant material; refers to soils containing >30% organic matter by weight.
Pegmatite	An extremely coarse-grained igneous body closely related genetically to large masses of fine-grained plutonic rocks; it may be present as a vein or a dike in the granular igneous rock, but more commonly is found completely enclosed within the neighbouring country rock.
Penstock	A structure associated with a hydroelectric station designed to carry water from the intake to the turbine.

Periphyton	The organisms, collectively, that live attached to rocks, gravel, aquatic vegetation and other substrate.
pH	Indicates the balance between the acids and bases in water and is a measure of the hydrogen ion concentration in solution.
Photosynthesis	The process which takes place in green plants by which simple sugars are manufactured from CO_2, water and mineral nutrients with the aid of chlorophyll within the plant cells in the presence of light.
Physoclistic	With swim bladder isolated from the oesophagus.
Physostomic	With swim bladder connected to the oesophagus by an open duct.
Pier	As part of a hydroelectric station, an abutment extending from the station, either upstream or downstream, and lending foundation support and directionality to water passed through the structure.
Piscivorous (piscivores)	Fish-feeding.
Plagioclase	A type of feldspar that is rich in sodium and calcium.
Planform	A body of water's outline or morphology as viewed from above.
Planktivorous (planktivores)	Plankton-feeding.
Plankton	Minute organisms that drift or float passively with the current of a lake.
Plecoptera	Stonefly nymphs.
Pleistocene Epoch	The earliest epoch of the Quaternary Period; it began 2 to 3 million years ago and lasted until the Holocene Epoch, approximately 10,000 years ago and was a time of widespread continental glaciation.
Pluton	Any rock of molten origin that forms a large body within the earth's crust when it solidifies.
Pneumatic	Involving the mechanic properties associated with air or other gas pressure.
Potamoplankton	Drift plankton (associated with flowing water, i.e., streams and rivers).
Powerhouse	A primary part of a hydroelectric facility where the turbines and generators are housed and where power is produced by falling water rotating the turbine blades.
Precambrian	Encompasses the time between the origin of the earth and the appearance of complex forms of life about 600 million years ago, and is believed to be equivalent to as much as 90% of the earth's 405-billion-year history.

Proglacial lake	Formed either by the damming action of a moraine or ice dam during the retreat of a melting glacier, or one formed by meltwater trapped against an ice sheet due to isostatic depression of the crust around the ice.
Protolith	Pertaining to the previous mineralogical composition/structure.
Pyroxene	One of a group of minerals closely related in structure, chemical composition and physical properties; the pyroxenes are inosilicates in which the SiO_4 tetrahedrons are linked into chains by sharing oxygens.
Quartz	A mineral: an oxide of silicon which is abundant and widespread occurring as an important constituent in many igneous, sedimentary and metamorphic rocks.
Quaternary Period	The second and youngest period of the most recent Cenozoic Era (also called the Age of Mammals); the Quaternary Period began 2 to 3 million years ago and consists of two epochs, the Pleistocene and the Holocene (known also as Recent).
Reservoir	A body of water collected and stored in an artificial lake behind a dam.
Riparian	Of or on a watercourse bank.
Rotifera (rotifers)	Small, usually microscopic, pseudocoelomate (lacking a true coelum) unsegmented animals, with a ciliated region, the corona, at the anterior end, comprising the zooplankton community in waterbodies.
Run-of-the-river	Passing all flows as they come.
Runner	An enclosed water wheel that transforms the static and kinetic energy of the water into useful work.
Sandstone	A type of sedimentary rock that contains a large quantity of weathered quartz grains.
Sedimentary	Rock formed by the deposition, alteration and/or compression and lithification of weathered rock debris, chemical precipitates, or organic sediments.
Sluice	An open channel designed to divert excess water which could be within the structure of a hydroelectric dam or separate of the main dam (see spillway).
Sluice gate	Gate used to regulate the flow of water through an opening usually used to pass water over or around dams.
Sodic	Containing sodium.
Special Concern	A species of special concern because of characteristics that make it

	particularly sensitive to human activities or natural events.
Species	A group of closely related individuals which can and normally do interbreed to produce fertile offspring.
Sphagnum	A genus containing the species of moss responsible for the production of peat – common within bog wetlands.
Spillway	A passageway located near or at the top of a dam through which excess water is released or “spilled” past the dam without going through the turbine(s); as a safety valve for the dam, the spillwall must be capable of discharging major floods without damaging the dam while maintaining the reservoir level below some predetermined maximum level.
Stop log	A gate (sometimes made from squared lumber) which can be placed into an opening to shut off or regulate the flow of water.
Swamp	Wooded mineral wetland or peatland.
Tailrace	A channel through which the water flows away from a hydroelectric plant following its discharge from the turbine(s).
Tailwater	The water from a generating station after it has passed through the turbine.
Talus	A sloping heap of loose rock fragments lying at the foot of a cliff or steep slope.
Taxon (plural taxa) or Taxonomic Group	One of a hierarchy of levels in the biological classification of organisms: the seven major categories are (in order of decreasing size) kingdom, phylum (or division), class, order, family, genus, species. The taxonomic groups can be high (class level), intermediate (family level) or low (genus or species level).
Terrestrial	Belonging, living on or growing in the earth or land.
Threatened	A species likely to become endangered if limiting factors are not reversed.
Till	Material derived from bedrock and overlying unconsolidated material and deposited directly by glacial ice with its characteristics dependent upon the source rock.
Total dissolved solids	An index of the amount of dissolved substances in a water.
Trash rack	Bar screen with larger space openings installed to prevent logs, stumps and other larger solids from penetrating the intake.
Trichoptera	Caddisfly larvae.
Trophic	Level of organization in the food chain, e.g., producers, herbivores, carnivores.

Turbidity	A measure of the suspended particles such as silt, clay, organic matter, plankton and microscopic organisms in water which are usually held in suspension by turbulent flow or Brownian movement.
Turbine	A mechanism in an electrical generation facility which converts the kinetic and potential energy of water (in the case of hydroelectric turbines) into mechanical energy which is then used to drive a generator converting mechanical to electrical energy.
Vascular	Made up of vessels or ducts for conveying water.
Varved	Characterized by a pair of thin sedimentary layers, one thicker and one thinner, deposited within a one-year period.
Weir	A dam in the river to stop and raise the water.
Young-of-the-year	Fish that hatched during the year when caught.
Zooplankton	That portion of the plankton consisting of animals, usually minute crustaceans and other small multicellular and single-cell animals.

APPENDIX A – DISPOSITION REPORT

DISPOSITION REPORT FOR THE PROPOSED NEW POST CREEK HYDROELECTRIC PROJECT RESPONSES TO AGENCY COMMENTS

Submitted to:

Coral Rapids Power Inc. 11 Elm Street North Timmins, Ontario P4N 6A3	Ontario Power Generation Inc. 700 University Avenue Toronto, Ontario M5G 1X6

Prepared by:
SENES Consultants

Prepared by:	Dr. Jerry Fitchko Phil Shantz	November 2013 Date
Reviewed by:	Ms. Gillian MacLeod Sr. Environmental Advisor Ontario Power Generation Inc.	November 2013 Date
Accepted by:	Mr. Wayne Ross President Coral Rapids Power Inc.	November 2013 Date
Accepted by:	Mr. Matt MacDonald Project Manager Ontario Power Generation Inc.	November 2013 Date

CRP/OPG RESPONSES TO AGENCY REVIEW COMMENTS

As indicated in Section 6.2.3, CRP/OPG provided the draft ER and TSDs to DFO, MNR and MOE for review prior to the Notice of Completion.

DFO provided five general comments on the proposed Project. These are listed below with responses to the comments by CRP/OPG:

DFO Comment 1

There is greater concern about maintaining the habitat downstream of the New Post falls than upstream between the falls and the weir. While walleye can be confirmed as using the habitat below the falls for spawning, it is possible that sturgeon will also use the areas below the falls at least periodically for spawning.

CRP/OPG Response

The following statements are made in the ER and Aquatic TSD:

"Coker and Portt (2013e) concluded that the studies undertaken have demonstrated that Lake Sturgeon spawn in the Abitibi River below Abitibi Canyon. The study findings also support the conclusion that Lake Sturgeon do not spawn in New Post Creek. Despite the lack of evidence based on the study findings, MNR and DFO have opined that New Post Creek may still be a possible spawning area used occasionally by Lake Sturgeon.

However, Lake Sturgeon were caught in New Post Creek prior to and after the Abitibi Canyon spawning period, suggesting that the watercourse does provide important habitat function, e.g., availability of higher benthic macroinvertebrate densities for foraging."

"As indicated in Section 3.1.9.7, White Sucker and Longnose Sucker spawning also occurs in New Post Creek downstream of the waterfalls, generally after Walleye spawning. Although the focus has been on Walleye spawning, the timing window for minimum flow maintenance will account for suitable conditions for catostomid spawning and egg incubation. Therefore, a minimum flow of 15 m^3/s will be maintained for the spring spawning and egg incubation period, approximately May 1 to mid-June. As indicated in Section 3.1.9.5, study findings support the conclusion that Lake Sturgeon do not spawn in New Post Creek. However, if spawning is demonstrated in New Post Creek, the timing window would be expanded to include the Lake Sturgeon spawning and egg incubation period."

DFO Comment 2

The design and operation of the weir and generating station should ensure that water over the falls is never shut off and that appropriate minimum flows are always maintained (natural inflows permitting) to prevent desiccation of eggs/inverts in the riffle/rapids downstream of the New Post Falls.

CRP/OPG Response

As indicated in Section 6.3.4.1 of the ER, the amended Abitibi River WMP will mandate that the Operating Plan for the proposed New Post Creek Project maintain the requisite minimum seasonal flows.

DFO Comment 3

Flows over the falls should be increased and decreased at rates that are close to “natural” (e.g. ramping flows up gradually from winter to spring spawning periods, or down gradually from spawning to summer to winter operations). Avoid turning all water on/all water off in a fashion which can dislodge eggs and invertebrates or promote fish and invertebrate stranding.

CRP/OPG Response

As indicated in the ER and Aquatic Environment TSD, there will be a “brief transition of flows from 15 to 7.5 15 m^3/s from the end of egg incubation (based on thermal units accumulated) with the rampdown rate (m^3/s per day) to be determined in consultation with the MNR and DFO.”

DFO Comment 4

Since the head pond for the NPC GS will likely develop a fishery, and the high head and fast turbine speed for the GS means that survival through the turbines will likely be low at least for fish larger than fry or fingerling size, DFO supports designing trash racks/fish screens that will prevent most fish from passing downstream through the turbines that would suffer high rates of turbine mortality.

CRP/OPG Response

The following statements are made in the ER and Aquatic Environment TSD:

“Initially, very low fish entrainment mortality is expected for the proposed New Post Creek Project primarily due to the low numbers of small fish present in New Post Creek. However, as indicated in Section 4.3.8, creation of the proposed headpond may result in the establishment of fish populations of larger size, e.g., Northern Pike and White Sucker. As indicated in Section 7.3, an Adaptive Management Program (AMP) will be developed that will consider effects monitoring, adaptive management measures and adjustments to mitigation measures based on observed conditions, e.g., mitigation of entrainment if adverse effects on fisheries resources are determined. This monitoring plan will be designed and implemented to meaningfully assess impingement and entrainment effects on fish populations, and inform mitigation design and implementation effectiveness. The monitoring plan will follow a protocol and schedule developed in consultation with MNR and DFO.

Entrainment monitoring will be required as part of the AMP. If entrainment is deemed high relative to local populations, a retrofit fish diversion system will be considered following Best Available Technology Economically Achievable. There are many examples where successful retrofit diversion systems such as angled bar racks and other fish guidance systems have been installed when a significant entrainment problem has been identified after hydroelectric facility development in the United States.”

DFO Comment 5

Since it is quite likely that we will be issuing the Authorization for the New Post Creek Hydro Project under the amended Fisheries Act, we recommend that the proponent provide DFO with the information requirements for the application for a Fisheries Act Authorization outlined in the “Information and Documentation to be Provided” section of the proposed amended Fisheries Act.

CRP/OPG Response
CRP/OPG will consult with DFO with respect to any *Fisheries Act* requirements.

The disposition table below lists the specific review comments from the MNR and MOE, and the responses to the comments by CRP/OPG.

Agency review comments are provided verbatim. All comments were deemed by the agencies as having been addressed by the responses.

Proposed Hydroelectric New Post Creek Project – Disposition Table

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
MNR Comments (Draft ER and TSDs)			
1.	Socio-Economic and Land Use/ 2-5/2.2.2 Preferred Alternative/1	Alternative 1 should be specifically stated to be the preferred alternative.	The second last paragraph of Section 2.2.1 addresses the selection of Alternative 1 as the preferred alternative. The following first sentence will be inserted into the first paragraph of Section 2.2.2: "As indicated in Section 2.2.1, Alternative 1 is the preferred alternative." This sentence will also be added to the ER and other TSDs.
2.	Socio-Economic and Land Use/ 3-8/3.3.2 Existing Land Use and Res Policy Direction/0	The discussion about park classification could refer to Clarification of Little Abitibi Provincial Park Classification (Griffin 2003) as stating that '... Little Abitibi River - New Post Creek section of the park will be managed as waterway class and the Pierre-Montreuil Lakes section as natural environment class...'	The following sentence will be added at the end of the second paragraph of Section 3.3.2: "The Little Abitibi River – New Post Creek section of the Park is managed as waterway class, whereas the Pierre – Montreuil Lakes section is managed as natural environment class (Griffin, 2003)." The Griffin (2003) citation will be provided in Section 5.0 References.
3.	Socio-Economic and Land Use/3-8/3.3.2 Existing Land Use Tenure... Direction/0	Third paragraph second sentence is not correct in fact hunting and trapping are allowed in the park as per direction in the park management statement (OMNR 2006). Fifth paragraph states that ' (the park) has negatively impacted on their traditional activities and modern day economic pursuits.' needs clarification. In fact the management statement for the park (OMNR 2006) states that 'First Nations have expressed interest in and have shared knowledge of the park and surrounding area. Aboriginal communities may have used the area for hunting trapping fishing gathering and travel. These uses may continue subject to public safety conservation and other considerations.' Further the current hydroelectric project on New Post Creek is being enabled by extensive consultation with First Nations and the public to change the park boundary. This is going ahead with direct benefits both to TTN and other Ontarians as per direction in the Provincial Parks and Conservation Reserves Act 2006.	The third paragraph in Section 3.3.2 has been revised as follows: "LAPP is a non-operating provincial park and therefore there are no visitor facilities in the Park but recreational uses such as canoeing, camping, hunting and angling are permitted. Existing commercial fur harvesting (trapping) is also permitted; however, new commercial fur harvesting is not permitted (MNR, 1992, 2000, 2006). The fifth paragraph of Section 3.3.2 has been revised as follows: The first sentence "It is not clear how a man-made river diversion became part of LAPP." has been deleted (see also response to Comment 66). The remainder of the fifth paragraph has been revised as follows: "TTN maintains that they were not consulted on the establishment of the Park and that it has negatively impacted on their traditional activities and modern day economic pursuits. It is noted that the protection of aboriginal rights and treaty rights was enshrined in the *Constitution Act* in 1982 with the

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			enactment of section 35. The judiciary has since defined section 35 to require the duty to consult prior to decisions made which could impact aboriginal rights and treaty rights. In 2004, the Supreme Court of Canada, through its landmark decisions in the Haida Nation and Taku River First Nation cases further refined and clarified what the duty to consult entails. As indicated above, LAPP was regulated in 1985." The following paragraph will be inserted after the revised fifth paragraph: "As indicated in Ontario Parks (2006), "First Nations have expressed interest in and have shared knowledge of the park and surrounding area. Aboriginal communities may have used the area for hunting, trapping, fishing, gathering and travel. These uses may continue, subject to public safety, conservation and other considerations." It is further stated that "any communications or cooperation between aboriginal communities and MNR for planning and operations purposes will be done without prejudice to any future discussions or negotiations between the Government of Ontario and aboriginal communities." The proposed New Post Creek Project is being enabled by extensive consultation with First Nations and the public to change the Park boundary (see First Nation and Métis Interests and Consultation, and Public and Agency Consultation TSDs)." These revisions will also be incorporated into Section 3.4.2.1 of the ER.
4.	Socio-Economic and Land Use/2-4/Figure 2.2 Alternative Hydro Development Locations on New Post	Clarification is needed on this map to show that the preferred Alternative 1 will be outside the park once the boundary amendment is complete. I recommend	The amended LAPP boundary will be shown on ER and TSD figures indicating that the proposed Project is outside the Park.

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
	Creek/0	that you add the proposed boundary of lands to be dropped - this will clearly show that Alternative 1 infrastructure will be outside the park.	
5.	/2-28/Project Description/0	The headpond fluctuation is stated to be 50 centimetres. Is this a daily fluctuation expected with the peaking that will occur? This seems like it could be substantial for a small and confined headpond (?). A better understanding of the frequency, timing and duration of this proposed alteration will assist reviewers in considering the potential effects.	CRP/OPG has committed to maintain the minimum flows downstream of the proposed spillway at all times. The forebay fluctuations are intended to provide operation during low flow periods primarily in late winter and late summer. This pulsing will be an automatic process and will involve the following: 1. The turbines are expected to require a minimum of 5 to 10 m^3/s to operate. Any time the total flow in New Post Creek is less than 5 to 10 m^3/s plus the minimum downstream flow requirement, the turbine units will not be able to operate. 2. In such situations, the proposed GS will be allowed to draw down the forebay within the prescribed range at a flow rate that will optimize efficiency. 3. When the water level reaches its lower limit, the units will shut down until the forebay returns to its high level. This will not be co-ordinated with the time of day for increasing revenue but will be an automatic process. 4. The fluctuation allowance is lower in the winter to maintain an ice cover on the forebay. 5. This cycle will repeat most frequently in situations when flows are just below the required 5 to 10 m^3/s plus the minimum downstream flow requirement. The situation that would cause the most frequent starts/stops would be during the winter with a 10 cm band. In such cases the cycle could be expected to repeat every 8 to 48 h, depending upon riparian flow. 6. In the prescribed period where a 50 cm band is permitted the cycle would be expected to

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			repeat every 48 to 150 h, depending upon riparian flow. 7. The flows downstream of the dam would not change during this process as they will remain as the defined minimum flow requirement. This information will be provided in the ER and TSDs.
6.	/2-37 to 2-39/Project Description/0	I get the impression that the site will be peaked as much as possible. It seems like there is lots of opportunity for storage for days and generation that might last only half a day or less? (We encourage you to more fully describe these proposed operations in the final ER.)	See response to Comment 5.
7.	/2-24/Project Description/0	Regarding minimum flows which refers to the bypass reach there is a footnote that indicates 'condition flows' (?) Furthermore 'all dimensions provided are approximate and will be finalized during the detailed design of the proposed project'. So what is the expectation here? Are the current bypass reach flows just approximate? Please provide further details thanks.	The footnote in Table 2.1 has been replaced by the following footnote: [1] See Section 2.4.2.2. The minimum flows in Table 2.1 have been revised to reflect those presented in Section 2.4.2.2 as follows: Minimum Flow:[1] *May 1 to mid-June* 15 m^3/s *mid-June 1 to August 31* 7.5 m^3/s *September 1 to 30* 5 m^3/s *October 1 to April 30* 2 m^3/s These revisions will also be undertaken in the TSDs. These minimum flows downstream of the spillway structure will be maintained at all times during GS operation. It should be noted that Section 2.4.2.2 clarifies the May 1 to June 30 period as approximately May 1 to mid-June with the timing dependent on Walleye spawning and egg incubation period with a brief transition of flows from 15 to 7.5 m^3/s from the end of egg incubation to Canada Day weekend (i.e., July 1).
8.	/2-24/Project Description/0	The headpond inundation is stated to be 170 hectares how far upstream (in km) will the headpond extend	As indicated in the first paragraph on p. 2-13, water levels will be affected for a distance of

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
		during normal operation? The information does indicate that at the 100 yr. flood level the upstream extent will be 7.2km.	approximately 7,166 m. The following revision will be made to Table 2.2: Headpond New inundation area 170 ha (extending 7,166 m upstream of dam) This revision will also be undertaken in the TSDs.
9.	/2-24/Project Description/0	What is the 'average annual riparian flow'? Is this equal to the average flow? (Since a riparian flow usually has a recurrence of once every two to twenty years I'm not sure what is meant by this.) Thanks.	This will be revised to "average annual flow" in the ER and TSDs.
10.	/2-15/Project Description/0	This page has a couple of comments regarding the overburden as being erosion prone (sands and silts) and the idea that the powerhouse will be constructed on a dense sand deposit. There seems to be much concern about the underlying stability of this location and it's erosion potential. How big a concern is this to the proponent?	The following information will be inserted into the second paragraph in Section 2.3.3: "The surficial overburden material above the water table is relatively firm and can be excavated and temporarily sloped back at a 2H:1V slope angle, or 3H:1V for slope height higher than 10 m (KGS Group, 2013a). The firm sand deposit will be saturated below the water table reflecting the proximity to the Abitibi River. Therefore, it will be necessary to dewater the area prior to excavating below the water table. Temporary construction shoring will be required due to the depth of the required excavation and groundwater condition, and to minimize the footprint that would be disturbed. The sand deposit can be excavated using standard soil excavation equipment such as bucket excavators, bulldozers and similar equipment, in combination with an appropriate and effective dewatering procedure. A properly designed sheet pile wall, diaphragm wall and/or contiguous bored pile wall can be used to support and dewater the excavation." This information will also be added to the TSDs.
11.	/2-11/Project Description/0	There is a statement that a sediment trap 'may be included' to reduce the potential for suspended sediment and bedload entrainment in the flow diverted into the powerhouse. I assume more details of this would be found in the full EA? Thanks.	The operation of the sediment gate will consist of opening the gate, likely manually. The actual need to clear the sediment trap would be with a frequency in the order of years if

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			not decades. However, OPG has considered this issue and is suggesting that a yearly flushing occur during near the start of freshet. A yearly flushing would reduce the effect of a larger less frequent (e.g., every 10 years) flushing event and may also help in providing sediment bank stabilization for the by-pass reach that otherwise may be starved of sediment. This information will be included in the Project Description section of the ER and TSDs.
12.	/2-11/Project Description/0	There is discussion of the 1:100 year flood levels. What is the corresponding discharge to the 1:100 year event?	The corresponding discharge is 296 m^3/s. This information will be included in the Project Description section of the ER and TSDs.
13.	/2-11/Project Description/0	There is a suggestion of a gate to evacuate the possibility of sediment accumulation. This would seem like a good idea. Are there any ideas of suspended sediment load or volumes above the proposed dam site? Is bedload transport a concern? What is the erosion potential in the headpond?	As indicated in Table 2.12 of the Aquatic Environment TSD, TSS concentrations in New Post Creek at the proposed intake location and the upstream Otter Rapids Road bridge were <5 mg/L during flow of 12.26 m^3/s and ranged from 21 to 229 mg/L during higher flows (124.19 to 145.85 m^3/s). Additional TSS sampling was undertaken during the spring of 2013 when flows were nearing the peak of the flood hydrograph at 260 m^3/s. TSS concentrations ranged from 148 to 317 mg/L (mean of 225 mg/L). Based on bed load sampling in September 2011, it was determined that bed load does not occur at the proposed intake location at flows of 13 m^3/s. Bed load sampling was attempted in the spring of 2012; however, due to a problem with the equipment on site, material could not be successfully retrieved. In the spring of 2013, bed load sampling was not attempted for safety reasons due to high flows and treacherous velocities with floating debris. This information will be incorporated into the Aquatic Environment TSD.

Proposed Hydroelectric New Post Creek Project – Disposition Table

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			As indicated in Section 3.2.3 of the Aquatic Environment TSD, clearing of the headpond (flooded) area will result in the disturbance and exposure of soil with potential for increased erosion and resuspension in the water column. Stumps are to remain in the ground so as to maintain root mat, limit soil disturbance and lower the risk of erosion and TSS released to the headpond. It is anticipated that increases in TSS will be temporary. When an oligotrophic lake in northwestern Ontario was subjected to seasonal experimental fluctuations of water levels, Turner *et al*. (2005) determined that TSS concentrations remained extremely low after three years of drawdown of 2 to 3 m. As water-level fluctuations in the headpond will range only up to 0.5 m, it is anticipated that changes to TSS concentrations will be small.
14.	Aquatic Report/1-16//0	The report mentions that a 'series of stop logs' might be used to control flows in the spillway. Newpost G.S. will not be manned thus how accurately and how quickly will stop logs be able to provide the bypass reach flows? The proposed Obermeyer inflatable bladder weir seems a much better option.	The use of stop logs is common throughout the Province with OPG regularly undertaking such operations. As indicated in Section 1.2.3, the final choice of the type of equipment used will be determined by the DBC.
15.	Aquatic Report/1-40//0	The report states that the 'proposed project will not change the total volume of water flowing into the Abitibi River'. No however the magnitude of the flows the frequency of the discharges the duration of the flows the rate of change and the timing of the discharges will be very different from what occurs now. We encourage OPG to acknowledge these alterations in the EA so that reviewers and the regulating agencies can consider effects accordingly.	The following sentences will replace the last two sentences of the third paragraph in Section 1.3.2.2 of the Aquatic Environment TSD: "Total flows from New Post Creek into the Abitibi River will remain unchanged (except that there will now be two discharge locations, i.e., at the proposed GS tailrace and the existing New Post Creek outlet). As a result, flow magnitude, frequency, timing, duration and rate of change will be different than current flow conditions at the New Post Creek outlet." These replacement sentences will also be added to the ER and other TSDs.
16.	Aquatic Report/1-41/Operating Regime/0	There is discussion here of cycling flows 'a few times a day during a low flow period'. Much more detail is	See response to Comment 5.

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
		needed here - It would be helpful to the reviewers if examples are provided showing anticipated hourly flows and changes in flows over time. Is this akin to storing water and releasing every few hours? How many times a day is this anticipated during these low flows? How often would this happen during an average year? A better understanding of the proposed cycling and associated effects will help agencies make informed decisions on approvals.	
17.	Aquatic Report/1-40//0	There is much use of the term 'pulsed' or 'pulsing' when referring to flows and Generating Station operation. Can 'pulsed flows' be defined? How is this different from a peaking operation?	See response to Comment 5.
18.	Aquatic Report/1-16//0	The 1:100 year levels show significant flooding of the unnamed tributary just south of the proposed dam site. Is there further information on site stability and erosion potential for this location?	As indicated in the first paragraph under the sub-heading Flooding Upstream into Tributary Streams (p. 3-42), this tributary is the largest watercourse flowing into New Post Creek in the proposed headpond area. It will be affected the most from headpond development due to its proximity to the proposed weir and being subjected to the highest water level increase, as well as its low gradient channel. Approximately 64 ha of its valley will be flooded. As indicated in the response to Comment 13, clearing of the headpond (flooded) area will result in the disturbance and exposure of soil with potential for increased erosion and resuspension in the water column. Stumps are to remain in the ground so as to maintain root mat, limit soil disturbance and lower the risk of erosion and TSS released to the headpond. It is anticipated that increases in TSS will be temporary. When an oligotrophic lake in northwestern Ontario was subjected to experimental fluctuations of water levels, Turner *et al*. (2005) determined that TSS concentrations remained extremely low after three years of drawdown of 2 to 3 m. As water-level fluctuations in the headpond will range only up to 0.5 m, it is anticipated that changes to TSS concentrations will be small.

Proposed Hydroelectric New Post Creek Project – Disposition Table

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			Overall site stability is expected to be restored within one complete growing season thereby minimizing the potential for erosion. As indicated in the response to comment 122, visual monitoring of shoreline erosion and sedimentation will be undertaken after one complete growing season after proposed GS operation initiation.
19.	Aquatic Report///0	In the Introduction it is worth mentioning some basic characteristics including: i) the original drainage area of Newpost Creek = 315 sq.km's ii) the current drainage area = 3010 sq.km's iii) 100 yr. flood value = ? m^3 s-1 etc.	The following sentence will be inserted after the third sentence in the second paragraph of Chapter 1.0: "With a drainage area increase of approximately 9.5 times (from 319 to 3,025 km^2), mean flow in New Post Creek has increased from approximately 4.4 to 42 m^3/s (based on 1975-2012 data), with a 1:100 year flood event flow of 296 m^3/s." This sentence will also be included in the ER and the other TSDs.
20.	Aquatic Report/1-5//0	Regarding the replacement of Provincial Park lands and proposed land exchange the report states this will increase the size of the LAPP and enhance its ecological integrity. On the down side the replacement will divide the PP in to two and fragment and separate the riverine aquatic values as Newpost Creek will no longer be a continuous system. We encourage you to state both advantages and disadvantages of this replacement in the report.	The following sentence will be inserted at the end of the last paragraph of Section 1.1: "However, land deregulation will result in the disjunction of LAPP as the waterway class portion is no longer be a continuous system." This sentence will also be included in the ER and other TSDs.
21.	Aquatic Report/ES-2//0	The report states 'headpond will create an additional 131.9 ha of aquatic habitat and alter an existing 37.5 ha of riverine habitat ...'. The Project Description indicated that inundation was 170 ha at FSL. It would be best to include all this information every time the headpond extent is mentioned; there seems to be bits and pieces of this information in different locations in the reports.	The following will be added to the end of the second sentence of the second paragraph on p. ES-2: "(with a total inundation area of approximately 170 ha)", as well as the first paragraph under the sub-heading <u>Inundation Upstream of the Proposed Weir</u> (p. 4-52) and Table 4.5 of the ER. This addition will also be made to the first paragraph under the sub-heading <u>Inundation Upstream of the Proposed Weir</u> (p. 3-40), Table 3.3, the second paragraph of Section 3.2.13 and the fourth paragraph of Chapter 4.0 of the Aquatic Environment TSD, as well as the second paragraph on p. ES-2, the first paragraph under the sub-heading

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			Inundation Upstream of the Proposed Weir (p. 4-52) and Table 4.5 of the ER.
22.	Aquatic Report/1-32//0	The report mentions 'Existing slopes along the Abitibi River and inland at the proposed Project site are relatively steep.' and ' As native soils are highly erodible extensive stabilization works may be required to prevent vegetation removal drainage pattern alteration and slope destabilization by heavy loads.' We encourage you to include an entire section on slope stability stemming from all these concerns.	The following information will be inserted into the second paragraph under the sub-heading Powerhouse Structures on p. 1-18 (as similarly indicated in the response to Comment 10): "The surficial overburden material above the water table is relatively firm and can be excavated and temporarily sloped back at a 2H:1V slope angle, or 3H:1V for slope height higher than 10 m (KGS Group, 2013a). The firm sand deposit will be saturated below the water table reflecting the proximity to the Abitibi River. Therefore, it will be necessary to dewater the area prior to excavating below the water table. Temporary construction shoring will be required due to the depth of the required excavation and groundwater condition, and to minimize the footprint that would be disturbed. The sand deposit can be excavated using standard soil excavation equipment such as bucket excavators, bulldozers and similar equipment, in combination with an appropriate and effective dewatering procedure. A properly designed sheet pile wall, diaphragm wall and/or contiguous bored pile wall can be used to support and dewater the excavation." This information will also be added to the ER and other TSDs.
23.	Aquatic Report/2-18//0	The comparison of the 1947 and 2005 photos are interesting but what is the scale of each of the photos? This is important if the reader is expected to visually look and interpret differences between the two images.	Scales will be provided for the two aerial photos.
24.	Aquatic Report/2-9//0	Best to indicate here that the full drainage area for New Post Creek at the Mouth is approximately 3025 sq.km's. Again is it assumed that Table 2.4 presents monthly average flows?	The second sentence of the first full paragraph on p. 2-9 has been revised as follows: "This entire area of approximately 3,025 km^2 would be drained….." The title of Table 2.4 has been revised to the following: "Mean, Maximum and Minimum Monthly Flows (m^3/s) at New Post Creek Outlet to the Abitibi River (1975 to 2012)". The title of

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			Table 2.3 has been similarly revised.
25.	Aquatic Report///0	A graph showing the longitudinal profile of New Post Creek pre- and post-development would be very informative especially if it focused on the headpond and bypass reach areas.	The topographical surveys undertaken for this proposed Project are of limited extent within New Post Creek, and therefore we do not have the information required to create a longitudinal profile from New Post Creek Diversion Dam to the Abitibi River.
26.	Aquatic Report/2-19//0	It is likely that the majority of erosion in New Post Creek occurred in the 1960's shortly after the Diversion Dam was put in place. There is mention here of an annual average channel migration or erosion which is likely not a reasonable way to examine change over time in this instance.	The following sentence will be inserted after the first sentence in the first paragraph under sub-heading Post-diversion (p. 2-17): “The majority of erosion of New Post Creek occurred in the 1960s upon initiation of the New Post Creek Diversion Dam operation with subsequent reduction of erosion rates.” The following sentence has been revised as follows: “The increase in flow and associated erosion would have a dramatic impact on the channel morphology of the creek (Parish, 1998).” It should be noted that the “annual average channel migration or erosion” data presented by Parish (1998) was based on 1971, 1978 and 1994 air photos provided by the MNR for the study.
27.	Aquatic Report/2-9//0	I think it is possible to update some data presented here. According to WSC gauge 04ME005 the extreme maximum flow = 269.7 cubic metres per second (May 9 2013).	The data presented in Table 2.4 indicate that highest mean maximum monthly flow (202.8 m^3/s) occurred in May 2008. Review of the flow data for May 2013 indicates a mean monthly flow of approximately 191.1 m^3/s with a maximum instantaneous flow of 270.226 m^3/s on May 9, 2013. Based on review of the mean daily flow data from 1975 to 2013, this maximum instantaneous flow of 270.226 m^3/s is likely the highest on record. The following sentences will be inserted at the end of the second paragraph on p. 2-9: “A maximum instantaneous flow of 270.226 m^3/s was recorded on May 9, 2013, probably the highest on record. It should be noted that the 2013 gauge data are preliminary, with finalized data not available until early 2014.”

Proposed Hydroelectric New Post Creek Project – Disposition Table

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
28.	Aquatic Report/2-1/Groundwater Hydrology/0	The report states that groundwater yields are less than 1 litre per second (MNR 1984). This information is very coarse and from a general map of Ontario published in the referenced document. Is there anything else that can provide something more accurate? Are the mentioned hydrogeological investigations described in further detail elsewhere?	See attached Table G-4A – Groundwater Monitoring Results 2009 Installations, Table G-4B – Groundwater Monitoring Results 2011 Installations and Figure G03 – Site Plan – Test Hole Locations taken from the KGS Group report "New Post Creek Hydroelectric Development Geotechnical Data Report", Draft Report, Rev B (April 2013).
29.	Aquatic Report/2-10//0	Regarding Figure 2.5 the data as graphed has not be cleaned beware of the information presented in this figure. The grey line shows a constant discharge for a period of time in June of one year which is not correct and there is a peak flow of greater than 400 cubic metres per second which is very likely a false reading. I spent some time correcting this data so I remember what the original graph looks like (!)	The following footnote has been added to Figure 2.5 which was excerpted from the Abitibi River WMP: "[2] It should be noted that portions of two flow hydrographs are incorrect, e.g., the grey line shows a constant discharge for a period of time in June of one year which is not correct and the peak flow of greater than 400 m^3/s is very likely a false reading."
30.	Aquatic Report//2.1.4.11 New Post Creek Hydrology/0	Does Table 2.3 provide average monthly flows? How reliable is / was the New Post Diversion Dam gauge data? (I thought I was told years ago by an OPG Engineer that it is unreliable.) The ratio of New Post drainage area (319 sq.km) to the Little Abitibi River Diversion Dam (2706 sq.km) is one order of magnitude. The report indicates that flows were prorated using drainage basin area - how skewed could the results be? Experience at other sites indicates that low flows tend to be exaggerated at the smaller area site for example.	Table 2.3 does provide mean monthly flows. Its title has been revised to the following: "Estimated Natural (Pre-diversion Mean, Maximum and Minimum Monthly Flows (m^3/s) at New Post Creek Outlet to the Abitibi River". The flow data have been obtained and validated through a number of methods, including regular verification of gauge calibration. The natural (pre-diversion dam) flows in New Post Creek were estimated from the validated flows at the New Post Creek Diversion Dam gauge and prorated to the local drainage area downstream of the gauge. For verification, these estimates were compared with overall flow metrics recorded at other gauges installed on watercourses with similar drainage basins and precipitation characteristics and within a 250 km radius of New Post Creek. Having been developed in a rigorous manner, these are the best data available for this proposed Project. On this basis it is not possible to define a skew to the data.

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			In terms of data reliability, outlier data for the New Post Creek Diversion Dam gauge have been deleted and the remaining data adjusted based on the measured stage-discharge relationships for 1975, 1979, 1982-83, 1997-99, 2003 and 2006.
31.	Aquatic Report/2-17//0	Regarding channel stability over time the lower parts of New Post Creek are in bedrock which provides a natural base level which to some degree will control channel morphology and change over time. This will interrupt the typical pool & riffle sequence and common alluvial channel assumptions.	Good point. The following paragraph has been added after the second paragraph on p. 2-17: "Reaches of New Post Creek that are in bedrock have provided a natural base for maintenance of channel alignment and morphology."
32.	/2-14//0	Figure 2.7 is a poor scan and the Legend cannot be read and it is difficult to see detail in the map. It was not easy to follow some of the discussion that referred to this figure.	The scan is the best possible as the figure was folded in the original Ontario Hydro (1963) report. However, the legend has been corrected and is now legible. The discussion excerpted from the Ontario Hydro (1963) report was general in nature and did not specifically refer to Figure 2.7. The purpose of the original Figure 2.7 in the Ontario Hydro (1963) report was to provide the location points of hand-drawn cross-sections of the creek, point-form descriptions, e.g., Location Point 14 (Mileage 5.96) – "Bank beaver burrow – left bank, shows coarse sand and gravel", and photographs provided in the Appendix. Specific information provided in the cross-sections and point-form descriptions on water depths and channel widths was included in the legend.
33.	Aquatic Report/2-15 to 2-17//0	Thanks for these archival photos they are very interesting. What time of year were these photos taken any ideas?	Late August 1961
34.	Aquatic Report/2-48/Tributaries of New Post Creek/0	Adding the calculated drainage area for each tributary would be helpful to assess their importance to delivering flow and sediment to the headpond area. For example the largest tributary is 36.6 square kilometres in size. The report states that the length of the main channel of this tributary is 4542 metres? My	The Aquatic Environment TSD states that 4,542 m is the distance between New Post Creek and the Otter Rapids Road; not the length of the watercourse. Watershed areas for the 10 tributaries have been provided and will be included in the

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		software indicated that the main stem of this tributary is 22.7 kilometres long (?)	Aquatic Environment TSD and ER.
35.	Aquatic Report/2-47//0	For the geomorphic description of New Post Creek it would be helpful to provide actual channel slope values (e.g. 0.0016 (metres per metre)) rather than just saying 'steep' or 'relatively steep'.	The slope values have been calculated, and the ER and Aquatic Environment TSD will be revised with this information.
36.	Aquatic Report/2-25 & 2-26/2.2.1/0	I appreciate the information on TSS. Is there any concern(s) about bedload transport? The report states that bedload is not a concern if flows are less than 13 cubic metres per second however flows (especially this year) often exceed 13 cubic metres per second.	As indicated in the response to Comment 13, based on bed load sampling in September 2011, it was determined that bed load does not occur at the proposed intake location at flows of 13 m^3/s. Bed load sampling was attempted in the spring of 2012; however, due to a problem with the equipment on site, material could not be successfully retrieved. In the spring of 2013, bed load sampling was not attempted for safety reasons due to high flows and treacherous velocities with floating debris. This information will be incorporated into the Aquatic Environment TSD.
37.	Aquatic Report/3-14//5	Although we recognize that TTN proposed prediversion flows over New Post Falls these flows were ruled out of the minimum flow discussion as not acceptable to MNR.	This is correct. The last sentence of the last paragraph under the sub-heading Restoration of Historic Flow Regime (p. 3-15 of the Aquatic Environment TSD) will be revised as follows: "Restoration of the historic flow regimes may also affect current fish habitat and therefore was not acceptable by the MNR."
38.	Aquatic Report/3-54//0	In Adaptive Management Program there is no mention of tweaking the 7.5 m3/sec summer minimum flow to meet aesthetic values if inadequate. Same comment as 2314.	As part of a monitoring commitment, CRP/OPG will be undertaking a photographic documentation of the minimum flows over the New Post Creek waterfalls during the summer period (July through September), particularly with respect to mist generation. CRP/OPG does not expect this documentation of minimum flows to be significantly different than the average daily flow of 9.17 m^3/s indicated in Photograph 3.1 (p. 3-31). The photographic documentation of minimum flows over the waterfalls will be provided to the MNR for review of aesthetic values and assessment for potential

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			adjustment up or down taking into account net societal economic costs and benefits. This information will be included in the Aquatic TSD and ER.
39.	Aquatic Report/3-45/3.2.9/0	There is no mention of trash rack mesh size to prevent larger fish from being entrained. Please describe.	The following paragraph will be inserted before the first full paragraph on p.3-46: "Trash racks will be positioned at the upstream face of the intake to prevent entrainment of debris and will be removable. The spacing of the rack bars shall be in accordance with the requirements of the turbine manufacturer, but will not exceed 150 mm (clear) between bars, or as per DFO and MNR approved spacing."
40.	Aquatic Report/3-46//5	The statement that '...gross head of only 66m is considerably less that Churchill Falls' is misleading. A 66m head is very high for a 25MW facility when compared to local similar sized facilities (e.g. Long Sault GS).	You are correct that a 66 m head is very high when compared to Long Sault GS which has a generating capacity of 18 MW and head of only 9 m. However, there other generating stations with similar capacities and relatively high heads, e.g., Kakabeka Falls GS with a head of 56 m and capacity of 23 MW and Wawaitin GS with a head of 37.8 m and capacity of 15 MW. Additional examples outside Ontario include the BC Hydro 24 MW Aberfeldie GS with a head of ~80 m and the Innergex 54 MW Ashlu Creek GS with 220 m of head. These examples will be added at the end of the second last sentence in the fourth full paragraph on p. 3-46.
41.	Aquatic Report/3-44//0	Proposed 50m ROW for powerline requires discussion with MNR. As stated previously in comment # 2301.	The first sentence of the second paragraph on p. 1-25 in Section 1.2.3 under the sub-heading Transmission Line states that "the proposed transmission line will be constructed within a minimum 30.5 m (100 feet) wide right-of-way (ROW) that would be increased to a maximum 50 m width to prevent the fall of non-compatible trees over the transmission line conductors (KGS Group, 2013c). This sentence will be revised as follows: "the proposed transmission line will be constructed within a 30.5 m (100

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			feet) wide ROW (KGS Group, 2013c). Any non-compatible trees outside the 30.5 m ROW will also be removed to prevent their fall over the transmission line conductors. The remaining vegetation (compatible trees, shrubs, understory) will remain intact." This revision will also be incorporated into the ER and other TSDs. The second last sentence of the first paragraph under the sub-heading Transmission Line ROW Maintenance (p. 3-44) will be revised as follows: "However, overall adverse effects on any watercourse due to non-compatible riparian tree removal are expected to be minor given that the proposed ROW is only 30.5 m wide and will represent a very small proportion of the total length of the watercourse to be traversed."
42.	Aquatic Report/3-29 to 3-34//0	There is no specific description of the agreed upon proposed tweaking to the 7.5 m3/sec minimum summer flows to meet aesthetic values if after construction 7.5 m3/sec is shown to be inadequate. The only vague reference is on page 3-34 1st paragraph where it refers to 'adaptive management'. We suggest this should be included in the ER as it reflects discussion about effects of the project and proponent commitments to mitigation. It is expected that this commitment will be acknowledged as part of the application for LRIA approvals.	See response to Comment 38.
43.	Public and Agency Consultation/2-24/Table 2.1/0	Minimum flow is described incorrectly. Please use the correct flows as described in table on page 2-38.	See response to Comment 7.
44.	Public and Agency Consultation/2-32/23.1.2/0	In the Requirements for offsite and other ancillary features there is no mention of a boat launch upstream of the weir as previously discussed.	A requirement for a boat launch is not contemplated. Prior to construction initiation, the DBC will identify disembark/launch locations (with appropriate signage) for canoeists to access the portage trail.
45.	Public and Agency Consultation/2-13//1	'...possible gate to evacuate sediment.' MNR has concerns with the effects (e.g. volume timing etc.) of sediment 'evacuation'.	See response to Comment 11.

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46.	Aquatic Report/2-70/2.3.4/1	States that two outfitters are located in Cochrane when they are actually from Smooth Rock Falls. It's also incorrectly noted on page 3-52 para 3.	The corrections have been made.
47.	Public and Agency Consultation/2-24//5	'Fibre optic cable trenched from switchyard to communications trunk.' Please identify location on map.	The fibre optic communications trunk is located within the existing Hydro One transmission line ROW. The sentence has been revised as follows: "A fibre optic cable will be installed by trenching directly west from the point of interconnection switchyard (see Figure 2.12) to the Ontera-owned fibre optic communications trunk, located within the existing Hydro One transmission ROW." This revision will also be undertaken in the ER and other TSDs.
48.	Public and Agency Consultation/2-22//2	Hydroline right of way is proposed as 30.5m min and max of 50m to prevent tree falls. This is wider than the other ROW's in the area (30m for 115kv and 40m for 230kv max). Final ROW width requires discussion with Cochrane District MNR.	The first sentence of the second paragraph on p. 1-25 in Section 1.2.3 under the sub-heading Transmission Line states that "the proposed transmission line will be constructed within a minimum 30.5 m (100 feet) wide right-of-way (ROW) that would be increased to a maximum 50 m width to prevent the fall of non-compatible trees over the transmission line conductors (KGS Group, 2013c). This sentence will be revised as follows: "the proposed transmission line will be constructed within a 30.5 m (100 feet) wide right-of-way (ROW) (KGS Group, 2013c). Any non-compatible trees outside the 30.5 m ROW will also be removed to prevent their fall over the transmission line conductors. The remaining vegetation (compatible trees, shrubs, understory) will remain intact." This revision will also be incorporated into the ER and other TSDs.
49.	Socio-Economic and Land Use/3-8/3.3.2/3	It states that hunting and trapping are not permitted in Little Abitibi Provincial Park when in fact they are permitted uses.	The second paragraph in Section 3.3.2 has been revised as follows: "LAPP is a non-operating provincial park and therefore there are no visitor facilities in the Park but recreational uses such as canoeing, camping, hunting and angling are permitted. Existing commercial fur harvesting (trapping) is also permitted; however, new commercial fur harvesting is not permitted (MNR, 1992, 2000, 2006).

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50.	Socio-Economic and Land Use/3-9//3	It states that there is a Land Use Permit (LUP) for the bridge across New Post Creek but I believe the whole Otter Rapids Road is under an LUP (not only the bridge). Carole Boucher to advise.	Carole Boucher of MNR will advise on this at some point.
51.	Socio-Economic and Land Use/3-10//1	The Wetum Road opened in January 2013 and is in use during the winter season.	The third sentence in the third paragraph under the sub-heading Access and Transportation (p. 3-9) has been revised as follows: "The Otter Rapids Road is an access point for the Wetum winter road which was opened in January 2013."
52.	Socio-Economic and Land Use/4-9//0	Recreational canoeing and boating...-there is a portage mentioned upstream of the weir but no boat launch as discussed.	A requirement for a boat launch is not contemplated. Prior to construction initiation, the DBC will identify disembark/launch locations (with appropriate signage) for canoeists to access the portage trail. The disembark/launch location on New Post Creek will subsequently likely need to be relocated due to the proposed inundation.
53.	First Nation and Métis Interests and Consultation///0	No comment other than the FN/Métis engagement was well captured.	Thank you.
54.	Aquatic Report/2-7/2.1.4.1/1	Average post-diversion flows described as 35m3/sec (KGS 2010a) is inconsistent with 42m3/sec as described on page 2-8 para 1. 35 m3/sec also noted on page 3-4 para 4 2-17 para 1 2-68 para 5. Please clarify and/or correct.	The average post-diversion flow of ~35 m^3/s cited by KGS Group (2010a) is based on available data from 1975 to part of 2010. The current mean diverted flow of ~42 m^3/s is the average of the means presented in Table 3.4 which includes data through 2012. As indicated by the footnote, the mean annual flow of 36.0 m^3/s presented in Table 3.4 was taken from the Abitibi River WMP and as indicated the value is based on 1973-2002 data. The variability of the mean flow data will be clarified in the ER and TSDs.
55.	Environmental Report/4-105//0	Other Land Use and Tenure-It states that the Licence of Occupation (LO) will need to be amended to include inundation area. This is incorrect. The inundation area will require a new easement.	The incorrect sentence has been replaced with the following: "A new easement will be required for the proposed inundation area." This revision will also be undertaken in the Socio-Economics and Land Use TSD,
56.	Environmental Report/7-27//2	Reduced flow over New Post Falls will negatively affect all visitors to the falls and not just 'two local outfitters'.	The last sentence of the second paragraph on p. 7-27 has been revised as follows: "In turn, this may have a minor negative effect on visitor experience appreciation and the two local

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			outfitters who utilize the waterfalls as a tourism attraction for a portion of their businesses."
57.	Environmental Report/7-24//0	SEV-past direction was to require the proponent to specifically address the 11 principles for a given project and the District Manager signs it and it's placed on file before any permits are issued. I'm checking to see if this direction is still valid.	Based on the email dated August 12, 2013 received from Robin Stewart, the following paragraph will be inserted after the 11th SEV principle (p. 7-24): "The *EBR* requires MNR to ensure that the 11 SEV principles have been considered prior to the issuance of any permits or authorizations for an environmentally sensitive project, such as the proposed New Post Creek Project. This is undertaken by reviewing and documenting the 11 SEV principles and addressing the relevant ones. Once addressed, the document is signed by the District Manager and placed on the project file prior to permitting."
58.	Environmental Report/7-18/7.3/0	As required by the Abitibi River System Water Management Plan (ARSWMP) CRP/OPG will be required to collect and maintain hourly flow and level data and provide to MNR as requested for audit purposes.	The first paragraph under the sub-heading **Operations** (p. 7-18) in Section 7.3 of the ER will be revised as follows: "Flow discharge, water levels and water temperature will be monitored throughout proposed Project operation. As required by the Abitibi River WMP, CRP/OPG will collect and maintain hourly water level and flow data which will be provided to the MNR as requested for audit purposes." The same revision will be undertaken for the second paragraph of Section 6.3.5 of the ER.
59.	Environmental Report///0	There needs to be a statement in the ER stating that the operation and monitoring of the New Post GS will be in compliance with the approved Abitibi River System Water Management Plan (ARSWMP) and that the requirements of the ARSWMP amendment process are being met and documented by the EA process.	The following two sentences have been inserted after the third paragraph under the sub-heading Summary in the Executive Summary (p. ES-6) and at the end of Section 7.3 (p. 7-25): "The operation and monitoring of the proposed Project will be in compliance with the approved Abitibi River Water Management Plan (WMP). The requirements of the Abitibi River WMP amendment process are being met and documented by the EA process."
60.	Environmental Report/I-5/1.2/0	Refers to sec 9.3 for other environmental approvals but sec 9.3 is acronyms. It should say sec. 7.3.1 and Table 7.2.	The correction has been made.

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61.	Environmental Report/ES-3/ Socio-ec and land use/0	There is no mention of the Commercial Bear Management Area (BMA) operator who actively hunts bear at the end of the access road to the proposed weir. You did mention the BMA operator on page 3-70 under Hunting.	The following same paragraph occurs on p. 3-12 of the Socio-Economics and Land Use TSD and p. 3-70 of the ER: "Bear Management Areas (BMAs) have been established by the local MNR offices. These BMAs are allocated and licensed to hunting outfitters on Crown lands. Bear hunt camps may be allocated to commercial operators in the area under a Mini-land Use Permit during the open bear season. The proposed New Post Creek Project site occurs within BMA CC-26-015. TTN has indicated that few if any members hunt bear as it is considered a sacred animal."
62.	Environmental Report/ES-1/Aquatic Environment Section/0	Please describe how the upstream and downstream zones of influence (ZOI) were determined. Is there potential to have influence outside this zone?	The upstream limit of the zone of influence is considered to be the upstream limit of backwater effects from the proposed intake weir in New Post Creek, as direct effects upon upstream habitats will occur this far. However, the establishment of a lacustrine fish community within the proposed headpond may result in some changes to the fish community farther upstream, since some members of the new lacustrine fish community may migrate upstream to spawn or feed. The downstream limit of the zone of influence is at the mouth of New Post Creek at the Abitibi River. Upstream of its outlet, New Post Creek will be influenced by minimum flows and the operation of the proposed GS. A short section of the Abitibi River between the proposed tailrace and New Post Creek mouth will have increased flow reflecting that passed through the proposed GS. Upstream of the proposed tailrace and downstream of the New Post Creek mouth in the Abitibi River, flows will not be affected.
63.	Terrestrial TSD/2-34/2.5.4.3/0	Inundation area ends 7166m upstream of weir. As the LAPP exists above this point please explain rationale for why it ends there (are there rapids etc.)?	There is a set of rapids at this location, but there are also rapids downstream of this location that have incrementally raised the stream's surface elevation to a point that it is no longer affected

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			by the backwater effect from the proposed weir. There are also rapids upstream from this location.
64.	Terrestrial TSD/3-33//0	65. In regard to 'borrow pits' mentioned in figure 1.19 you indicate that no terrestrial surveys were done as part of this EA. If any new aggregate permits are needed as part of the project you will have to comply with the Aggregate Resources Act and EA Act requirements	The following paragraph will be inserted after Table 7.2 of the ER: "As indicated in Section 2.4.1.2, identification of specific borrow areas to be used during the construction phase is not possible at the EA stage. Figure 2.2 shows the locations of potential borrow areas. For new aggregate permits, the DBC will comply with *Aggregate Resources Act* and *EA Act* requirements.
65.	Environmental Report/3-55/3.2.4.3/1	It does not appear that the regional status of any plant species were determined. Therefore regionally rare plant species could not be given any consideration in this environmental assessment. Such information may not have affected decisions or mitigation measures but the effect of the project on regionally rare species remains undocumented. Also applies to Section 3.5.4 of the Terrestrial TSD.	Table 2.8 of the Terrestrial Environment TSD will also list the regional status of the plants observed within the proposed Project study area based on "Plants of the Clay Belt of Northern Ontario and Quebec" (Baldwin, 1958) and "Flora of the Hudson Bay Lowlands" (Riley, 2004). Both sources have limitations. Baldwin (1958) is somewhat dated; therefore, it is possible that the status of some plant species listed may not reflect the current status of the species. Riley (2003) is more recent, but addresses plants of the Hudson Bay Lowlands geographic region. The proposed Project is situated just south of the region; therefore, the status rankings may not be applicable or suitably applied to some of the species with the proposed Project area. Nonetheless, given the proximity of the proposed Project to the Hudson Bay Lowlands region, the rankings provide some measure of the species status within the proposed Project area.
66.	Environmental Report/ES-3/Executive Summary/22	It should be noted that the portion of this portion of the park was regulated well after the diversion was created. I believe this is a significant point.	The following paragraph will be inserted after the third paragraph (p. 3.66) under the sub-heading <u>Existing Land Use , Tenure and Resource Policy Direction</u>: "MNR (1978) identified the significant historical natural and recreational values of the "Little Abitibi – Newpost Canoe Route" and provided the justification for the establishment of the "Little

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			Abitibi Waterway Park". LAPP was regulated in 1985 (O. Reg. 279/85 Schedule 195), 22 years after the construction of the New Post Creek Diversion Dam on the Little Abitibi River. Therefore, the Diversion Dam is a pre-existing, non-conforming resource management activity in LAPP, as new hydroelectric developments have not been permitted in provincial parks by policy and more recently by legislation (i.e., *PPCRA*)." The first sentence "It is not clear how a man-made river diversion became a part of LAPP." of the next paragraph will be deleted. These revisions will also be undertaken in Section 3.3.2 of the Socio-Economics and Land Use TSD.
67.	Environmental Report/2-10/2.3.1/2	This is the first time I have heard about use of a sluice gate to evacuate accumulated sediments downstream of the water control structure into the provincial park. The environmental effects of this activity on the park environment/aquatic species downstream of the water control structure have not been explicitly assessed in Section 4.3.4. and no mitigation measures have been identified or developed (e.g. frequency timing sediment volume). Resident species of New Post Creek downstream of the water control structure (including small fish species and amphibians) as well as below New Post Falls must be considered. Required alteration also applies to final sentence on page 2-10 of ER and Section 3.2.4 of Aquatic TSD.	See response to Comment 11. The following paragraph will be added to the Section 4.3.3 of the ER: "As indicated in Section 2.3.1, the actual need to clear the sediment trap would be with a frequency in the order of years if not decades. However, CRP/OPG has considered this issue and is suggesting that a yearly flushing occur during near the start of the freshet, i.e., mid-April. This timing will avoid amphibian breeding and fish spawning periods. A yearly flushing would reduce the severity of a sudden increase in TSS concentrations due to a larger less frequent (e.g., every 10 years) flushing event and may also help in providing sediment bank stabilization for the by-pass reach that otherwise may be starved of sediment. The TSS concentrations resulting from this evacuation operation will be well below the sub-lethal effects threshold of approximately 1,000 mg/L for fish for short-term exposures, i.e., 4 to 14 h (Fitchko *et al*., 2008), and will be of short duration (less than 1 h). As indicated in Section 7.3, TSS concentrations will be

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			measured during the initial two sediment evacuation events." This paragraph will also be included in Section 3.2.3 of the Aquatic Environment TSD. Fitchko, J., M. Ernst, B. McCormick and L. Gresock 2008. *Lake Erie Link Project: Assessment of Potential Construction Effects of Electric Cable Crossing(s) of Lake Erie*, pp. 655-663. *In*: J.W. Goodrich-Mahoney, L.P. Abrahamson, J.L. Ballard and S.M. Tikalsky [Eds.]. The Eighth International Symposium on Environmental Concerns in Rights-of-Way Management, 12-16 September 2004, Saratoga Springs, New York, USA. Elsevier B.V., Amsterdam, The Netherlands.
68.	Environmental Report/3-32/3.1.9.5/24	Absence of evidence is not evidence of absence. I have no criticisms of the work by Coker and Port to determine if Lake Sturgeon spawn below NPF. However LAST is a long-lived species and individual females can go several years between breeding cycles. So despite their best efforts I do not think NPC can be eliminated as a possible spawning site for LAST. Some of the years were not optimal for LAST spawning. LAST were caught below NPF in the breeding season which indicates the area nonetheless provides some kind of habitat function that is important to LAST. But it IS fair to say all of the confirmed LAST spawning activity occurred at Abitibi Canyon while it could not be confirmed below NPF. I do not think that the possibility of infrequent spawning activity below NPF can be eliminated. Having said all this it is clear that Walleye are the more regular spawner below NPF and it is appropriate for Walleye to be the first consideration at that location. Also applies to Aquatic TSD pg 2-60 paragraph 6; pg 3-17 paragraph 4; and pg 3-38 paragraph 1.	The following sentence will be inserted at the end of the sixth paragraph on p. 3-32 of the ER: "Despite the lack of evidence based on the study findings, MNR and DFO have opined that New Post Creek may still be a possible spawning area that is used occasionally by Lake Sturgeon." The same sentence will be inserted at the end of the sixth paragraph on p. 2-60 of the Aquatic Environment TSD. The following paragraph will also be inserted after the sixth paragraph on p. 3-32 of the ER: "However, Lake Sturgeon were caught in New Post Creek prior to and after the Abitibi Canyon spawning period, suggesting that the watercourse does provide an important habitat function, e.g., availability of higher benthic macroinvertebrate densities for foraging (see Section 3.1.8)." The same paragraph will be inserted after the sixth paragraph on p. 2-60 of the Aquatic Environment TSD.
69.	Environmental Report/7-7/Table 7.1/0	Net effect on water temperature (last row on pg 7-7) is not consistent with the report text or aquatic TSD. This needs to be fixed. See Aquatic TSD pg 3-38.	The assessment of the significance of effects on water temperature in Table 7.1 has been revised as follows: **Likelihood of Net Effect**:

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			Certain **Significance**: Insignificant **Overall Assessment & Discussion**: Minor negative (localized effect)
70.	Environmental Report/3-7/3.1.3.1/2	Ontario Parks has previously authorized access to the diversion dam and channels via winter trail.	The sentence on p.3-7 or the ER has been revised as follows: "Access to the diversion dam is by helicopter and a MNR-authorized winter trail." This sentence will also be revised in the Aquatic Environment TSD.
71.	Aquatic Report/2-62/2.2.6.9/0	Referenced individual's name is misspelled.: Seyler not Seylor	The corrections have been made in the Aquatic Environment TSD and ER.
72.	Environmental Report/4-104/4.6.2/29	The reports are inconsistent and unclear when referring to activities or developments occurring within the park boundary. Greater consistency is needed throughout all documents to clarify whether the author is referring to the previous park boundary or the new (revised) park boundary. It must be clear through-out the document that no part of this development as defined under the PPCRA can or will occur within the new park boundary.	The ER and TSDs will be updated with respect to completion of the MNR Class EA process and revised to reflect the new park boundaries.
73.	Environmental Report/4-94/4.4.6/19	The Ontario Wetland Evaluation System was intended for use in Municipal Planning so it is hardly a surprise that there are no evaluated significant wetlands in the study area. Also applies to section 3.6 of the terrestrial TSD	The following will be added to the last sentence of the last paragraph of Section 4.4.6 "; however, wetland evaluations have not been undertaken in northern Ontario to the extent in southern Ontario."
74.	Environmental Report/4-89/4.4.5.3/0	Paragraphs under 'Effects on Downstream Riparian Environment' are very high level and supporting information/explanations have not been provided. The following paragraph speaks to effects on thicket swamps. However it is not clear how the downstream (park) environment will be positively or negatively affected with respect to things like silt load erosion or deposition hydrology and moisture regime fish and amphibian spawning sites. These need to be more explicitly described.	The three paragraphs in Section 4.4.5.3 under the sub-heading "Effects on Downstream Riparian Environment" (p. 4-89) of the ER will be replaced with the following: "Erosion and sediment deposition are expected to decrease overall as a result of the reduced flows downstream of the proposed GS. It is anticipated that the overall reduction in flows (which can vary considerably within and between years) will result in the shorelines and banks being more exposed for greater periods of time, as well as some areas of the streambed being more exposed at certain times of the year. Where streambed is exposed, it will be coarse material that will provide a new, harder shoreline

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			for the reduced stream width. Most of the finer substrate that is more prone to erosion occurs higher up along the banks, and will be subject to eroding flows less often than it is under current conditions. Where exposed areas of finer substrate are subject to erosion in periods and/or years where flows are higher, the resulting erosion is expected to stabilize over time as this creek section moves toward a new state of equilibrium under the altered flow regime. The implementation of minimum flows will help achieve a new state of equilibrium, and as the shorelines stabilize over time, vegetation such as willow and alder will become established as part of natural successional processes, further contributing to soil stabilization and erosion control. Existing downstream shoreline and floodplain vegetation communities are expected to adapt to the change in flows and/or shift in structure and species composition in response to the changes in disturbance patterns and moisture regime. Some areas along the creek that are subject to seasonal or periodic flooding under the existing flow regime will not be flooded to the same extent under the post-development flow regime. As a result, plant species less tolerant of flooding and the associated disturbance may move into these areas. For example, alder and willow thickets currently maintained by the disturbance associated with the current flooding regime may transition to forest, while the thickets may gradually expand into open areas exposed by the reduction in water levels. Surveys for breeding amphibians were not within the scope of the field studies for the proposed Project, therefore, data on the specific locations of amphibian breeding sites in the downstream environment and the specific

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			species present are not available. However, based on analysis of 32 years of historical flow data, our knowledge of the site, and knowledge of amphibian species known to occur in this area, some general assumptions can be formulated about anticipated effects to downstream amphibian populations. Under current conditions, the volume and frequency of downstream flows can vary considerably within years as well as between years. Based on 32 years of historic data, flow in May range between 30 and 235 m^3/s. As a result of the dynamic nature of this hydraulic system, amphibians that breed in the area are naturally adapted to substantial variations in the frequency and timing of flooding in the spring and throughout the year. Based on the historic flow data, an approximately 40% reduction in May flow volumes is expected to occur on average, with a consequent reduction in flooding; however, the data indicate that in most years the predicted spring flows will exceed the 50 m^3/s to be diverted to the proposed GS. Breeding sites located at higher elevations or further inland from New Post Creek that depend on periodic flooding under the existing flow regime will be more vulnerable to the proposed reduction in flows in some years, however, these sites may be sustained by other processes such as rainfall, overland runoff and tributary inputs. Furthermore, given the dynamic nature of riverine ecosystems, it is expected that the amphibian populations present in New Post Creek have the capacity to adapt to the predicted flow reductions resulting in negligible, if any, effect.”
75.	Environmental Report/4-50/4.3.7/4	I do not agree with the certainty of the statements in the first paragraph with respect to LAST. See my previous comments on Lake Sturgeon spawning below NPF.	The following sentence will be inserted at the end of the first paragraph on p. 4-50 of the ER: “However, Lake Sturgeon were caught in New Post Creek prior to and after the Abitibi Canyon

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			spawning period, suggesting that the watercourse does provide an important habitat function, e.g., availability of higher benthic macroinvertebrate densities for foraging (see Section 3.1.8)."
76.	Environmental Report/4-3/Table 4.1/0	Significant features of Little Abitibi Provincial Park need to be acknowledged too. How is it the Pinard Moraine CR was recognized as a significant natural area whereas the park was not? I provided OPG/TTN within information that demonstrated that the New Post portion of Little Abitibi PP contains provincially significant ecosystem representations as do the replacement lands. That is why MNR had interests in that site in the first place. This must be reflected in the text. Also applies to Section 4.4.6 (pg 4-94) Table 7.1 (pg 7-3 last row; pg 7-4 first row) and Section 3.6 of the Terrestrial TSD.	Little Abitibi Provincial Park was addressed under the criterion "Protected areas" in Table 4.1 (p. 4-8). The first sentence of the third paragraph in Section 3.2.5 of the Terrestrial Environment TSD has been revised as follows: "LAPP, located adjacent to the proposed Project property, provides waterway and natural environment class representation in the Lake Abitibi Ecodistrict (3E-1)." The third sentence has been deleted and the following two sentences added: "LAPP has a number of significant earth and life science features (Ontario Parks, 2006), including the Pinard Moraine, Zinger Lake esker complex, New Post Creek fault and 300+ years old Red Pine (*Pinus resinosa*) stand (see Section 2.6 of the Terrestrial Environment TSD). The Replacement Lands regulated into LAPP increased Park size by 243.0 ha and enhanced its overall ecological integrity." The following paragraph has been added as the first paragraph in Section 4.4.6 of the ER: "As indicated in Section 3.2.5, the nearest designated natural area is LAPP, located adjacent to the proposed Project property. The Replacement Lands regulated into LAPP increased Park size by 243.0 ha and enhanced its overall ecological integrity. However, land deregulation to permit the proposed Project to proceed resulted in the disjunction of LAPP as the waterway class portion is no longer a continuous system."

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			The first sentence of the third paragraph in Section 2.6 of the Terrestrial Environment TSD has been revised as follows: "LAPP, located adjacent to the proposed Project property, provides waterway and natural environment class representation in the Lake Abitibi Ecodistrict (3E-1)." The third sentence has been deleted and the following two paragraphs added: "LAPP has a number of significant earth and life science features (Ontario Parks, 2006). The Park is considered to be of moderate to high significance in providing representative samples of Precambrian and Quaternary activities that have occurred in this area of northeastern Ontario. The Pinard Moraine is one of the most prominent northern moraines in the Hudson Bay Lowlands. This feature extends eastward over a broad area from west of the Abitibi River across the New Post Creek area to the east. The esker complex in the Zinger Lake area is significant for study purposes as it preserves a Late Wisconsian esker under the blanket of Cochrane Till. The exposure of interbedded Cochrane Till and lacustrine silt and sand at the north end of Zinger Lake identifies a portion of the Cochrane lobe as having advanced into a proglacial lake. This feature is regionally unique in the Northeast Zone and possibly is the only one of its kind. Numerous faults and fractures are present within the Park affecting drainage and topography in some areas. The most significant fault occurs below the 25 m waterfalls on New Post Creek. This vertical fault includes an 8 m wide canyon which extends for 200 m below the waterfalls. One of the most significant life science features is a Red Pine (*Pinus resinosa*) stand that is estimated to be 300+ years old and is considered to be one of the most northerly examples remaining in this part of the Province (Riley, 1978). This stand is considered to be

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			provincially significant (Del Monte, 1984). The Replacement Lands regulated into LAPP increase the size of the Park by 272.0 ha and support more extensive areas of landform/vegetation associations that are presently under-represented in both LAPP and Ecodistrict 3E-1 (Beacon, 2010). The Replacement Lands support a greater number of ecological functions, have a higher level of diversity and encompass lands that have been considerably less disturbed by human activities. The Replacement Lands are also situated in an area where the surrounding landscape matrix is less disturbed. The contribution of these lands into LAPP will reinforce the large scale linkages to the north. As a consequence, the area is considered to support a higher level of ecological integrity than the deregulated area." The following paragraph has been added as the first paragraph in Section 3.6 (p.3.30) of the Terrestrial Environment TSD: "As indicated in Section 2.6, the nearest designated natural area is LAPP, located adjacent to the proposed Project property. The Replacement Lands regulated into LAPP increased Park size by 243.0 ha and enhanced its overall ecological integrity. However, land deregulation to permit the proposed Project to proceed resulted in the disjunction of LAPP as the waterway class portion is no longer be a continuous system." Little Abitibi Provincial Park will be addressed under the criterion "Protected areas" in Table 7.1 with the following assessment of the significance of effects: **Likelihood of Net Effect**: High **Value of Resource**: High **Magnitude**: Low **Geographic Extent**: Loss of 197 ha; gain of 440 ha

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			Duration or Frequency: Permanent **Reversibility**: Irreversible **Ecological/Social Context**: Area gain of 243 ha and enhancement of overall ecological integrity; disjunction of LAPP as waterway class portion is no longer a continuous system **Significance**: Insignificant **Overall Assessment & Direction**: Negligible
77.	Environmental Report/4-1/4.1/0	There is no standard description about how the magnitude of the potential effect is determined although there are some explanatory notes in the table. The objectivity of the assessments would be improved if there was some general description about what constitutes a high vs. low effect (e.g. geographic extent intensity).	As indicated by the points in the second paragraph of Section 7.1, some guidance has been provided on the definition and meaning of some of the terms used in the assessment of the significance of effects. However, the determination of "effect levels" is based on EA practitioner experience and judgment.
78.	Environmental Report/3-75/3.5/0	Figure 3.7 shows only those Conservation Reserves and Parks created or modified during the OLL Land Use Strategy but not the protected areas that existed prior to that exercise. Strange.	Figure 3.7 was excerpted from the Abitibi River WMP.
79.	Environmental Report/3-66/3.4.2.1/32	The statements in paragraph 4 of this section are unacceptable as written. Ontario Parks can provide information about why the park was established as it exists today. Ontario Parks can also provide information on what forms of consultation occurred Cprior to regulation. TTN may not feel this was adequate which of course can also be acknowledged in the text.	See response to Comment 66 regarding why LAPP was established. See response to Comment 3 regarding consultation.
80.	Terrestrial TSD/2-47/2.5.6/0	The final statement of paragraph 2 should not be referenced to Sheppard & Morris (2008). 'Staple' means that the food item was a significant part of the First Nation diet. Only TTN elders can advise whether that final statement is accurate but I suspect that wild plums were not a' staple.'	The last sentence of the last paragraph in Section 2.5.6 has been revised as follows: "Sheppard and Morris (2008) postulated that the population is likely introduced intentionally or accidentally by European or aboriginal people inhabiting the site."
81.	Aquatic Report//Appendix B/0	The pictures presented in the spawning assessment are much appreciated thanks.	Thank you.
82.	Aquatic Report//Appendix A/0	The legends for the Appendix A Habitat Maps did not reproduce very well.	The legends have been revised to facilitate greater resolution when photocopied.
83.	Terrestrial TSD/1-10/Figure 1.5/0	As it states on page 1-37 and 1-38 that aggregates will not be covered by this EA please keep in mind in order	As indicated in the response to Comment 64, the following paragraph will be inserted after

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		to issue a new aggregate permit it will require EA coverage. Many of the sites identified on Figure 1.5 primarily on the East side of the River are currently not authorized by an aggregate permit therefore an application will be required to activate the sites even if there has been past excavation. Please note that an aggregate permit is required when Crown or Leased aggregate material is excavated and the local MNR office should be consulted prior to excavation. Please note the process to acquire an aggregate permit usually takes about 4 to 6 months and can continue on longer depending on the issues.	Table 7.2 of the ER: "As indicated in Section 2.4.1.2, identification of specific borrow areas to be used during the construction phase is not possible at the EA stage. Figure 2.2 shows the locations of potential borrow areas. For new aggregate permits, the DBC will comply with *Aggregate Resources Act* and *EA Act* requirements."
84.	Aquatic Report/3-52//2	Further discussion is required around the impact of the project on the existing portage trails. A map of the proposed alternative portage is required to be reviewed by Parks and MNR District staff.	The following paragraph will be inserted after the second paragraph in Section 3.2.12: "Prior to initiation of construction of the proposed Project, the DBC will identify disembark/launch locations for canoeists to access the new portage trail between New Post Creek and the Abitibi River during the construction period. A map showing the proposed location of the new portage trail will be provided to Ontario Parks and MNR for review and approval. The disembark/launch location on New Post Creek will subsequently likely need to be relocated due to the proposed inundation and the final portage trail location between New Post Creek and the Abitibi River will be discussed with Ontario Parks during the construction phase."
85.	Public and Agency Consultation/2-22//2	Please add a sentence stating that the Right of Way will be outside of the Park Boundary (update all reports that duplicate this paragraph).	The following sentence was added to the end of the second paragraph under the sub-heading Transmission Line (p. 2-19): "The proposed transmission line right-of-way (ROW) is located outside of LAPP." This sentence will be inserted in the ER and other TSDs.
86.	Socio-Economic and Land Use/3-10/3-10 Forest Operations/0	It is worth noting in the document that the SFL boundary will be amended through a separate process to change the boundary of the licensed area.	The following paragraph will be inserted under the sub-heading Forest Resources in Section 4.2.3 (p. 4-7): "The SFL for the recently amalgamated Abitibi River Forest will be amended by the MNR through a separate process to change the boundary of the licensed area to account for the proposed Project

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			property."
87.	Socio-Economic and Land Use/2-1//4	Paragraph beginning 'The generation...' change 're-regulation' to 'regulation.	Correction was previously made during preparation of the ER and other TSDs.
88.	Aquatic Report/18/Intermittent Operation of the GS/0	In the Assessment of Effects to Fish Habitat there is some discussion of 'immediate' increases of discharge that 'may dislodge deposited eggs'. We suggest you consider ramping rates in cubic metres per second per hour that gradually increase and decrease to and from peaked flows rather than immediate changes in discharge. (I think there is some discussion of this on p.19 to help alleviate sudden changes in flows in the bypass reach but more detail would be appreciated).	The discussion on the effects of immediate flow increases is based on the operation of the GS **without pulsing**. As long as pulsing is part of the proposed operating regime of the GS, significant immediate increases to flow in New Post Creek downstream of the intake weir will not occur. The pulsing operation will mitigate the potential effects of intermittent GS operation on the spawning habitat in New Post Creek below the waterfalls. As indicated in the second last paragraph of Section 3.2.7 of the Aquatic Environment TSD, "Based on June 1998 flow data, flows were greater than 25 m^3/s on June 1 to 3 and would have permitted continuous operation of the proposed GS. After dropping below 25 m^3/s on June 4, without the pulsing option, the proposed GS would have had to shut down releasing significant increased flow. During the remainder of the month, flows were variable (i.e., above and below the 25 m^3/s threshold for proposed GS operation), resulting in a number of additional startups and shutdowns, and associated sudden downstream flow changes. Intermittent operation of the proposed GS using water stored in the headpond would mitigate against these sudden and potentially frequent flow increases downstream of the intake weir and over the spawning area downstream of the waterfalls."
89.	///0	It would be very helpful to have a longitudinal profile of Newpost Creek from the Little Abitibi River Diversion Dam to the Abitibi River. A long profile of a river provides insight on sediment transport potential stream energy and potential change over time.	As indicated in the response to Comment 25, the topographical surveys undertaken for this proposed Project are of limited extent within New Post Creek, and therefore information required to create a longitudinal profile from

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			New Post Creek Diversion Dam to the Abitibi River is not available.
90.	Aquatic Report/B-3//0	Regarding Photograph 6 in this location Newpost Creek is 44m to 63m wide but with bypass reach flows of 7.5 5 and 2 cms the wetted width will be much reduced. What might be the implications of the channel bed exposed continuously once the dam is in operation? We suggests these effects should be explored through the EA to inform the application for approvals.	With reduced flows a portion of the existing channel will be dewatered regularly so that it no longer will be considered aquatic habitat. However, these areas will be inundated periodically, and possibly for an extended period during the spring or other periods when the flow in New Post Creek exceeds 50 m^3/s plus the minimum flow. Therefore, depending upon the topographic relief of these areas of the existing stream channel, they will likely develop some mix of wetland/floodplain plant and animal communities, likely similar to the alder thicket and open wetland/ floodplain meadow that is found along the channel at present. The following is stated on p. 4-89 of the ER: "Some areas along New Post Creek that are subject to seasonal or periodic flooding under the existing flow regime will not be flooded to the same extent under the post-development flow regime. As a result, species less tolerant of flooding and the associated disturbance may move into these areas. Alder and willow thickets currently maintained by the disturbance associated with flooding will likely transition to forest, while the thickets will likely expand into open areas exposed by the reduction in water levels."
91.	Aquatic Report/3-42/Tributary Streams/0	What are the drainage areas of the 10 tributaries that are described to flow into the proposed headpond? Also you should include how far upstream from the proposed dam site the tributaries enter into Newpost Creek. Is there an erosion potential due to headpond tributary inundation?	As indicated in the response to Comment 34, watershed areas of the 10 tributaries will be included in the ER and Aquatic Environment TSD. The distances of the tributary mouths from the proposed weir location will also be provided. It is expected that water-level fluctuations due to pulsing may result in proposed headpond shoreline (and tributary) inundation; however, stabilization of the erosion processes can be expected within one growing season. As indicated in response to Comment 122, visual monitoring (with photographic documentation) of shoreline erosion and sedimentation will be

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			undertaken upstream of the proposed dam after one growing season after initiation of proposed GS operation to confirm stabilization of erosion processes.
92.	Aquatic Report//3.2.4/0	In the Sediment Erosion and Transport section what are the TSS concentrations? Was any suspended sediment sampling done in Newpost Creek to get an idea of the sediment load to help describe existing conditions from which once can consider effects and monitor change? How comparable is the site used in the Turner et al. (2005) paper to Newpost Creek?	As indicated in the response to Comment 13, TSS concentrations in New Post Creek at the proposed intake location and the upstream Otter Rapids Road bridge were <5 mg/L during flows of 12.26 m^3/s and ranged from 21 to 229 mg/L during higher flows (124.19 to 145.85 m^3/s). Additional TSS sampling was undertaken during the spring of 2013 when flows were nearing the peak of the flood hydrograph at 260 m^3/s. TSS concentrations ranged from 148 to 317 mg/L (mean of 225 mg/L). Based on bed load sampling in September 2011, it was determined that bed load does not occur at the proposed intake location at flows of 13 m^3/s. Bed load sampling was attempted in the spring of 2012; however, due to a problem with the equipment on site, material could not be successfully retrieved. In the spring of 2013, bed load sampling was not attempted for safety reasons due to high flows and treacherous velocities with floating debris. This information will be incorporated into the Aquatic Environment TSD. As indicated in Section 3.2.3 of the Aquatic Environment TSD, clearing of the headpond (flooded) area will result in the disturbance and exposure of soil with potential for increased erosion and resuspension in the water column. Stumps are to remain in the ground so as to maintain root mat, limit soil disturbance and lower the risk of erosion and TSS released to the headpond. It is anticipated that increases in TSS will be temporary. When an oligotrophic lake in northwestern Ontario was subjected to seasonal experimental fluctuations of water

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			levels, Turner *et al*. (2005) determined that TSS concentrations remained extremely low after three years of drawdown of 2 to 3 m. As water-level fluctuations in the headpond will range only up to 0.5 m, it is anticipated that changes to TSS concentrations will be small. The lake studied by Turner *et al*. (2005) is a 16.1 ha double-basin oligotrophic lake with a maximum depth of 14.7 m located on Precambrian granite in the Experimental Lakes Area of northwestern Ontario. The proposed Project headpond is larger in area (170 ha) with a maximum depth of 7 m located in an area of clay till with bedrock outcrops.
93.	Aquatic Report/3-14//0	The rationale for using a 3 cubic metres per second bypass reach flow is to maintain fish habitat. This discharge is much lower than what currently flows in the channel - are there any concerns geomorphically regarding bank erosion from the proposed dam site down to the Abitibi River when these bypass reach flows are passed? There will essentially be an underfit stream in a much larger channel.	As indicated on page 4-47 of the ER: "The lower flows in this creek section will result in an increase of exposed shorelines and banks. Although there may be more exposed streambed under the reduced flows, most of this will be coarse material that will provide a new and harder shoreline for the reduced stream size. Most of the finer substrate that is prone to erosion occurs higher up along the banks and will subsequently be less often subject to eroding flows."
94.	Aquatic Report/3-18 to 3-22/Figures 3.1 to 3.5/0	The fine details in these figures are obscured especially the legends.	The size of these five pages has been increased from letter to tabloid.
95.	Aquatic Report/B-10//0	Looking at Photograph #20: at higher flows there certainly is some bedload transport potential looking at the size of the sediment on the bed and the erodible banks. Was bedload transport ever assessed in any of the reports?	As indicated in the responses to Comments 13 and 92, bed load sampling was attempted in the spring of 2012; however, due to a problem with the equipment on site, material could not be successfully retrieved. In the spring of 2013, bed load sampling was not attempted for safety reasons due to high flows and treacherous velocities with floating debris. This information will be incorporated into the Aquatic Environment TSD.
96.	Environmental Report/0/0/0	Proposed New Post Creek Hydroelectric Project Environmental Report Table 7.2 Need to change	A new row has been added to Table 7.2 as follows;

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		information in the table. Land Use Permit A Land Use permit or an Easement can be given for the transmission corridor.	**Agency**: MNR **Statute**: *Public Lands Act* **Likely Permits, Licences and Approvals**: Land Use Permit or Easement **Applicability**: Land Use Permit or Easement for the transmission line ROW. A Letter of Authority can be given for the construction of the transmission line ROW in correspondence with the Land Use Permit or an Easement. The paragraph under the sub-heading Other Land Use and Tenure (pp. 4-105 to 4-106) in the ER has been revised to reflect the above. The first paragraph in Section 4.2.1.3 of the Socio-Economics and Land Use TSD has also been revised to reflect the above.
97.	Socio-Economic and Land Use/4-6/4.2.1.3/0	New Post Creek Generation Station Socio-Economic and land use Technical Support Document/ 4.2.1.3 Other Land Use and Tenure P 4-6 And Proposed New Post Creek Hydroelectric Project Other Land Use and Tenure /P 4-106 Add ' A Location Approval is required for the approved use of the site for waterpower (not construction). Plans and Specs are required for the construction of the waterpower facility.'	A second paragraph was inserted after the first paragraph under Section 4.2.1.3 of the Socio-Economics and Land Use TSD, as well as after the first paragraph under the sub-heading Other Land Use and Tenure (p. 4-106) of the ER, as follows: "A Location Approval is required for the approved use of the proposed Project site for waterpower (not construction). Plans and specifications are required for the construction of the proposed waterpower facility. "
98.	Environmental Report/0/0/0	Proposed New Post Creek Hydroelectric Project Environmental Report Table 7.2 Need to change information in the table. Add Letter of Authority A Letter of Authority can be given for the construction of the transmission corridor in correspondence with the land use permit or an easement.	See response to Comment 96.
99.	Environmental Report/0/0/0	Proposed New Post Creek Hydroelectric Project Environmental Report / Table 7.2 Need to change information in the table. Crown Lease Remove 'Construction of GS: Short term Crown lease during construction of GS' and add 'For sediment pond location' Add Construction Lease Interim tenure during dam construction.	The heading Construction of GS was deleted in the **Applicability** column of Table 7.2 and text revises as follows: Short term Crown lease for sediment location. Construction Lease Interim Tenure during dam construction.

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100.	Environmental Report/0/0/0	Proposed New Post Creek Hydroelectric Project Environmental Report/ Table 7.2 Need to change information in the table. LRIA Remove 'Multi-purpose Work permit application form to provide information related to LRIA approvals and add Approvals under LRIA.' Add ' Approvals under LRIA' Remove ' For construction activities on shore lands and add In water work not covered under the PLA.' Add ' For in water work that is not covered under PLA.' LRIA Remove 'Location approval for the works involving the construction of the new dam and GS' add 'Location Approval for the approved use of the site for waterpower (not construction)'.	The following text was deleted in the **Likely Permits, Licences or Approvals** column of Table 7.2 "Multi-purpose Work Permit application form to provide information related to *LRIA* approvals" and replaced with the following: "Approvals under *LRIA*". The following text was deleted in the **Applicability** column "For construction activities on shore lands" and replaced with the following: "In-water works not covered under the *Public Lands Act*". The following text was deleted in the **Applicability** column "Location approval for the works involving the construction of the new dam and GS" and replaced with the following: "Location Approval for the approved use of the site for waterpower generation (not construction)".
101.	Environmental Report/0/0/0	Proposed New Post Creek Hydroelectric Project Environmental Report Table 7.2 Need to change information in the table. Waterpower Lease Agreement Change Water Power to Waterpower.	"New Water Power Lease Agreement' has been revised to: "New Waterpower Lease Agreement" in Table 7.2.
102.	Environmental Report/0/0/0	Proposed New Post Creek Hydroelectric Project Environmental Report Table 7.2 Need to change information in the table. LO Change LO to Easement An easement is required for the inundation not an LO.	The following text was deleted in the **Likely Permits, Licences or Approvals** column of Table 7.2 "LO" and replaced with "Easement". The following text was deleted in the **Applicability** column "Amendment to the existing OPG LO for the Abitibi River" and replaced with: "Easement required for the inundation".
103.	Environmental Report/0/o/0	Proposed New Post Creek Hydroelectric Project Environmental Report / Table 7.2 Need to change information in the table. Public Lands Act Remove Ontario regulation 453/96 Section 2 and add Section 2 (1) regulation 975. Add to Applicability - activities such as a road building trail water crossing and work on shore land.	The following text was deleted in the **Likely Permits, Licences or Approvals** column of Table 7.2 "Ontario Regulation 453/96 Section 2" and replaced with "Section 2(1) Regulation 975". Under the **Applicability** column, the text under the sub-heading <u>Construction of GS</u> was revised as follows: "A work Permit is required for various construction related activities such as road construction, trails, water crossings and work on shorelands".

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104.	Environmental Report/4-90/0/0	13. Proposed New Post Creek Hydroelectric Project Environmental Report Proposed Transmission Line Effects P 4-90 Please rationalize the need to clear vegetation within a maximum 50m wide corridor	As indicated in the response to Comment 48, the first sentence of the second paragraph on p. 1-25 in Section 1.2.3 under the sub-heading Transmission Line states that “the proposed transmission line will be constructed within a minimum 30.5 m (100 feet) wide right-of-way (ROW) that would be increased to a maximum 50 m width to prevent the fall of non-compatible trees over the transmission line conductors (KGS Group, 2013c). This sentence will be revised as follows: “the proposed transmission line will be constructed within a 30.5 m (100 feet) wide right-of-way (ROW) (KGS Group, 2013c). Any non-compatible trees outside the 30.5 m ROW will also be removed to prevent their fall over the transmission line conductors. The remaining vegetation (compatible trees, shrubs, understory) will remain intact.” This revision will also be incorporated into the ER and other TSDs
105.	Socio-Economic and Land Use/4-6/4.2.1.3/0	New Post Creek Generation Station Socio-Economic and land use Technical Support Document / 4.2.1.3 Other Land Use and Tenure / P 4-6 And Proposed New Post Creek Hydroelectric Project Other Land Use and Tenure P 4-106 You have that an 'Easement will be required under the Public Lands Act for the transmission line'. For your information MNR can also provide you with a Letter of Authority for the construction of the transmission corridor in correspondence with a Land Use Permit.	The paragraph in Section 4.2.1.3 has been revised as follows: “OPG currently has a LO for a section of New Post Creek in the vicinity of New Post Creek Diversion Dam. Various Land Use Permits, Crown Leases and a Construction Lease will be required from MNR under the *Public Lands Act* to allow for short-term tenure authorizing the occupation of Crown land for the construction of the proposed Project. Plans and specifications are required for the construction of the proposed waterpower facility.” A new second paragraph will be inserted after the first paragraph as follows: “A Location Approval is required for the approved use of the proposed Project site for waterpower (not construction). As well, CRP/OPG will need to obtain a Waterpower Lease Agreement for the proposed Project once construction is completed and the site is in-service. A new Easement is required for the proposed

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			inundation area. A Land Use Permit or an Easement will also be required under the *Public Lands Act* for the transmission line. A Letter of Authority can also be provided by the MNR for the construction of the transmission line in correspondence with a Land Use Permit or Easement.”
106.	Socio-Economic and Land Use/4-6/4.2.1.3/0	New Post Creek Generation Station Socio-Economic and land use Technical Support Document 4.2.1.3 Other Land Use and Tenure / P 4-6 And Proposed New Post Creek Hydroelectric Project Other Land Use and Tenure / P 4-105 Change 'As well OPG/CRP will need to obtain a water power lease and a Licence of Occupation for the Proposed Undertaking once construction is completed and prior to operations.' to ' As well OPG/CRP will need to obtain a Waterpower Lease Agreement after the construction is complete and the site is in service. An easement is required for the inundation area.'	See response to Comment 105.
107.	Socio-Economic and Land Use/4-6/4.2.1.3/0	New Post Creek Generation Station Socio-Economic and land use Technical Support Document /4.2.1.3 Other Land Use and Tenure /P 4-6 And Proposed New Post Creek Hydroelectric Project Other Land Use and Tenure / P 4-105 During construction various Land Use Permits and Crown Leases will be required from MNR under the Public Lands Act to allow for short-term tenure authorizing the occupation of Crown Land for construction of the facility. Add construction Lease.	See response to Comment 105.
108.	Socio-Economic and Land Use/4-9/4.2.1.3/0	New Post Creek Generation Station Socio-Economic and land use Technical Support Document / 4.2.1.3 Other Land Use and Tenure / P 4-9 And Proposed New Post Creek Hydroelectric Project Environmental Report / Navigable Waters and Public Safety /P 4-27 Identify the location of the portage and the alternative portage on a map.	The following paragraph will be inserted after the first paragraph under the sub-heading Recreational Canoeing and Boating (p. 3-52) in Section 4.2.3 of the Socio-Economics and Land Use TSD, at the end of the sub-section heading Navigable Waters and Public Safety (p. 4-28) of the ER, as well as after the second paragraph in Section 4.6.4 (p. 4-108) of the ER: “Prior to initiation of construction of the proposed Project, the DBC will identify disembark/launch locations for canoeists to access the new portage trail between New Post Creek and the Abitibi River.

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			A map showing the proposed location of the new portage trail will be provided to Ontario Parks and MNR for review and approval.”
109.	Socio-Economic and Land Use/4-6/4.2.1.3/0	New Post Creek Generation Station Socio-Economic and land use Technical Support Document / 4.2.1.3 Other Land Use and Tenure / P 4-6 And Proposed New Post Creek Hydroelectric Project / Other Land Use and Tenure / P 4-105 Need to reword this phrase. 'This LO will need to be extended to include the proposed inundation area for the Proposed Undertaking' Change it to. 'An easement is required for the inundation.'	See response to Comment 105.
110.	Aquatic Report/0/1.2/0	Figure 1.21 Site -specific Study Area Add identification arrows on the box for the Unnamed Watercourse # 520 #491 and #629.	Identification arrows are provided on Figure 1.21 for the three Unnamed Watercourses.
111.	Environmental Report/3-76/Table 3.16/0	Proposed New Post Creek Hydroelectric Project Environmental Report Table 3.16 P 3-76 and P 3-77 Change the facility dam Owner Operator name from ACCC to H20 POWER LP	ACCC has been revised to H2O Power LP in Table 3.16 of the ER and Table 2.26 of the Aquatic Environment TSD.
112.	///0	Many of the proposed activities within the terrestrial landscape related to facility and transmission line construction operation and maintenance will alter the existing landscape and elevate the risk for fire starts. Such activities could also present significant operational challenges from a response perspective within the area of undertaking. Wildfires have the potential to significantly impact the facility adjacent land and resource user's private property and other values which emphasizes the need for a proactive approach to managing the risk and associated liabilities under the Act. That said early involvement and regular consultation with fire management staff at all stages via existing MNR channels is encouraged in order to maintain situational awareness ensure compliance and seek clarification on procedures. Key contacts for this project include Regional Fire Science and Planning Specialist Nicole Galambos (Phone: 705.235.1178 Email: nicole.galambos@ontario.ca) and Fire Operations Supervisor Cochrane Fire Management Headquarters Al Winters (Phone: 705.272.7153 Email: al.winters@ontario.ca).	Thank you for the contact information which will be provided to the DBC for the proposed Project to ensure early involvement and regular consultation with MNR. The following two paragraphs will be inserted after the fourth paragraphs in Sections 4.4.5.1 and 3.5.1 of the ER and Terrestrial Environment TSD, respectively: “Early involvement and regular consultation will be undertaken by the DBC with the MNR Fire Management Headquarters in Cochrane to maintain situational awareness, ensure compliance and seek clarification on procedures. Specific concerns to be addressed by the DBC include the handling and storage of hazardous materials on site; vegetation management procedures related to the construction and maintenance of temporary and permanent facilities, transmission line ROW and access roads; and access to the site for fire response purposes with consideration for ease of access

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			turnarounds and egress. If access is to be controlled procedures should be in place in advance to afford local fire response staff reasonable access to the site. Fire management should also be aware of any hazards that they may encounter in the event that they are dispatched to a fire on site and any relevant communications procedures. Certain forest operations, such as road construction and land clearing, may be subject to the Modifying Industrial Operations Protocol if the fire hazard warrants imposing specific conditions within the annual fire season (April 1-October 31). The restrictions associated with operating in accordance to the protocol are directly correlated to the daily fire hazard. Specific conditions may include ensuring fire suppression equipment is on site and immediately available for deployment by trained staff, as well as the use of spark arrestors, cleaning machinery and smoking in the forest environment."
113.	Environmental Report///0	Environmental Report - Section 6.0 - Public and Agency Consultation should reference MNR Aviation Forest Fire and Emergency Services. Contact can be made through existing MNR channels or via direct consultation with the designated fire management staff identified previously.	MNR Aviation Forest Fire and Emergency Services were not contacted during public and agency consultation (see, however, response to Comment 112). All of the MNR reviewers of the proposed New Post Creek ER and TSDs will be cited in the Public and Regulatory Agency Consultation TSD.
114.	Environmental Report///0	Environmental Report - Section 1.1 - The Regulatory Framework and Environmental Assessment Process should make reference to the Forest Fire Prevention Act. This Act should also be included in Table 7.2 - List of Permits Licenses and Approvals Possibly Required for the Proposed New Post Creek Project.	Section 1.1 addresses the regulatory framework and EA process for obtaining EA approval. The following row has been added to Table 7.2: **Agency**: MNR **Statute**: *Forest Fire Prevention Act* **Likely Permits, Licences or Approvals**: Permits **Applicability**: Burning of non-merchantable wood material and management of forest fuels left on site (i.e., slash and chipper/mulch piles)

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115.	///0	Specific concerns to address include the handling and storage of hazardous materials on site; vegetation management procedures related to the construction and maintenance of temporary and permanent facilities transmission lines and access roads; and access to the site for fire response purposes with consideration for ease of access turnarounds and egress. If access is to be controlled procedures should be in place in advance to afford local fire response staff reasonable access to the area of undertaking. Fire management staff should also be aware of any hazards that they may encounter in the event that are dispatched to a fire on site and any relevant communications procedures.	See response to Comment 112.
116.	///0	Further to the general requirements outlined within the FFPA certain forest operations such as road construction land clearing etc. may be subject to the Modifying Industrial Operations Protocol if the fire hazard warrants imposing specific conditions within the annual fire season (April 1st - October 31st). The restrictions associated with operating in accordance to the protocol are directly correlated to the daily fire hazard. Specific conditions may include ensuring fire suppression equipment is on site and immediately available for deployment by trained staff.	See response to Comment 112.
117.	///0	Even though the Class EA for hydro power does not specifically address forest fire management concerns many of the proposed activities in all phases of the project are subject to provisions outlined within the Forest Fire Prevention Act and consultation is therefore advised at all stages. More specifically activities associated with the proposed vegetation management strategy such as burning and the management of forest fuels left on site (i.e. slash and chipper/mulch piles) would likely be subject to various conditions or approvals. The FFPA also includes certain rules about the use of spark arrestors cleaning machinery and smoking in the forest environment.	See response to Comment 112.
118.	///0	The Class Environmental Assessment for hydro power development projects does not specifically address forest fire management concerns; however the	See response to Comment 112.

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		process must address the natural role of fire within the project area and the associated impacts the proposed activities will have on Natural Vegetation and Habitat Linkage; the increased fire hazard and risks that the project poses to public health and/or safety; and appropriate mitigation strategies (i.e. the application of FireSmart principles the use of wide transmission corridors free from debris and access and fire response planning).	
119.	Environmental Report///0	Environmental Report - Section 4.0 - Effects Assessment and Recommended Mitigation Measures should discuss any measures to mitigate risk and manage wildfire within the area of undertaking. This may also be relevant to the proposed Hazardous Materials Management Plan Waste Management Plan and Spills Emergency Preparedness and Response Plan.	As indicated in the last paragraphs of Sections 4.4.5.1 and 3.5.1 of the ER and Terrestrial Environment TSD, respectively, "A Fire Protection Plan will be developed by the DBC. This Plan will provide an inventory of available fire suppressant equipment, fire brigade set-up, response plans and contingency plans. The Plan will also include fire reporting and procedures for obtaining fire permits and prohibitions on materials to be burned on-site. The conditions of any burning permits will be acknowledged in the Plan. If the burning of slash and unmerchantable timber is required, the Plan will outline the communication process with the MNR to obtain approval to proceed based on fire bans and weather forecasts, as well as to confirm availability of rapid fire response resources, if required." The following sentence will be inserted at the end of the above paragraph: "The Fire Protection Plan will be part of the broader Environmental Management Plan."
120.	ER/2-16/2.3.5/0	Pinard Creek represents a valued brook trout fishery. Proposed ROW construction and maintenance mitigation must ensure riparian vegetation and banks are protected.	The second paragraph under the sub-heading Watercourse Crossings (p. 4-23) of the ER and the second last paragraph under the sub-heading Watercourse Crossings (p. 3-12) of the Aquatic Environment TSD will be revised as follows: "As transmission line construction will adhere to the appropriate mitigation measures, e.g., buffer establishment, erosion and sediment control, and management and control of

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			incidental spills, identified in…..” The following will be added at the end of this paragraph: “A potential adverse effect on fish habitat and fisheries could be the maintenance of riparian vegetation in a more open state due to vegetation management in the proposed ROW. These effects would be negligible for those watercourses where the riparian habitat is currently dominated by wetlands, thicket swamps and thickets. Riparian vegetation of the watercourses to be traversed by the proposed transmission ROW, including Pinard Creek which supports a brook trout fishery, are dominated by these low plant communities. These communities are expected to remain similar even with vegetation management.”
121.	ER/4-40/4.3.1.2/0	DFO was also not convinced sturgeon don't spawn below the Falls. Please add this to the text.	See response to Comment 68.
122.	ER/7-18/7.3/0	An erosion and sedimentation monitoring component should be added. Monitoring both upstream and downstream of the dam around the tailrace and at the transmission line ROWs should be conducted so design/operational effects can be ascertained effect predictions validated and the effectiveness of any erosion mitigation be determined. The potential for scouring of the river bottom at the tailrace the concern over deposition of sediment in the headpond and the impact frequent water level fluctuations may have on any unstable shoreline necessitate this.	The following will be added to the list of recommended environmental monitoring (p. 7-18 of the ER): • “visual monitoring (with photographic documentation) of shoreline erosion and sedimentation upstream and downstream of the proposed dam, at the proposed tailrace and in the watercourses traversed by the proposed transmission line ROW after one growing season after initiation of proposed GS operation (water samples for TSS analysis to be collected in any areas of visible turbidity and water temperature to be measured in Pinard Creek) with subsequent monitoring of any sites requiring additional stabilization mitigation;” This monitoring program will also be revised in Section 6.3 of the ER and Section 3.3 of the

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			Aquatic Environment TSD.
123.	ER/7-18/7.3/0	The Newpost Creek invertebrate community is comparably rich and abundant. The potential impacts of dam construction and operations to this community are not well understood for this site. It is known from the primary literature that invertebrate community responses are highly variable including negative responses like declines in abundances and diversity. Thus it could be fair to say they can not be precisely predicted. Furthermore predictions made on post construction benthic community recovery (Sec 4.2.5 pg 4-21) temperature impacts (Table 4.5 pg 4-56) and the adequacy of the 2 cms minimum winter flow will need to be validated. Thus determining the magnitude and ecological significance of invertebrate production and drift downstream of the proposed dam should be a monitoring program commitment.	The following will be added to the list of recommended environmental monitoring (p. 7-18 of the ER): • "benthic macroinvertebrate community sampling program (using standard techniques) to be undertaken in the proposed headpond and at locations previously sampled downstream of the proposed intake weir location during operation of the proposed GS"; • "benthic macroinvertebrate community and drift sampling program (using standard techniques) in New Post Creek below the waterfalls prior to proposed Project construction initiation to provide a baseline for a subsequent identical sampling program to be undertaken during operation of the proposed GS";
124.	ER//7.3/0	General methods and schedules for monitoring need to be included in the ER as per the OWA Class EA (sec. 4.5.3 on page 43).	Points 1, 2, 3 and 4 of the recommended environmental monitoring (p. 7-18) has been revised as follows: • "confirmation and quantification (based on relative abundance) of fish spawning and spawning success (including the Lake Sturgeon spawning period) based on gillnetting, egg collection mat deployment and drift netting in New Post Creek below the waterfalls during the first year of proposed GS operation with minimum flow (15 m^3/s); • assessment of effects on fish populations and species richness in the proposed headpond based on gillnetting, seining and/or electroshocking approximately one, five and ten years after initiation of

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			proposed GS operation, with frequency established in the finalized Monitoring Program (see below); • monitoring of vegetation growth along the transmission line ROW after one complete growing season as part of the vegetation monitoring program; • monitoring the success of re-planting programs on areas temporarily disturbed during construction after one complete growing season with subsequent monitoring of any sites requiring additional re-planting;" The monitoring programs will also be revised in Section 6.3 of the ER and Section 3.3 of the Aquatic Environment TSD. The following will be added to the end of the last sentence of the sixth paragraph on p. 4-1 of the Terrestrial TSD: "after one complete growing season with subsequent monitoring of any sites requiring additional re-planting".
125.	ER/7-18/7.3/0	Given an unusually wide ROW is proposed the transmission line vegetation monitoring should include a specific assessment of riparian vegetation and erosion along all creek crossings i.e. Pinard. On Pinard Creek simple water temperature monitoring for the protection of the coldwater fisheries should also be implemented to ensure the fishery is protected.	See response to Comments 120 and 122.
126.	ER/7-18/7.3/0	If sturgeon spawning is eventually concluded not to be occurring below the falls a better understanding of their presence there in the spring (and possibly other times of year) should be obtained in order to evaluate operational impacts to this population. One alternative hypothesis for sturgeon aggregating there and other species there might be the presence of increased invertebrate densities and/or drift from the spring freshet. The response of invertebrate communities to hydrodevelopment both within the headpond and downstream is highly variable. Disruption of this	See response to Comment 124: "confirmation and quantification (based on relative abundance) of fish spawning and spawning success based on gillnetting, egg collection mat deployment and drift netting in New Post Creek below the waterfalls during minimum flow (15 m^3/s)" would include the Lake Sturgeon spawning period. See response to Comment 68 re Lake Sturgeon use of New Post Creek.

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		community and the food chain may have negative effects on resident fish populations. This potential effect necessitates further discussion and monitoring consideration in the ER. Please add this to the text.	See response to Comment 123 re benthic macroinvertebrate sampling.
127.	ER/7-18/7.3/0	Please change the 'confirming walleye spawning' objective to 'quantifying fish spawning and spawning success'. Although spawning monitoring may feature walleye it should encompass all spring spawning species at the base of the falls. Moreover it will need to account for the completion of all phases of spawning i.e. egg deposition incubation hatching and drift. This monitoring of spring spawning will be a necessary requisite for implementing the Thermal Unit approach and/or refining the timing for the spring period (at least in the short term).	See response to Comment 124.
128.	ER/4-50/4.3.7/0	Please remove the statement that no mitigation for lake sturgeon is required. Despite field results to date it is premature to say that sturgeon spawning does not occur below the Falls. More importantly it is unacceptable and erroneous to state no mitigation measures for lake sturgeon need to be considered including minimum flows. Sturgeon spawning below the Falls aside we do not fully understand why/when they congregate there. Also it is conceivable that due to operations and physical modifications e.g. tail race area unanticipated effects to sturgeon (both positive and negative) may change their activities etc in way(s) that necessitate mitigation.	The sentence at the end of the first paragraph in Section 4.3.7 of the ER and in Section 3.2.7 of the Aquatic Environment TSD “As a result, no mitigation measures for Lake Sturgeon need to be considered, e.g., with respect to minimum flows.” has been deleted. The following sentence has been added: “However, Lake Sturgeon were caught in New Post Creek prior to and after the Abitibi Canyon spawning period, suggesting that the watercourse does provide an important habitat function, e.g., availability of higher benthic macroinvertebrate densities for foraging (see Section 3.1.8 for ER and Section 2.2.5 for Aquatic Environment TSD).
129.	ER/4-64/4.3.12/0	The proposed 'no impingement or entrainment mitigation' is not acceptable. If fish productivity and abundance improves upstream of the proposed facility as suggested on page 4-54 impingement and entrainment mitigation may become more meaningful and thus should be considered in anticipation of permitting. I acknowledge entrainment is mentioned on page 7-19 in an adaptive context and discussed in a general context in Sec 4.3.9 pgs 4-5758 but we need to know more details on impingement/entrainment mitigation i.e. trash rack spacing operational details with rationale and supportive references for the	The last paragraph of Section 4.3.9 of the ER will be revised as follows: “Initially, very low fish entrainment mortality is expected for the proposed New Post Creek Project primarily due to the low numbers of small fish present in New Post Creek. However, as indicated in Section 4.3.8, creation of the proposed headpond may result in the establishment of fish populations of larger size, e.g., Northern Pike and White Sucker. As indicated in Section 7.3, an Adaptive Management Program (AMP) will be developed that will consider effects monitoring, adaptive

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		proposed use of reduced rate of dam gate opening etc.	management measures and adjustments to mitigation measures based on observed conditions, e.g., mitigation of fish entrainment if adverse effects on fisheries resources are determined. This monitoring plan will be designed and implemented to meaningfully assess impingement and entrainment effects on fish populations, and inform mitigation design and implementation effectiveness. The monitoring plan will follow a protocol and schedule developed in consultation with MNR and DFO.” The last paragraph of Section 3.2.9 of the Aquatic Environment TSD will also be revised. The row on “Fish entrainment and survival” in Table 4.6 (p. 4-64) of the ER has been revised as follows: **Recommended Mitigation/Remedial Measures**: “None recommended initially due to low numbers of small resident fish; however, the establishment of fish populations of larger size should be monitored and the need for mitigation assessed” **Net Effect**: “No adverse residual effect initially; future effect unknown” The same revision will be undertaken in Table 3.4 of the Aquatic Environment TSD. See also response to Comment 39 re trash racks. The following paragraph will be added after the revised last paragraph of Section 4.3.9 of the ER: “Entrainment monitoring will be required as part of the AMP. If entrainment is deemed high relative to local populations, a retrofit fish diversion system will be considered following Best Available Technology Economically Achievable. There are many examples where successful retrofit diversion systems such as

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			angled bar racks and other fish guidance systems have been installed when a significant entrainment problem has been identified after hydroelectric facility development in the United States." This paragraph will also be added after the last paragraph of Section 3.2.9 of the Aquatic Environment TSD.
130.	ER/4-20/4.2.3.1/0	The inwater work timing restriction which accounts for sturgeon spawning is May 1st to June 30th. When combined with walleye considerations the resultant work exclusion window would be April 1st to June 30th. We encourage you to reflect this in the ER text as it will be required as part of the application for and will become a condition on approvals.	The first paragraphs in Sections 4.2.3.1 and 3.1.3.1 of the ER and Aquatic Environment TSD have been revised as follows: "In-water construction activities should be timed to avoid the spawning and egg incubation period of spring spawning fishes, such as Walleye and Lake Sturgeon, which typically excludes in-water work from April 1 to June 30 (DFO, 2010a)."
131.	ER/Table 4.1/4.1/0	There is significant potential for changes in invertebrate production and drift from above the Falls. These may be critical to fish populations below the Falls. Changes in the benthos may induce changes in fish production below the Falls. This potential effect should be reflected in the fisheries section of the table and the level of effect should be changed to unknown given the occurrence nature and intensity of this effect is uncertain at this point in time.	The row on "Inundated area creation on aquatic biota" in Table 4.6 of the ER has been revised as follows: **Recommended Mitigation/Remedial Measures**: "None recommended: inundation will increase biotic biomass, which may be beneficial to fish production in the proposed headpond and possibly below the waterfalls (to be monitored); ….." **Net Effect**: No adverse residual effect (potential net benefit in proposed headpond)" The same revision will be undertaken in Table 3.4 of the Aquatic Environment TSD.
132.	ER/3-63/3.3/0	The golden eagle is listed as Endangered in Ontario not special concern. The bald eagle is listed as special concern. Please correct text.	The text in the ER and Terrestrial Environment TSD will be corrected.
133.	ER/3-20/3.1.9/0	The current status of sturgeon between Abitibi Canyon and Otter Rapids is more relevant than the status of sturgeon downstream of Island Falls HGS yet is not reported in this section. The population between OR and ABC is isolated but not large and the available habitat critical habitats included are not well understood. Thus this population should not be considered or implied to be robust. Please expand this section's text to reflect this.	The following sentence will be added at the end of the fourth paragraph in Sections 3.1.9 and 2.2.6 of the ER and Aquatic Environment TSD, respectively: "The Lake Sturgeon population between Abitibi Canyon Dam and Otter Rapids Dam is isolated and not large, and its available critical habitats are not well understood (C. Chenier, MNR, 2013, pers. comm.)."

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134.	ER/3-18/3.1.8/0	The invertebrate community in New Post Creek may be significant to the fish below the falls. It also represents an important component of the system's biodiversity. The relative productivity and ecological significance of the New Post Creek invert community warrants some expansion in the text to better inform readers of the values at risk. I acknowledge some of this is contained in the Aquatic Environment document.	The last paragraph of Section 3.1.8 of the ER has been revised as follows: “Benthic macroinvertebrate communities were also sampled at 10 locations in New Post Creek upstream of the waterfalls (upstream and downstream of the proposed intake weir location). The benthic macroinvertebrate community composition data are presented in the Aquatic Environment TSD. The benthic macroinvertebrate communities had higher densities, number of taxa and species diversities, reflecting the more diverse habitat conditions and good water quality. Moreover, the greater diversities and densities of the communities are likely important to fish productivity below the waterfalls due to downstream drift. As indicated in Section 7.3, a benthic macroinvertebrate community and drift sampling program will be undertaken in New Post Creek below the waterfalls prior to proposed Project construction initiation to provide a baseline for a subsequent identical sampling program to be undertaken during operation of the proposed GS.” The following paragraph will be added at the end of Section 2.2.5: “The greater diversities and densities of the benthic macroinvertebrate communities in New Post Creek are likely important to fish productivity below the waterfalls due to downstream drift. As indicated in Section 3.3, a benthic macroinvertebrate community and drift sampling program will be undertaken in New Post Creek below the waterfalls prior to proposed Project construction initiation to provide a baseline for a subsequent identical sampling program to be undertaken during operation of the proposed GS.”
135.	ER/2-34/2.4.2.2/0	A ramp down rate for the bypass during the spring-summer period transition needs to be described. A 1cms/day RDR could be applied to all transition	As indicated in the second footnote to the table in the third paragraph in Section 2.4.2.2 of the ER, there will be a brief transition of flows from

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		periods.	15 to 7.5 m^3/s from the end of egg incubation to Canada Day weekend (i.e., July 1). The transitional flow rate will be determined in consultation with the MNR.
136.	ER/2-34/2.4.2.2/0	Text referring to walleye spawning period should read ' 15 cms minimum flow will be provided until 250 Thermal Units (TUs) plus 16 days or 485 Total TUs have been accumulated. Please change table text to reflect this. NB: The accumulation of TUs commences from an observed peak spawn or a specific mean daily water temperature derived from a series of peak spawning observations. This period covers all larval fish development and drift for walleye.	The following text is provided in the ER and TSDs: "Brief transition of flows from 15 to 7.5 m^3/s from the end of egg incubation (based on thermal units accumulated) with the rampdown rate (m^3/s per day) to be determined in consultation with the MNR."
137.	ER/2-10/2.3.1/0	The concept and operations of the proposed sediment gate needs to be better described in the text. The very brief reference prevents us from ascertaining potential downstream sedimentation effects and the need for mitigation like flushing flows. Please provide details on this structural element.	See response to Comment 67. Additional Background Servizi and Martens (1987, 1991, 1992) have shown that tolerance of salmonids to suspended sediments from the Fraser River (British Columbia) is dependent upon such factors as life stage and condition of fish, water temperature, sediment particle size and length of exposure. For example, fingerling Coho Salmon were more tolerant than fry. Tolerance was reduced among juvenile Coho Salmon with a viral kidney infection. Juvenile Coho Salmon were most tolerant of TSS at 7.0^{o}C, with a 96-h LC50 of 22,700 mg/L, whereas at 16^{o}C, the 96-h LC50 was 1,300 mg/L. The 96-h LC-50s for juvenile Sockeye Salmon decreased with increasing particle size, e.g., 17,560 mg/L for fine sediment, i.e., <74 µ, and 1,674 mg/L for coarser sediment (180-740 µ). However, fine sediments were found to lodge in the gills of Sockeye Salmon and cause gill trauma at 3,148 mg/L, or about 0.2 of the 96-h LC50 value. Based on the laboratory results, the authors speculated that sublethal responses (e.g., avoidance behaviour, such as preference for less turbid surface water, and increases in blood sugar levels and cough frequency) could be

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			expected at naturally occurring TSS concentrations of between 300 and 600 mg/L and sometimes exceeding 1,000 mg/L in the Fraser River during the spring freshet which can last for weeks. A TSS concentration of 317 mg/L was recorded in New Post Creek during the 2013 freshet. As indicated above, TSS concentrations resulting from the sediment evacuation operation will be well below the sub-lethal effects threshold of approximately 1,000 mg/L for fish for short-term exposures, i.e., 4 to 14 h (Fitchko *et al*., 2008), and will be of short duration (less than 1 h). With respect to benthic macroinvertebrates, Rosenberg and Snow (1975) and Rosenberg (1980) reported that exposure “for brief durations” to TSS concentrations up to 500 mg/L consisting of bankside sediments resulted in increased invertebrate drift, but no change in standing crop. The proposed sediment evacuation operation may also result in increased invertebrate drift in New Post Creek, which would be beneficial to the fish community downstream of the waterfalls. Servizi, J.A. and D.W. Martens 1987. *Some Effects of Suspended Fraser River Sediments on Sockeye Salmon (Oncorhynchus nerka)*. Can. Spec. Publ. Fish. Aquat. Sci. 96: 254-264. Servizi, J.A. and D.W. Martens 1991. *Effects of Temperature, Season and Fish Size on Acute Lethality of Suspended Sediments to Coho Salmon (Oncorhynchus kisutch)*. Can. J. Fish. Aquat. Sci. 48: 493-497. Servizi, J.A. and D.W. Martens 1992. *Sublethal Responses of Coho Salmon (Oncorhynchus kisutch) to Suspended Sediments*. Can. J. Fish. Aquat. Sci. 49: 1389-1395.

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			Rosenberg, D.M. and N.B. Snow 1975. *Ecological Studies of Aquatic Organisms in the Mackenzie and Porcupine River Drainages in Relation to Sedimentation*. Environment Canada, Fisheries and Marine Service, Technical Report No. 547: 86 p. Rosenberg, D.M. 1980. *Responses of Benthic Macroinvertebrates to Sedimentation in Freshwaters*. *In*: K. Weagle [Ed.]. Report on the Technical Workshop on Suspended Solids and the Aquatic Environment. Department of Indian Affairs and Northern Development, Contract OTT-80-019, Whitehorse, Yukon Territory. 11 p.
138.	AE Rep./Table 2.17/2.2.5/0	Please explain why the overwhelming majority of the Abitibi R. invert samples had exactly 43 specimens in them? Is this an error?	The area sampled by the Ponar dredge was 6 inches by 6 inches, or 0.152 m by 0.152 m (total area of 0.023 m^2). In many cases, only one individual of a particular taxon was collected by the Ponar dredge. Therefore, the total number of individuals per m^2 would be $1 \div 0.023 = 43$ individuals.
139.	ER/2-34/2.4.2.2/0	The identified spring period is also contingent on sturgeon not spawning at the base of the Falls. A separate TU model would be employed in this event. Please change text to reflect this.	A footnote will be added to the time period of "Approximately May 1 to mid-June[1]" as follows: [1] to be expanded to include Lake Sturgeon spawning period if spawning occurrence is demonstrated.
140.	Environmental Report///0	Further to Comment 2932, introductory text in a WMP-specific section could include: *The proposed project is expected to require changes to the Abitibi River System Water Management Plan. As such, OPG will be pursuing an administrative amendment to the water management plan in accordance with the Ministry of Natural Resources' requirements. It is expected that OPG will meet the intent of water management planning through the EA process and MNR's subsequent review and approval of the project under the Lakes and Rivers Improvement Act (LRIA).*	Acknowledged. CRP/OPG is preparing a specific section to address the water management planning requirements. The proposed draft section will be provided for MNR review when completed.
141.	Environmental Report///0	Further to Comment 2932, we encourage OPG to consider a WMP-specific section or chapter within the ER. This will help to make it really clear that the intent	See response to Comment 140.

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		of WMPing is being met through the EA (i.e., we don't plan a second public review exercise), Preparing a stand along WMP amendment section now will help streamline the administrative steps required to complete the amendment later, by creating a package that can simply be inserted in the existing WMP. We recommend the WMP section include at a minimum the options, preferred option and rationale, operating plans, and effectiveness monitoring program. If the conclusions of the EA result in a need to amend other parts of the existing WMP (e.g., new information about existing conditions not already reflected in WMP), subheadings can be included with reference to the appropriate section of the ER that contain the information.	
142.	ER//7.3/0	It is encouraging to see that you have started to consider monitoring commitments and adaptive management for the operational phase of the project. A p/c monitoring plan can address the effectiveness of the dam operating plan and other strategies to mitigate predicted effects and to meet operating plan objectives. Monitoring for these purposes will become requirements of some permits and approvals issued by MNR (e.g. approval of the plan for operations as per sec. 23.1 of LRIA) In general, a p/c monitoring plan should incorporate clearly stated monitoring objectives, identification of performance indicators and measurement endpoints, data collection methods and protocols, monitoring frequency and reporting requirements. A monitoring plan should acknowledge opportunities and the intention for design/operation changes to be implemented in the event that the proposed mitigation is not working or objectives are not being met. This includes identifying thresholds of change beyond which adaptive management might be required. The reporting requirements should use the following framework to guide the monitoring plan (example is for ecological change): • What was the ecological condition (status) before construction?	The following paragraph will be inserted after the second paragraph (p. 7-19) under the sub-heading **Operations** in the ER: "CRP/OPG will prepare a draft Monitoring Program document incorporating clearly stated monitoring objectives, identification of performance indicators and measurement endpoints, data collection methods and protocols, monitoring frequency and reporting requirements. The draft document will also include specific commitments around the indicators, methods/procedures, frequency and duration of monitoring, reporting commitments, and proposed actions to be taken in response to the findings. The draft Monitoring Program will be provided to MNR, DFO, MOE and JWG for review and comment. The final Monitoring Program will be submitted to MNR, DFO, MOE and JWG prior to the Location Approval stage of permitting."

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		• What is the potential degree of alteration in key ecosystem components posed by the planned development? • What is the potential impact to the ecological condition? • What measures are predicted to mitigate the impact and maintain or restore the ecological condition? • What is the effectiveness of the mitigation strategies? • What is the effect of resulting trade-offs?	
MNR Comments (Section 6.3 of the ER)			
1.	Sec 6.3.3, pg 6-3, 4th paragraph	MNR proposed the application of a monthly Q80 approach, not an annual Q80. I believe monthly Q80 flow values involved would be somewhat different from an annual Q80 value. Please revise text to reflect this.	The last sentence of the fourth paragraph in Section 6.3.3 has been revised as follows: "If used on a monthly basis for the proposed Project, the Q_{80} would exceed the minimum flows typically observed in New Post Creek during the winter (see Table 3.4)."
2.	Sec 6.3.3, pg 6-4, last paragraph	The Q95 is defensible as an extreme low flow, but should not be identified as the 'preferred' low flow...it is not. Please remove this reference.	The reference has been removed.
3.	Sec 6.3.3, pg 6-5, last paragraph	Please revise text to state CRP/OPG have 'concluded' based on additional fieldwork, not 'confirmed' as stated.	The revision has been made.
4.	Sec 6.3.3, pg 6-5, last paragraph	While it is true we have focused on the spawning of VEC species during discussions, the timing window of the spring spawning period should/must consider all species potentially using this site for spring spawning and incubation. Specifying only walleye and using terms like "dependent on" precludes or confuses this. A more holistic approach is desired wrt spawning mitigation. In practice this would likely involve the consideration of both walleye and sturgeon spawning needs in an effort to provide suitable conditions for all spring spawning species eg catostomids, sauger etc. Chronologically these other target species typically spawn between walleye and sturgeon spawning.	The last sentence of the last paragraph has been revised as follows: "The spring spawning minimum flow of 15 m^3/s was agreed to with a timing period of approximately May 1 to mid-June, with timing dependent on Walleye and catostomid spawning and egg incubation period." Similar revisions have been undertaken in the ER and TSDs indicating that the minimum flow of 15 m^3/s applies to the spring spawning and egg incubation period (for Walleye and catostomids). It is also indicated that this period would be "expanded to include Lake Sturgeon spawning and egg incubation period if spawning

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			occurrence is documented".
5.	Sec 6.3.4, pg 6-9, first paragraph	Please revise text to read..."Pulsing will be permitted at anytime of the year provided minimum flows are provided and no negative effects due to pulsing, that can not be otherwise mitigated, are observed".	The revision has been made in Section 6.3.4 and other sections of the ER, as well as in the TSDs.
6.	Sec 6.3.4.1, pg 6-9	See comment #4. Reference to walleye should be removed	See response to Comment 4.
7.	Sec 6.3.4.1, pg 6-9	Table footnote should be revised to read...'end of egg incubation (based on thermal units accumulated)...". It is also important to know that while an initial thermal unit value would be proposed and implemented, it should/would be revised based on actual spawning observational fieldwork ie egg matting, drift netting in conjunction with water temperature monitoring.	The revision has been made to the table footnote in Section 6.3.4.1 and other sections of the ER, as well as in the TSDs.
8.	Sec 6.3.4.1, pg 6-10, bullets 1 and 5	The identification of 5 to 10m^3/s as a minimum operational requirement is new. Prior to this we understood a flow of 10 m^3/s to be the minimum operational flow. If the new lower flow improves the economics of the project I suggest we revisit the minimum ecological flows to discuss their enhancement.	The minimum turbine operation of 5 to 10 m^3/s is based on newly identified equipment that may or may not be applicable to the proposed New Post Creek Project. As its applicability is uncertain, CRP/OPG will revise the text in the ER and TSDs to reflect the original preliminary design for a minimum operational flow of approximately 10 m^3/s.
9.	Sec 6.3.4.1, pg 6-11, Fisheries Constraint	Please replace " Walleye" with " Spring" to better reflect the need to consider all spring spawning species not just walleye.	See response to Comment 4.
10.	Sec 6.3.4.1, pg 6-11, Minimum Discharge	What exactly is meant by " reasonable effort basis"? If this refers to the description provided in the first paragraph on this same page please link it directly for clarity eg. Fall: A minimum flow....September 30. Except in a natural drought...in which all available flow will be released down the creek/bypass.	The revision had already been made.
11.	Sec. 6.3.5, pg 6-14, bullets 3,4,5,6:	I suspect monitoring proposed at 1 and 5 yrs after operations commence should be extended to include additional monitoring efforts eg 7 and 10 yrs. Headpond colonization and fish production rates vary with site conditions and available habitat. We know the progeny of some species here would take at least 2 or 3 years to become vulnerable to sampling and would	The monitoring program has been revised as follows: • "assessment of effects *on* fish populations and species richness in the proposed headpond based on gillnetting, seining and/or electroshocking approximately one,

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		only just be maturing at 4 or 5yrs (eg female walleye likely mature at 4 or 5yrs here). Thus I think it is very uncertain, after only 5yrs and 2 sampling sessions, that we would be able to confidently evaluate the occurrence and magnitude of potential impacts that in parts are a function of fish abundance and reproduction ie entrainment and changes in the fish community. So for now I would suggest you leave out the specific references to 1 and 5 yr monitoring. We should discuss monitoring objectives, appropriate methods, frequency and effort requirements more thoroughly during the drafting of the monitoring program plan and the AMP.	five and ten years after initiation of proposed GS operation, with frequency established in the finalized Monitoring Program (see below);”
MOE Comments (Draft ER)			
1.	General Comments: Selection of Preferred Alternative	Section 2.2 does not clearly state which of the four alternatives has been chosen. It would be useful if there was a brief summation as to why Alternative 1 was chosen (over the other three).	The following first sentence will be inserted into the first paragraph of Section 2.2 of the ER: “As indicated in Section 2.1, Alternative 1 is the preferred alternative due to its smallest footprint in LAPP and its technical and economic advantages.”
2.	General Comments: Pulsing Operations	The final draft report describes “pulsing” operations and “cycling flows” necessary during low flow periods in order to generate sufficient flows through to operate the facility. How is “pulsing” different from a peaking operation? We believe our and the public’s understanding of this process would be improved by a more detailed description using more everyday language and graphics wherever possible (eg. map(s) showing the extent, cross-section(s) showing depth). A discussion of the impacts of these fluctuations upon biological communities must be provided.	The following will be added after the fourth paragraph (p. 2-35) in Section 2.4.2.2 of the ER: “The forebay fluctuations are intended to provide operation during low flow periods primarily in late winter and late summer. This pulsing will be an automatic process and will involve the following: 1. The turbines are expected to require a minimum of 5 to 10 m^3/s to operate. Any time the total flow in New Post Creek is less than 5 to 10 m^3/s plus the minimum downstream flow requirement, the turbine units will not be able to operate. 2. In such situations, the proposed GS will be allowed to draw down the forebay within the prescribed range at a flow rate that will optimize

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			efficiency. 3. When the water level reaches its lower limit, the units will shut down until the forebay returns to its high level. This will not be co-ordinated with the time of day for increasing revenue but will be an automatic process. 4. The fluctuation is expected to be lower in the winter to maintain an ice cover on the forebay. 5. This cycle will repeat most frequently in situations when flows are just below the required 5 to 10 m^3/s plus the minimum downstream flow requirement. The situation that would cause the most frequent starts/stops would be during the winter. In such cases the cycle could be expected to repeat every 8 to 48 h, depending upon riparian flow. 6. In the prescribed period where a 50 cm band is achievable the cycle would be expected to repeat every 48 to 150 h, depending upon riparian flow. 7. The flows downstream of the dam would not change during this process as they will remain as the defined minimum flow requirement." This information will also be provided in the TSDs.
3.	General Comments: Affirmation of Operational Performance	It is our understanding that it is not uncommon for 2 – 3 years to pass before operational issues are resolved (tweaked). We believe that performance of the facility should be specifically monitored over this period to demonstrate whether/how assumptions were proven or where adjustments were necessary to achieve performance targets.	At the request of MNR, CRP/OPG has prepared a section in the ER on the Abitibi River Water Management Plan Administrative Amendment. This Section 6.3 addresses project alternatives, preferred alternative and rationale, water management options analysis and preferred water management option, the proposed operating plan and effectiveness monitoring. Section 6.3 has been provided as an attachment to this Response Document.
4.	General Comments: Aesthetic Values of the Falls and its Environs	In our view the analysis around the potential impacts upon the aesthetic value of New Post Creek Falls and its environs under various [especially low] flow	As indicated in Section 4.6.4, reduction of flows over the waterfalls to historic levels may possibly diminish visitor experience appreciation

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		conditions could be strengthened. In this regard there are many examples and considerable literature on landscape/viewscape analysis to guide this work. We believe it would be useful to present a visual depiction of what the river and environs would look like under the various flow scenarios compared to baseline/present conditions. Some photos of the site under various flow conditions have been provided and that is good, however we believe this should be done on a consistent basis for all projects.	value, particularly with respect to the mist generated by the waterfalls. Although no visual record of the waterfalls is available for the proposed minimum flows of 7.5 and 5 m^3/s during July/August and September, respectively, the waterfalls did generate appreciable mist during an average daily flow of 9.17 m^3/s (see Photograph 4.1). Appreciable mist generation is also expected at the minimum flows of 7.5 and 5 m^3/s. CRP/OPG is constantly monitoring flows measured at the Water Survey of Canada gauge station to identify occurrences of low flows that can be photographed. As indicated in Section 7.3 under the sub-heading "**Operations**", CRP/OPG will undertake photographic documentation of minimum flows over the New Post Creek waterfalls in July and September of the first year of proposed GS operation, particularly with respect to mist generation. CRP/OPG does not expect this documentation of minimum flows to be significantly different than the average daily flow of 9.17 m^3/s indicated in Photograph 4.1. The photographic documentation of minimum flows over the waterfalls will be provided to MNR for review of aesthetic values and assessment of potential adjustment up or down taking into account net societal economic costs and benefits.
5.	General Comments: Assessment of Significance (Table 7.1)	Ministry staff believes it to be useful if there is a discussion about how the significance ratings of "low, medium and high" are determined in Section 7.1.	As indicated by the points in the second paragraph of Section 7.1 (p. 7-1), some guidance is provided on the definition and meaning of some of the terms used in the assessment of the significance of effects. However, the determination of "effect levels" is based on EA practitioner experience and judgment.

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6.	General Comments: Adaptive Management Program/Plan	The last paragraphs of Section 7.2.3 refers to an Adaptive Management Program. Ministry staff fully supports this concept however it is felt it should be given a much higher profile. In our view an Adaptive Management Plan/Program provides the overall instrument by which to affirm pre-development modeling and operational assumptions and to affirm the facility is operating as expected and within its environmental parameters. At its core an AMP is about monitoring performance but it is not enough to just monitor; there must be a contingency aspect – what actions are triggered if performance is not as expected. In addition there ought to also be a notification component – agencies should be notified so that together any required operational/monitoring changes can be devised and implemented. A potentially useful means of notification is a stakeholder liaison committee which we would recommend be considered. The draft Aquatics Report mentions an Environmental Management Plan to be formulated by the builder/contractor. In our view there are obvious linkages between an Adaptive Management Plan and an Environmental Management Plan. Our expectation is that CRP/OPG will review the Environmental Management Plan in this light.	As indicated in response to Comment 3, CRP/OPG has prepared Section 6.3 in the ER on the Abitibi River Water Management Plan Administrative Amendment, including effectiveness monitoring (see attachment). As indicated in Section 7.3 of the ER under the sub-heading **Operations**, a number of environmental monitoring programs had been proposed by CRP/OPG to be undertaken during operation. Based on MNR and MOE comments, some of these have been modified and additional monitoring programs added. The following provides the complete list of monitoring programs (*text in italics subsequently added as a response to MNR comments*): • visual monitoring (with photographic documentation) of shoreline erosion and sedimentation upstream and downstream of the proposed dam, at the proposed tailrace and in the watercourses traversed by the proposed transmission line ROW after one complete growing season after initiation of proposed GS operation (water samples for TSS analysis to be collected in any areas of visible turbidity and water temperature to be measured in Pinard Creek) *with subsequent monitoring of any sites requiring additional stabilization mitigation*; • temperature/D.O. profile monitoring in the proposed headpond during the summer one and five years after initiation of proposed GS operation to confirm anticipated isothermal conditions, together with water sample collection for metal (including low-level THg and MeHg) analysis;

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			• benthic macroinvertebrate community sampling program (using standard techniques) to be undertaken in September in the proposed headpond and at locations previously sampled downstream of the proposed intake weir location one and five years after initiation of proposed GS operation; • benthic macroinvertebrate community and drift sampling program (using standard techniques) in September in New Post Creek below the waterfalls prior to proposed Project construction initiation to provide a baseline for a subsequent identical sampling program to be undertaken one and five years after initiation of proposed GS operation; • confirmation and quantification (based on relative abundance) of fish spawning and spawning success (including the Lake Sturgeon spawning period) based on gillnetting, egg collection mat deployment and drift netting in New Post Creek below the waterfalls during minimum flow (15 m^3/s) in the first year of proposed GS operation; • *assessment of effects on* fish populations and species richness in the proposed headpond based on gillnetting, seining and/or electroshocking *approximately* one, five *and ten* years after initiation of GS operation*, with frequency established in the finalized Monitoring Program (see below)*; • monitoring of THg body burden in Walleye in New Post Creek below the waterfalls and Slimy Sculpin (and any piscivorous fish population, if

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			established) in the inundated area upstream of the proposed Project intake weir location one year after the start of operations and based on findings of significantly elevated fish body burden every five years until mercury concentrations decline to previous background; • monitoring of TSS concentrations in New Post Creek during the initial two sediment trap evacuation events; • monitoring of vegetation growth along the transmission line ROW after one complete growing season as part of the vegetation management program; • monitoring the success of re-planting programs on areas temporarily disturbed during construction after one complete growing season with subsequent monitoring of any sites requiring additional re-planting; and • photographic documentation of minimum flows over the New Post Creek waterfalls, particularly with respect to mist generation, in July/August (7.5 m^3/s) and September (5 m^3/s) of the first year of proposed GS operation. The following paragraph will be added after this revised list of recommended monitoring programs: "CRP/OPG will prepare a draft Monitoring Program document incorporating clearly stated monitoring objectives, identification of performance indicators and measurement endpoints, data collection methods and protocols, monitoring frequency and reporting requirements. *The draft document will also include specific commitments around the indicators, methods/procedures, frequency and duration of monitoring, reporting*

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			commitments, and proposed actions to be taken in response to the findings. The draft Monitoring Program will be provided to MNR, DFO, MOE and JWG for review and comment. The final Monitoring Program will be submitted to MNR, DFO, MOE and JWG prior to *the Location Approval stage of permitting*." As indicated in the next paragraph of the ER, "CRP/OPG will report the findings of these studies to the JWG and all relevant regulatory bodies." Based on review of these findings, any required operational/monitoring changes can be devised and implemented." The following sentence will be added to the end of the first paragraph (p. 7-18) under the sub-heading **Operations**: "As required by the Abitibi River WMP, CRP/OPG will collect and maintain hourly water level and flow data, which will be provided to the MNR as requested for audit purposes." The Environmental Management Plan to be developed by the DBC and implemented during construction will be reviewed and assessed by CRP/OPG in an adaptive management perspective.
7.	Detailed MOE Comments: Baseline Mercury Monitoring	Ministry staff generally agrees with the approach undertaken by OPG to establish baseline conditions for mercury in key elements of the aquatic ecosystem, but offers additional guidance with respect to some baseline data gaps. It is understood that the use of a predictive model to evaluate the potential for the project to increase the bioavailability of mercury to fish may not be appropriate in this situation as piscivorous specifies do not currently inhabit the proposed inundation area. It is proposed that the proponent will rely on post-inundation monitoring to help with early identification of the potential for increases in fish tissue	As indicated in the response to Comment 6, CRP/OPG will undertake a fish composition and abundance field survey in the proposed headpond one, five *and ten* years after initiation of GS operation after initiation of GS operation*, with frequency established in the finalized Monitoring Program*. Based on the survey findings, if it is determined that a piscivorous fish population has become established, their THg body burden will be monitored. If the THg concentrations exceed the provincial fish consumption restriction(s), CRP/OPG will

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		mercury concentrations and that the project will benefit from the information requests identified in the following sections. Additional discussion is needed should elevated mercury concentrations be revealed as a result of post-inundation monitoring and there be a need to mitigate and/or identify triggers for compensation.	request guidance from the MOE with respect to public notification and signage.
8.	Detailed MOE Comments: Project Inundation Area vs. Headpond Area	It should be noted that there are discrepancies within the draft ER between the area representing the project inundation area and the headpond area. The executive summary indicates that the headpond will create an additional 131.9 ha of aquatic habitat while altering 37.5 ha of existing aquatic habitat. This would result in a final headpond area of approximately 170 ha. However, section 2.3.1 of the draft ER conversely states that the Project will result in a total inundated area of approximately 170 ha. The information presented in Table 2.3 appears to clarify this; however, there needs to be consistency with how this information has been presented throughout the draft ER.	The following will be added to the end of the second sentence of the second paragraph on p. ES-2: "(with a total inundation area of approximately 170 ha)", as well as the first paragraph under the sub-heading <u>Inundation Upstream of the Proposed Weir</u> (p. 4-52) and Table 4.5 of the ER. This addition will also be made to the first paragraph under the sub-heading <u>Inundation Upstream of the Proposed Weir</u> (p. 3-40), Table 3.3, the second paragraph of Section 3.2.13 and the fourth paragraph of Chapter 4.0 of the Aquatic Environment TSD,
9.	Detailed MOE Comments: Consistency with Respect to Proposed Minimum Flows and Dates	The generating station is to be operated as a run-of-river facility with some "pulsing", allowing for a 0.5 m headpond operating band and commitment of the minimum flows listed below. It is understood that the timing of each minimum flow period will be dependent upon Walleye spawning and egg incubation periods; however, the draft ER is not consistent in explaining this. For example, the minimum flows and dates listed in Table 2.1 differ from those included under section 2 4.2.2. There needs to be consistency throughout the report in dates, minimum flows and the need for some flexibility with respect to timing of each flow period. ◦ Proposed minimum flows: ▪ approx May 1 to Jun 30 - 15 m^3/s ▪ Jul 1 to Sep 15 - 7.5 m^3/s ▪ Sep 16 to Nov 30 - 3 m^3/s ▪ approx Dec 1 to Apr 30 - 2 m^3/s	The minimum flows in Table 2.1 have been revised to reflect those presented in Section 2.4.2.2 as follows: Minimum Flow: May 1 to mid-June 15 m^3/s mid-June to August 31 7.5 m^3/s September 1 to 30 5 m^3/s October 1 to April 30 2 m^3/s These revisions will also be undertaken in the TSDs. These minimum flows downstream of the spillway structure will be maintained at all times during proposed GS operation. It should be noted that Section 2.4.2.2 now clarifies that timing of the May 1 to mid-June period is dependent on the spring spawning and

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			egg incubation period (*Walleye and catostomids*) with a brief transition of flows from 15 to 7.5 m^3/s from the end of egg incubation (based on *thermal units accumulated*) with a rampdown rate of xx m^3/s per day.
10.	Detailed MOE Comments: Project Description – 2.3.1 Intake Structure	• Section 2.3.1 of the draft ER states: "The spillway structure consists of gates to maintain minimum flow requirements, gates or devices to manage high flow periods and maintain forebay levels" and that, "The final choice of the type of equipment used will … consist of either a series of stop logs (see Figure 2.5) or of an in-stream low (3.7 m high) steel crest gate section and an uncontrolled (fixed) concrete weir. The steel crest gate would be an Obermeyer type, which is operated by a pneumatic bladder". Section 2.4.2.1 of the draft ER later explains that opening and closing of the sluice gates will be conducted remotely from the OPG North East Control Centre in Timmins; however, no explanation is provided regarding the operation of either the stop logs or the Obermeyer type rubber dam. This should be explained.	Control of the forebay water level is somewhat different when different types of spillways are considered. In the case of inflatable weirs (Obermeyer style equipment) the forebay water level is maintained automatically by the station controller by establishing a defined water level setpoint. The operator does have access to override the automatic control if necessary from a remote location. The water level is controlled by instrumentation which monitors the elevation of the weir crest and forebay water levels with the relative difference maintained by the operator by adjusting the inflation of the bladders. This difference controls the flows over the spillway to maintain the forebay level. In case of stop logs the forebay level is maintained by the manual addition and removal of stop logs as required. In this approach the water levels are monitored remotely by the operator and instructions are issued when flows change sufficiently to warrant an adjustment in order to remain within the operating range of the forebay. This information will be included in the ER and TSDs
11.	Detailed MOE Comment: Project Description – 2.4.2.1 Proposed New Post Creek Hydroelectric GS	• Towards the end of Section 2.4.2.1, the draft ER states; "Pulsing will be undertaken during other times of the year when there is not enough flow to provide the minimum flow and run the turbines…Pulsing will be permitted at any time during the year within this operating range of 0.5 m." The draft ER further states "This operational pulsingwill continue until there is	The following will be added after the fourth paragraph (p. 2-35) in Section 2.4.2.2 of the ER: "The forebay fluctuations are intended to provide operation during low flow periods primarily in late winter and late summer. This pulsing will be an automatic process and will

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		sufficient water for continuous operation. " The draft ER; however, does not provide a definition for "pulsing" or provide further specifics regarding the frequency of "pulsing" (i.e. hours, days, etc). This section of the report should be updated to include a definition of "pulsing" in comparisonwith "peaking", as well as, elaboration on the frequency of "pulsing" and provide examples of how long under specific flows it will take for the headpond to reach the top of the operating band when starting at the bottom of the band. Flow monitoring accomplished thus far should provide an idea as to the frequency at which "pulsing" will occur.	involve the following: 1. The turbines are expected to require a minimum of 5 to 10 m^3/s to operate. Any time the total flow in New Post Creek is less than 5 to 10 m^3/s plus the minimum downstream flow requirement, the turbine units will not be able to operate. 2. In such situations, the proposed GS will be allowed to draw down the forebay within the prescribed range at a flow rate that will optimize efficiency. 3. When the water level reaches its lower limit, the units will shut down until the forebay returns to its high level. This will not be co-ordinated with the time of day for increasing revenue but will be an automatic process. 4. The fluctuation is expected to be lower in the winter to maintain an ice cover on the forebay. 5. This cycle will repeat most frequently in situations when flows are just below the required 5 to 10 m^3/s plus the minimum downstream flow requirement. The situation that would cause the most frequent starts/stops would be during the winter. In such cases the cycle could be expected to repeat every 8 to 48 h, depending upon riparian flow. 6. In the prescribed period where a 50 cm band is achievable the cycle would be expected to repeat every 48 to 150 h, depending upon riparian flow. 7. The flows downstream of the dam would not change during this process as they will remain as the defined minimum flow requirement." This information will also be provided in the TSDs.

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12.	Detailed MOE Comment: 2.4.2.2 Operating Regime	• In addition to the minimum flows proposed to be maintained within the by-pass reach of this site, it is recommended that the draft ER also elaborate on how these minimum flows will be adjusted from season to season and during pulsing operations. A more detailed discussion is required with respect to ramping rates.	As indicated in response to Comment 9, Section 2.4.2.2 now clarifies that timing of the May 1 to mid-June period is dependent on the Walleye (*and catostomid*) spawning and egg incubation period with a brief transition of flows from 15 to 7.5 m^3/s from the end of egg incubation (based on *thermal units accumulated*) with a rampdown rate of xx m^3/s per day.
13.	Description of the Existing Environment Aquatic Environment: 3.1.4 Water Quality	• The use of Abitibi River water quality data from a location 75 km downstream of the proposed project, which was gathered in 1972 and 1981, is not appropriate. Current, baseline water quality data needs to be collected from the Abitibi River downstream of the tailrace, for the parameters sampled for from New Post Creek.	In a letter dated June 17, 2011, MOE recommended the monitoring of baseline water quality. During the meeting with regulatory agencies on October 27, 2011, CRP/OPG indicated that currently water samples were being collected from New Post Creek for the analysis of turbidity and TSS during the spring, summer and fall. MOE requested that CRP/OPG consider including monthly analysis during the ice-free period of additional water quality parameters as indicated in the Guidance Document. CRP/OPG indicated that monthly analysis may be unnecessary especially due to the remote location of the proposed Project, the absence of other users with potential to impact water quality characteristics both upstream and downstream and finally the cost burden of undertaking monthly sampling. It was agreed that sampling for the additional parameters would be undertaken concurrent with sample collection for turbidity and TSS, and when other field operations were being undertaken. A table was attached to the Minutes of the Meeting providing a list of water quality parameters to be analyzed. During the meeting, the MOE did not request water quality monitoring of the Abitibi River. As indicated in the second comment below, the MOE has requested post-operational monitoring of metals. CRP/OPG will comply with this

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			request and undertake post-operational monitoring of metals in the proposed headpond. With the possible exception of mercury, metal concentrations are not expected to increase as the headpond is expected to maintain isothermal conditions during the summer due to the short hydraulic residence time (to be confirmed by temperature/D.O. profile monitoring) and provide for the sedimentation of metal-associated particulates. However, as part of the Adaptive Management Program, if a significant increase in metal concentrations is observed in the headpond, a monitoring program will be undertaken for the Abitibi River upstream (background), at and downstream of the tailrace. Moreover, as the flow of the Abitibi River is significantly greater (mean annual flow of 279.2 m^3/s) than the maximum flow through the proposed tailrace (50 m^3/s), any elevated metal concentrations would be expected to be rapidly dispersed to background.
14.	3.1.4 Water Quality (continued)	• It is noted that the laboratory detection limits for several of the parameterssampled for were greater than the Provincial Water Quality Objectives (PWQO). It should be ensured that analysis of future water quality samples is conducted atdetection limits capable of detecting level at or below the PWQOs.	The detection limits are standard for commercial analytical laboratories. For subsequent metal analyses, CRP/OPG will request the analytical laboratory to use detection limits at or below the PWQOs.
15.	3.1.4 Water Quality (continued)	• Baseline water samples have not been analyzed for low-level mercury (total and methyl). It is recommended that metals, including low-level mercury be included as parameters in baseline and post-operational water monitoring programs. ◦ Water samples should be collected using “ultra clean” protocols and analyzed by a laboratory that can achieve minimum detection limits of 0.1 ng/L for total mercury and 0.02 ng/L for methyl mercury.	CRP/OPG will endeavour collect baseline and post-operational water samples for the analysis of low-level THg and MeHg. The analyses will be undertaken by a qualified analytical laboratory such as Flett Research Ltd. in Winnipeg, Manitoba.

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16.	3.1.9.1 Existing Aquatic Habitat	• This section of the draft ER should include drainage area for each tributary flowing into New Post Creek in order to better understand the total area contributing to New Post Creek flows. Furthermore, the portions of these drainage areas comprised of wetlands should be included in this discussion for each tributary, as the surrounding wetland areas draining into New Post Creek and tributaries of the Creek may be ongoing sources of naturally occurring mercury methylation. Also, since it is proposed that the site will operate as a "pulsing" facility, varying headpond water levels within a 0.5 m operating band, there is even greater possibility for increased Hg methylation due to increased fluctuations in wetlands draining to inundated tributaries.	The length and drainage area for each New Post Creek tributary to be affected by inundation are listed below: • Tributary 1: 2492 m; 64.24 ha • Tributary 2: 78 m; 0.087 ha • Tributary 3: 103 m; 0.489 ha • Tributary 4: 205 m; 0.463 ha • Tributary 5: 146 m; 0.298 ha • Tributary 6: 530 m; 6.00 ha • Tributary 7: 217 m; 0.359 ha • Tributary 8: 201 m; 0.372 ha • Tributary 9: 174 m; 0.328 ha • Tributary 10: 215 m; 1.32 ha This information will be provided in tabular form at the end of the section (p. 4-55) under the sub-heading "Flooding Upstream into Tributary Streams" in the ER, as well as the Aquatic Environment TSD. The MNR provided the total drainage areas of the ten tributaries, as well as the areas of swamp/lake and their percentages of the total drainage areas (*see Table 4.12 in the ER*). As indicated above, approximately 16.6 ha of wetland associated with the ten tributaries will be inundated, with the total areas to be inundated in watersheds of Tributaries 8, 9 and 10 are wetland. Table 4.10 (p. 4-88) of the ER provides the areas of vegetation types affected by the proposed inundation. Of the total terrestrial inundation area of 129.9 ha, only 3.7 ha consist of organic meadow marsh, organic shallow marsh and open water marsh. An additional 16 ha consist of mineral thicket swamp and organic thicket swamp. Therefore, approximately 84% of the total wetland area (19.7 ha) to be inundated is associated with the ten tributaries (16.6 ha). This table and associated text will be incorporated before the last paragraph (p. 4-89) under the sub-heading Proposed Inundation

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			Zone Effects in the ER and before the last paragraph (p. 3-25) in Section 3.5.3.2 of the Terrestrial Environment TSD As pulsing will be restricted to the inundation area, it will affect a relatively small wetland area with respect to possible enhanced mercury methylation. Information on potential wetland effects on mercury methylation will be incorporated into Sections 4.3.10.2 and 3.2.10 of the ER and Aquatic Environment TSD, respectively (see responses to Comments 28 and 51).
17.	3.1.9.1 Existing Aquatic Environment (continued)	• The draft ER indicates that Tributaries 2, 3, 5 and 10 of New Post Creek are, "…very small and have small watersheds…They likely do not provide habitat for fish". However, report does not indicate if these tributaries were fished or if they may be coldwater streams. This needs to be clarified.	The following information is provided in the Aquatic Environment TSD (pp. 2-48 to 2-53): "Tributary 2 (MNR ID#491) This tributary is very small and has a small watershed (Figure 2.10). Consequently, it has little flow, as evidenced by the shallow channel that drops steeply into New Post Creek from the surrounding table lands. It was not flowing but did have some standing water at a small culvert crossing of Parliament Loop Road, approximately 516 m upstream from New Post Creek, after a couple of rainy days when examined on September 18, 2012. Based on aerial photograph examination, the tributary does not have a well defined channel, and is likely often dry. No electrofishing was attempted, but this watercourse is unlikely to support fish, due to the lack of water and the steep drop into New Post Creek that would likely be a barrier to upstream fish movement. Tributary 3 (MNR ID#554) This tributary is very small and has a small

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			watershed (Figure 2.10). No outfall to New Post Creek was apparent when this area was examined on September 20, 2011. Aerial photograph examination indicates that it is essentially a swale that appears to begin approximately 1,100 m upstream from New Post Creek. It likely does not provide habitat for fish." "Tributary 5 (MNR ID#545) Tributary 5 is very small with a small watershed (Figure 2.10). No outfall to New Post Creek was apparent on September 20, 2011. Examination of aerial photographs and another site approximately 150 m upstream from New Post Creek on September 18, 2012 indicates that it has a poorly defined channel. There was no water present at the Otter Rapids Road culvert or downstream on September 18, 2012, despite the previous 36 hours of rain. Because of the lack of water this watercourse likely does not provide habitat for fish." "Tributary 10 (MNR ID#495) This tributary is very small and has a small watershed (Figure 2.10). Based on this and the absence of water observed during a day of steady rain on September 17, 2012, it is typically dry. The shallow soil channel that drops steeply into a pre-diversion channel of New Post Creek from the surrounding lands without creating a gully also suggests that significant flow in this watercourse is rare. Aerial photograph examination indicates that there is no defined channel. Due to the lack of water this watercourse is unlikely to support fish. The section of pre-diversion New Post Creek channel that this tributary discharges to is now an oxbow pond and wetland." Additional information is provided in the Coker

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			and Portt (2013) report provided in Appendix 1 of the Aquatic Environment TSD. The following will be inserted at the end of the third paragraph (p. 3-25) under the sub-heading Tributaries of New Post Creek: “(see Aquatic Environment TSD for more details).”
18.	3.1.9.3 Fish Community Composition	• As it is anticipated that conversion of New Post Creek at the proposed weir from a lotic environment to a lentic one due to development of the headpond will create additional fish habitat and attract piscivorous fish species such as Northern Pike, it is recommended that the draft ER include a discussion with respect to from where the new fish will come and information regarding fish community composition from these location(s). Section 3.1.9.3 should include information on the composition of the fish community within the Little Abitibi River; including a discussion regarding a plan for future fish assessment work should fish community composition information be limited for this system.	The following will be inserted after the fifth paragraph of Sections 4.3.7 and 3.2.7 of the ER and Aquatic Environment TSD, respectively: “Flooding upstream of the proposed intake weir will result in the creation of shallow lacustrine habitat. The existing community of riverine fishes in the proposed headpond area will in structure to one that is more typical of a lacustrine system. As indicated in Section 3.1.9.7, a YOY Northern Pike was captured in drift nets set in New Post Creek at the Otter Rapids Road Bridge. The likely source of Northern Pike immigration to New Post Creek would be the Little Abitibi River upstream of the New Post Creek Diversion Dam that would entail being spilled over the dam. As indicated by Seyler (1997), Walleye, Northern Pike and White Sucker are the predominant sportfish in the Little Abitibi River. Other species likely present are those collected in New Post Creek upstream of the waterfalls, including Fallfish, Longnose Sucker, Lake Herring and Burbot. Based on distribution mapping provided by Seyler (1997), the Little Abitibi River does not appear to support populations of Lake Sturgeon, Smallmouth Bass, Lake Whitefish, Goldeye, Mooneye and Sauger. The creation of shallow lacustrine habitat will likely promote aquatic macrophyte growth and the concomitant spawning habitat may result in the establishment of a resident Northern Pike population.”

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			It should be noted that historic records suggest that anadromous Brook Trout may also have been found in the Little Abitibi River prior to construction of the New Post Creek Diversion Dam. As indicated in Section (7.3 – ER) (3.3 – Aquatic Environment TSD), fish community monitoring will be undertaken to confirm increased fish populations and species richness in the proposed headpond based on gillnetting, seining and/or electroshocking one and five years after initiation of GS operation."
19.	3.1.9.3 Fish Community Composition (continued)	• Table 3.9 should be updated to include fish weight and length ranges and averages, as well as numbers of each species caught in the Abitibi River and New Post Creek (downstream and upstream of the falls).	No length or weight measurements were made on any of the fish species captured, except for Lake Sturgeon and those fish captured for THg analysis. Table 3.9 is a compilation from many sources using a variety of non-standard methods to primarily establish presence. Adding the numbers captured into this table would be misleading with regard to relative abundance, and therefore it is best to refer to the source tables contained within the supporting fisheries reports in Appendix 1 of the Aquatic Environment TSD to review the information in comparable sets.
20.	3.1.9.8 Fish Mercury Body Burden	• Section 3.1.9.8 does not mention the sampling date for the fish collected from below the New Post Creek waterfalls and the adjacent section of the Abitibi River.	Walleye 1 to 19 were collected between September 15 and 20, 2011, whereas Walleye 20 was collected on November 1, 2011. This information will be added as footnote to Tables 3.10 and 2.21 in the ER and Aquatic Environment TSD, respectively.
21.	3.1.9.8 Fish Mercury Body Burden (continued)	• Table 3.9 of the draft ER only recognizes the presence of fish species within the Abitibi River and New Post Creek downstream and upstream of the falls, but should also include fish numbers for each	Table 3.9 is a compilation from many sources using a variety of non-standard methods to primarily establish presence. Adding the numbers captured into this table would be

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		species caught as part of conducted fish assessments.	misleading with regard to relative abundance, and therefore it is best to refer to the source tables contained within the supporting fisheries reports in Appendix 1 of the Aquatic Environment TSD to review the information in comparable sets.
22.	3.1.9.8 Fish Mercury Body Burden (continued)	• Table 3.10, which summarizes total mercury (THg) concentrations in Walleye tissue sampled for this project from fish collected below the New Post Creek waterfalls and in the adjacent section of the Abitibi River, should be updated to include historic THg concentrations collected from fish sampled from the Abitibi Watershed as part of the Seylor (1998) study and Hg data collected from the Provincial Sport Fish Contaminant Monitoring Program; especially between the Abitibi Canyon and Otter Rapids GSs.	Chris Mahon, Sport Fish Technician – Biomonitoring Unit, MOE Environmental Monitoring and Reporting Branch, was kind enough to promptly provide the historic fish mercury body burden data. The data were statistically analyzed and following information will be included in the ER and Aquatic Environment TSD. <u>Island Falls to Abitibi Canyon</u> Walleye (1977): 1.20 µg/g for 40 cm length; no statistically significant relationships with length and weight; complete consumption restrictions for the sensitive population; recommended partial consumption restrictions for general population. Walleye (1996): 0.93 µg/g for 40 cm length; no statistically significant relationships with length and weight; complete consumption restrictions for the sensitive population; recommended partial consumption restrictions for general population. Northern Pike (1977): 1.00 µg/g for 55 cm length; statistically significant relationships with length and weight; complete consumption restrictions for the sensitive population; recommended partial consumption restrictions for general population. Longnose Sucker (1996): mean concentration – 0.26 µg/g (range: 0.12-0.50 µg/g); no

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			statistically significant relationships with length and weight. Lake Sturgeon (1984): mean concentration – 0.95 µg/g (range: 0.37-1.70 µg/g); no statistically significant relationships with length and weight. Goldeye (1977): mean concentration – 0.47 µg/g (range: 0.20-0.74 µg/g); no statistically significant relationships with length and weight. Sauger (2010): mean concentration – 0.48 µg/g (range: 0.18-0.8 µg/g); no statistically significant relationships with length and weight. <u>Abitibi Canyon to Otter Rapids</u> Walleye (1996): 0.51 µg/g for 40 cm length; no statistically significant relationships with length and weight; slightly below complete consumption restrictions for the sensitive population (i.e., partial restriction); no consumption restrictions for general population. Walleye (2011): 0.41 µg/g for 40 cm length; no statistically significant relationships with length and weight; below consumption restrictions for the sensitive population (i.e., partial restriction); no consumption restrictions for general population. Northern Pike (1996): 0.58 µg/g for 55 cm length; statistically significant relationships with length and weight; complete consumption restrictions for the sensitive population; no consumption restrictions for general population. <u>Otter Rapids to Onakawana</u> Walleye (1996): 0.64 µg/g for 40 cm length; no statistically significant relationships with length

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			and weight; complete consumption restrictions for the sensitive population; recommended partial consumption restriction for general population. Longnose Sucker (1996): mean concentration – 0.09 µg/g (range: 0.03-0.22 µg/g); no statistically significant relationship with length; statistically significant relationship with weight.
23.	3.1.9.8 Fish Mercury Body Burden (continued)	• Figure 3.4 of the draft ER should also include graphing of the historic Walleye data collected from the Abitibi Watershed as referenced above in order to demonstrate and comment on trends in THg concentrations over time.	Graphs have been prepared for the relationships between THg concentrations and length and weight for the historic fish data provided by the MOE and will be included in the Aquatic Environment TSD. Graphs for Walleye and Northern Pike between Abitibi Canyon and Otter Rapids will also be included in the ER.
24.	3.1.9.8 Fish Mercury Body Burden (continued)	• Current and historic fish tissue THg data should also be presented for standardized fish lengths (being those fish sizes potentially used for human consumption; i.e. 40 cm for Walleye) in order to view trends in THg concentrations over time. Following the collection of post-development fish tissue samples, THg results for baseline and post-development standardized fish sizes should be compared.	As indicated in the response to Comment 22, THg concentrations in 40 cm Walleye between Island Falls and Abitibi Canyon decreased from 1.20 µg/g in 1977 to 0.93 µg/g in 1996. THg concentrations in 40 cm Walleye between Abitibi Canyon and Otter Rapids decreased from 0.51 µg/g in 1996 to 0.41 µg/g in 2011. This information will be included in Sections 3.1.9.8 and 2.2.6.9 of the ER and Aquatic Environment TSD, respectively.
25.	3.1.9.8 Fish Mercury Body Burden (continued)	• A similar relationship as is depicted in Figure 3.4 should be developed for THg concentration and fish weight. Both relationships should be plotted together to demonstrate what parameter might play more of a role in THg concentrations.	As indicated in the response to Comment 23, graphs have been prepared for the relationships between THg concentrations and length and weight for the historic fish mercury body burden data provided by the MOE and will be included in the Aquatic Environment TSD. Graphs for Walleye and Northern Pike between Abitibi Canyon and Otter Rapids will also be included in the ER.

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26.	3.1.9.8 Fish Mercury Body Burden (continued)	• As discussed above under section 3.1.9.3 comments, it is anticipated that the conversion of a portion of New Post Creek to a lentic environment will create additional fish habitat and attract piscivorous fish species such as Northern Pike to the proposed inundated area. Given that it is anticipated that Northern Pike may inhabit this area; via migrating from the Little Abitibi River upstream of the diversion structure, it is recommended that baseline fish Hg body burden values be collected for fish Northern Pike. This information will be essential in comparing post-operational THg values against baseline (pre-inundated) values .	Chris Mahon, Sport Fish Technician – Biomonitoring Unit, MOE Environmental Monitoring and Reporting Branch also provided fish mercury body burden data for Northern Pike from Little Abitibi Lake. These data were statistically analyzed with the following results. Northern Pike (1997): 0.80 µg/g for 55 cm length; statistically significant relationships with length and weight; complete consumption restrictions for the sensitive population; recommended partial consumption restrictions for general population. This information will be included in Sections 4.3.10.3 and 3.2.10.2 of the ER and Aquatic Environment TSD to be used as baseline THg concentrations should a Northern Pike population becomes established in the proposed headpond.
27.	3.1.9.8 Fish Mercury Body Burden (continued)	• Although the draft ER references the current recommended consumption advisories for the general and sensitive populations for the section of Abitibi River between the Abitibi Canyon and Otter Rapids GSs as set out in the MOE's Guide to Eating Ontario Sports Fish, it only refers to the Canadian fish consumption standard of 0.5 µg/g of THg as an estimated target for consumer sale. It should be noted that this value is above the recommended partial, and slightly below the complete consumption restrictions set within the MOE's Guide to Eating Ontario Sports Fish for sensitive populations. The Draft ER needs to include a comparison of standardized New Post Creek / Abitibi River Walleye THg concentrations against recommended partial and complete consumption restrictions, as outlined within the MOE's Guide to Eating Ontario Sports Fish.	The following paragraph will be inserted after Table 3.10 (p. 3-35) in Section 3.1.9.8 of the ER and Table 2.21 (p. 2-63) in Section 3.3.8.3 of the Aquatic Environment TSD: "As indicated by the MOE (2013), for women of child-bearing age and children under 15, partial consumption restrictions for sport fish containing mercury begin at concentrations of 0.26 µg/g with complete restriction advised for concentrations above 0.52 µg/g. For the general population, partial consumption restrictions begin at concentrations above 0.61 µg/g with complete restriction advised for concentrations above 1.84 µg/g. The THg concentrations in 18, three, one and none of the 20 Walleye analyzed exceeded the 0.26 µg/g, 0.52 µg/g, 0.61 µg/g and 1.84 µg/g consumption restrictions, respectively". Provincial fish consumption restrictions will be

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			included in the ER and Aquatic Environment for Walleye and Northern Pike based on the data provided by the MOE and resulting from the sampling program undertaken as part of the EA for the proposed Project. Consumption restriction information has been provided in the responses to Comments 22 and 26.
28.	3.1.9.8 Fish Mercury Body Burden (continued)	• The draft ER does not discuss the frequency at which the "pulsing" will occur, consequently it is unclear as to how often upstream portions of the watershed; especially wetland habitat, will undergo water level fluctuations. As wetlands may be ongoing sources of naturally occurring mercury methylation, the frequency at which pulsing will occur is necessary, as there may be greater potential for increased Hg methylation and subsequent accumulation in fish. Also, the sampling of forage fish from the headpond, immediately upstream of the weir and from within one of the tributaries to New Post Creek (one which drains a wetland and has adequate numbers for composite sampling should also be incorporated into future monitoring plans).	As indicated in the response to Comment 2, the following will be added after the fourth paragraph (p. 2-35) in Section 2.4.2.2 of the ER: "The forebay fluctuations are intended to provide operation during low flow periods primarily in late winter and late summer. This pulsing will be an automatic process and will involve the following: 1. The turbines are expected to require a minimum of 5 to 10 m^3/s to operate. Any time the total flow in New Post Creek is less than 5 to 10 m^3/s plus the minimum downstream flow requirement, the turbine units will not be able to operate. 2. In such situations, the proposed GS will be allowed to draw down the forebay within the prescribed range at a flow rate that will optimize efficiency. 3. When the water level reaches its lower limit, the units will shut down until the forebay returns to its high level. This will not be co-ordinated with the time of day for increasing revenue but will be an automatic process. 4. The fluctuation is expected to be lower in the winter to maintain an ice cover on the forebay. 5. This cycle will repeat most frequently in situations when flows are just below the required 5 to 10 m^3/s plus the minimum downstream flow requirement. The situation that would cause the most frequent starts/stops would be during the winter. In such cases the cycle could be expected to repeat every 8 to 48 h, depending

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			upon riparian flow. 6. In the prescribed period where a 50 cm band is achievable the cycle would be expected to repeat every 48 to 150 h, depending upon riparian flow. 7. The flows downstream of the dam would not change during this process as they will remain as the defined minimum flow requirement." This information will also be provided in the TSDs. Water level fluctuations will be added to the list of factors influencing mercury levels with the following discussion: Water level fluctuations may also affect MeHg production. Fagerstrom and Jernelov (1972) reported that when sediments containing mercury are exposed to air after dredging or due to fluctuations in water level, the rate of biological methylation of mercury may be extremely high, i.e., 10^3 to 10^4 times the "normal" methylation rate in the aquatic environment. A number of studies have shown that the mercury methylation rate in sediments is significantly higher in aerobic systems than in anaerobic systems, particularly when under anoxic conditions large amounts of sulphides are present which will make the mercury less available for methylation due to the formation of the almost insoluble mercuric sulphide (Fagerstrom and Jernelov, 1971; Jacobs and Keeney, 1974; Bisogni and Lawrence, 1975; Compeau and Bartha, 1983; Berman and Bartha, 1986). As indicated in Section 2.4.2.1, annual water levels in New Post Creek vary by approximately 3 m. With pulsing, water level fluctuations will be less, but occur more frequently over short periods of time. Water level fluctuations will be limited to 0.5 m below the usual full headpond

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			water level. Pulsing will be permitted at any time during the year within this operating range of 0.5 m (*provided minimum flows are directed over the spillway and no negative effects due to pulsing, that can not be otherwise mitigated, are observed* (G. Funnell, MNR, 2013, pers. comm.). As indicated in Section 2.4.2.2, water level fluctuations in the proposed headpond due to pulsing are intended to provide operation during low flow periods, primarily in late winter and late summer. As biological production is significantly reduced in the winter due to low temperatures, the rate of microbial mercury methylation will be minimal. During the late summer, with mean flows approximately three times greater than in the late winter (see Table 3.4), pulsing will be less frequent and not likely to the low FSL of 186.50 m.a.s.l. As indicated in response to Comment 16, the majority of the total wetland area to be inundated is associated with the ten tributaries. During pulsing, the wetland areas to be inundated at the minimum and maximum operating levels are 12.5 ha and 16.4 ha, respectively, a difference of only 3.9 ha (see response to Comment 49). <u>References</u> Berma, M. and R. Bartha. 1986. Control of the methylation process in a mercury-polluted aquatic sediment. Environ. Pollut. (Ser. B): 41-53. Bisogni, J.J., Jr. and A.W. Lawrence. 1975. Kinetics of mercury methylation in aerobic and anaerobic aquatic environments. J. Wat. Pollut. Contr. Fed. 47: 135-152. Compeau, G. and R. Bartha. 1984. Methylation and dimethylation of mercury under controlled redox, pH, and salinity conditions. Appl. Environ.

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			Microbiol. 48: 1203-1207. Fagerstrom, T. and A. Jernelov. 1971. Formation of methyl mercury from pure mercuric sulphide in aerobic organic sediment. Water Res. 5: 121-122. Fagerstrom, T. and A. Jernelov. 1972. Some aspects of the quantitative ecology of mercury. Paper presented at 6th Internat. Conf. Water Pollution Research, Internat. Assoc. Wat. Pollut. Res., June 1972, Jerusalem, Israel. 12 p. Jacobs, I.W. and D.R. Keeney. 1974. Methylmercury formation in mercury treated river sediments during in situ equilibration. J. Environ. Qual. 3: 121-126. As indicated in the response to Comment 6, THg body burden in Slimy Sculpin will be monitored in New Post Creek in the inundated area upstream of the proposed Project intake weir location one year after the start of operations and based on findings of significantly elevated fish body burden every five years until mercury concentrations decline to previous background.
29.	3.1.9.8 Fish Mercury Body Burden (continued)	• With respect to THg concentrations in Slimy Sculpin collected for the project, the reference to an “unnamed tributary discharging into New Post Creek approximately 150 m upstream of the proposed Project intake location. ”, and reference to Figure 2.6 does not provide an appropriate description of the location of the tributary. The tributary number and/or MNR ID number should be included, as they have been identified in a number of figures within the draft ER. Figure 4.11 would be a more useful reference than Figure 2.6, as it includes the proposed inundation areas as well as tributary numbers. As it is unclear from what tributary the forage fish were collected and sampled, it is difficult to comment with respect to the appropriateness of this tributary as a sample location. The Ministry prefers that forage fish be sampled from a	The first sentence of the first paragraph on p. 3-37 in Section 3.1.9.8 of the ER has been revised as follows: “Table 3.11 presents the THg concentrations in 20 Slimy Sculpin (total of 41 whole fish) collected on November 2, 2011 from the unnamed tributary (Tributary 1; MNR ID# 523) discharging into New Post Creek approximately 150 m upstream of the proposed Project intake location (see Figures 3.2 and 3.3).” The following sentence in the first paragraph on p. 3-37 will be deleted and replaced with the following: “Tributary 1 is the largest watercourse flowing into New Post Creek in the proposed headpond area, and will be affected the most from headpond development due to its proximity to the proposed weir and its

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		location within the proposed headpond, immediately upstream of the proposed weir. It is understood that if an adequate number of fish could not be caught immediately upstream of the proposed weir that an alternative location would be sampled; however, this should be discussed. Also, the justification for selecting Slimy Sculpin as a bioindicator of Hg uptake, as opposed to Spottail Shiners should be included.	low gradient channel, and being subjected to the highest water level increase (see Figure 2.6).” Similar revisions will be made to the first paragraph on p. 2-65 in Section 2.2.6.9 of the Aquatic Environment TSD. As indicated in Sections 3.1.9.8 and 2.2.6.9 of the ER and Aquatic Environment TSD, respectively, Slimy Sculpin were collected for baseline THg body burden analysis in the unnamed tributary (Tributary 1) discharging into New Post Creek approximately 150 m upstream of the proposed intake weir location. Slimy Sculpin will be collected from the inundated area of Tributary 1 for post-operational THg body burden analysis. The following statement will be added to the ER and Aquatic Environment TSD: “If inadequate numbers of Slimy Sculpin are available for analysis, CRP/OPG will consult with the MOE on alternative locations/species.” The following paragraph will be added prior to Tables 3.11 and 2.22 in the ER and Aquatic Environment TSD, respectively: “The standard forage fish species used for THg monitoring by the MOE are Spottail Shiner and YOY Yellow Perch. As indicated in Table 2.20, Spottail Shiner was captured in New Post Creek upstream of the waterfalls, but in small numbers insufficient to constitute the requisite composite samples. Yellow Perch were not captured in New Post Creek above the waterfalls.”
30.	3.1.9.8 Fish Mercury Body Burden (continued)	• It is recommended that any reference to an unnamed tributary be replaced by the tributary number and/or MNR ID number, as it will become easier to view the watercourse on one of the labelled figures.	CRP/OPG will undertake this recommendation.

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31.	3.1.9.8 Fish Mercury Body Burden (continued)	• Weight, length and age ranges and averages for each composite sample group of Slimy Sculpin should also be included in Table 3.11.	Slimy Sculpin was collected on November 2, 2011. Weight was not measured. Age was not determined; however, a distinct size class was sampled with fish lengths essentially the same as published YOY lengths, indicating that all fish in the samples were YOY. Total lengths were measured as follows: • Composite Sample 1: average = 46.67 mm; range = 41-52 mm; • Composite Sample 2: average = 49.0 mm; range = 39-57 mm; • Composite Sample 3: average = 47.0 mm; range = 40-54 mm; • Composite Sample 4: average = 47.38 mm; range = 33-54 mm; and • Composite Sample 5: average = 46.13 mm; range = 40-51 mm. This information will be included in Tables 3.11 and 2.22 of the ER and Aquatic Environment TSD, respectively.
32.	Effects Assessment and Recommended Mitigation Measures: 4.2 Proposed Project Construction – Aquatic Environment	• In our view these two best industry practices should be recommended for during-construction activities impacting water: ◦ MOE “Guidelines for Evaluating Construction Activities Impacting on Water Resources” (1995) ◦ DFO “Guidelines for Use of Explosives in or near Canadian Fisheries Waters” (1998)	CRP/OPG concurs with the MOE statement. These Guidelines were both identified in the second paragraph (p. 4-1) in Section 4.2 of the ER as Persaud and Jaagumagi (1995) and Wright and Hopky (1998), respectively.
33.	4.2 Proposed Project Construction – Aquatic Environment (continued)	• The reader would benefit from having the titles of such best practices included within the text of the draft ER as was done for the OWA’s “Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction”.	The titles of the Persaud and Jaagumagi (1995) and Wright and Hopky (1998) documents will be inserted into the text of the second paragraph (p.4-1) in Section of the ER. A similar revision will be made to the Aquatic Environment TSD.

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34.	4.2 Proposed Project Construction – Aquatic Environment (continued)	• The following recommendations are in addition to those mitigation measures proposed on page 4-13, with respect to potential effects of proposed transmission line construction: ◦ Where work is to occur in the vicinity of wetlands or areas too wet to access, such work should either be left to take place during dry conditions or carried out during frozen conditions.	It was stated in the seventh paragraph (p 1-25) under the sub-heading “Transmission Line” in Section 1.2.3 of the ER that “It is expected that the DBC selected for this work will execute the construction of the transmission line in the same manner as other such work in this region with the work likely being done in the winter to minimize the impact on the natural environment, particularly wet areas.” This mitigation measure will be carried over to Section 4.0 of the ER, as well as in Section 3.0 of the Terrestrial Environment TSD.
35.	4.2 Proposed Project Construction – Aquatic Environment (continued)	• Should water takings at a combined rate of over 50,000 litres per day be required, Section 34 of the Ontario Water Resources Act would require the proponent to obtain a Permit to Take Water (PTTW). Activities such as excavation and dewatering in areas of high water table for pole placement, or temporary stream diversions to facilitate in-water work at water crossings are considered water takings and may require a PTTW.	The following will be inserted after the first sentence of the fifth paragraph (p. 4-14) in Section 4.2.1 of the ER “, including excavation and dewatering in areas of high water table for transmission pole placement.” The following sentence will be added to the end of the fifth paragraph (p. 4-14) in Section 4.2.1 of the ER: “Temporary watercourse diversions to facilitate in-water work at water crossings are also considered to be water takings and may require a PTTW.” The same revisions will be undertaken in the Aquatic Environment TSD.
36.	4.2 Proposed Project Construction – Aquatic Environment (continued)	• Should dewatering activities be required, care should be taken during any discharge of water to ensure that the linear velocity of discharge does not produce scouring, erosion or flooding of the land or receiving stream.	As indicated in the fifth paragraph (p.4-14) in Section 4.2.1 of the ER, “An energy absorption diffuser should be used to minimize the impact of water on the discharge location.”
37.	4.2 Proposed Project Construction – Aquatic Environment (continued)	• Equipment used in the vicinity of a waterbody/watercourse should be located as far away as possible from such surface water features, and where necessary protected by combinations of dykes and plastic, capable of containing all fuels, oils and lubricants found at the site, to prevent spills from entering surface water. Adequate spill clean-up equipment and/or supplies should be available at the	The second paragraph (p. 4-19) in Section 4.2.2.5 of the ER addresses these mitigation measures.

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		site for fuel, oil and lubricantspills.	
38.	4.2 Proposed Project Construction – Aquatic Environment (continued)	• Should stormwater management controls be necessary at transmission stations or other locations along the transmission route, the proponent should consult the following MOE Guidance: ▪ "Stormwater Management Planning and Design Manual" (2003) when determining and designing stormwater management controls, and ▪ "Guideline B-6 – Guidelines for Evaluating Construction Activities Impacting on Water Resources" when developing erosion and sediment control plans.	The fourteenth paragraph (p. 2-27) in Section 2.4.1 states that: "The final site grading and elevations will be designed to minimize erosion and manage stormwater in accordance with the Stormwater Management Plan prepared by the DBC based on the MOE (2003) report "Stormwater Management Planning and Design Manual" and the conditions of the Environmental Compliance Approval under the *OWRA*." This paragraph will be repeated in Section 4.2.2 of the ER and Section 3.1.2 of the Aquatic Environment TSD.
39.	4.2.2.1 Erosion and Sediment Control	• The draft ER mentions that "Dredged material should be disposed of on land above the high water level…" In conducting any dredging during construction activities, it is recommended that where necessary the following MOE resources be applied and erosion and sediment control plans discuss the management of dredged material and control of runoff: ◦ "Evaluating Construction Activities Impacting on Water Resources Part III A – Handbook for Dredging and Dredged Material Disposal in Ontario – Legislation, Policies, Sediment Classification and Disposal Options" (1991, updated 2011) ◦ "Evaluating Construction Activities Impacting on Water Resources Part III B – Handbook for Dredging and Dredged Material Disposal in Ontario – Dredging Transport and Monitoring" (1991, updated 2011) ◦ "Evaluating Construction Activities Impacting on Water Resources Part III C – Handbook for Dredging and Dredged Material Disposal in Ontario – Sediment Sampling and Laboratory Analysis" (1991, updated 2011)	The following will be inserted after the last sentence of the third paragraph (p. 4-15) in Section 4.2.2.1 of the ER: "Management of dredged material and control of runoff will be addressed by the site-specific Sediment and Erosion Control Plan and Stormwater Management Plan to be prepared by the DBC. The management of dredged material will take into consideration the guidelines and requirements provided in the MOE Handbooks for Dredging and Dredged Material Disposal in Ontario (MOE, 2011c,d,e)." This revision will also be made in the Aquatic Environment TSD.

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40.	4.2.2.1 Erosion and Sediment Control (continued)	• Although the draft ER speaks of the development of “Erosion and Sediment Control Plans” during construction, and incorporation of this plan into the “Environmental Management Plan”, possible sediment retention and removal options should be identified in this section (i.e. the use of sedimentation ponds, which will require an Environmental Compliance Approval from the Ministry). The report also needs to elaborate on locations of such works, treatment options, volumes, discharge to the environment, proposed monitoring plans and effluent criteria; mainly concerning total suspended solids, turbidity, hydrocarbons, total ammonia nitrogen, pH, and other possible parameters of concern.	The following paragraph will be inserted into Sections 4.2.2.1 and 3.1.2.1 of the ER and Aquatic Environment TSD, respectively: “Figure 2.3 shows potential areas for settling ponds. The use of settling ponds will require Environmental Compliance Approvals under the *OWRA*. The DBC will be responsible for the final design of the settling ponds, including locations of such works, treatment options, volumes, discharges to the environment, proposed monitoring plans and effluent criteria for parameters of concern (e.g., pH, TSS, turbidity, hydrocarbons, total ammonia).”
41.	4.2.2.2 In-water Construction Activities	• The draft ER references the need for a PTTW for construction dewatering activities; however, the report should elaborate on all potential water takings involved during construction(perhaps where necessary for aggregate extraction) and offer estimated water taking rates and maximum volumes. An attachment provides recommendations with respect to requirements for construction and operations’ PTTW’s.	The following statement will be added after the last paragraph of Sections 4.2.2.2 and 3.1.2.2 of the ER and Aquatic Environment TSD, respectively: “Water taking requirements for dewatering activities (e.g., types, location, water taking rates and volumes) will be defined in the detailed engineering design prepared by the DBC.”
42.	4.2.2.3 Use of Explosives	• The draft ER fails to discuss potential water quality related impacts associated with blasting. Possible blasting agents and composition (i.e. ANFO – ammonium nitrate/fuel oil) and related contaminants of concern should be identified, along with options for mitigation measures to be employed in dealing with water quality concerns.	As indicated in the DFO “Guidelines for the Use of Explosives in or near Canadian Fisheries Waters”, no use of ammonium nitrate-fuel oil mixtures should occur in or near water due to the production of toxic by-products (ammonia). As summarized in Table 4.3, no adverse residual blasting effects are anticipated due to adherence to the DFO guidelines and blasting engineer recommendations regarding blasting methods and charges. As indicated in Section 4.2.2.3, all blasting will occur in compliance with federal regulations and directions.
43.	4.2.4 Acid Rock Drainage Potential	• pH values are missing from Table 4.2 Acid Base Accounting Results. These need to be included.	pH is not measured during Acid Base Accounting Tests

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44.	4.2.4 Acid Rock Drainage Potential (continued)	• As acid base accounting (ABA) results reveal that, although minimal, some samples have a low potential for acid rock drainage (ARD), and since metal concentrations have not been identified, it is inappropriate to say that "…any ARD from blasted rock exposed to New Post Creek will be neutralized by the moderately buffered water…" Although waste rock utilized for coffer dam construction will pose less of a risk of ARD as it will be beneath water, there is still a possibility of ARD from surface runoff proceeding from waste rock piles. It should be noted that care should be taken during the placement of waste rock on land, as to avoid runoff into the waterbody and a plan should be proposed for placement and monitoring of any waste rock stockpiles, including mitigation measures should ARD be evident.	The statement "any ARD from blasted rock exposed to New Post Creek will be neutralized by the moderately buffered water" will be revised to "any ARD from blasted rock exposed to New Post Creek may be tempered by the moderately buffered water". The following will be added to the last paragraph (p. 4-18) of Section 4.2.2.4 in the ER: "However, although the acid base accounting analysis revealed that ARD at the proposed Project site is unlikely, care should be taken during the placement of waste rock on land to avoid runoff into watercourses. In addition, a plan should be developed by the DBC for placement of, and monitoring of, any waste rock stockpiles, including mitigation measures should ARD be evident."
45.	Effects Assessment and Recommended Mitigation Measures 4.3 Proposed Project Operation – Aquatic Environment: 4.3.3 Water Quality	• The draft ER indicates that water quality in New Post Creek is expected to be similar to pre-inundation conditions after the anticipated trophic surge; however, it does not offer an approximate time frame for water quality to return to baseline conditions.	As stated in Section 4.3.3 of the ER, "The trophic surge effect (higher nutrient concentrations due to decomposition of organic material) is expected to be greatest in the first year with a rapid return to background", i.e., within a year of the first year. In 1988, Ontario Hydro undertook water quality simulations for a proposed inundation area of approximately 4,400 ha and determined that the trophic surge effect would last three to five years. Since the proposed New Post Creek headpond is smaller in area (170 ha) and with a much faster flushing rate, a more rapid return to background water quality can be expected. This information will be incorporated into Sections 4.3.3 and 3.2.3 of the ER and Aquatic Environment TSD, respectively.
46.	4.3.3 Water Quality (continued)	• This section should also refer the reader to section 4.3.10 of the draft ER for additional information regarding mercury and the methylation process	It does. The last sentence of the fourth paragraph in Section 4.3.3 of the ER states: "The inundation of adjacent wetland and cleared

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Line or Paragraph</th><th>Details</th><th>CRP/OPG Response</th></tr>
<tr><td></td><td></td><td></td><td>forested areas is expected to result in increased mercury concentrations in fish resident in the reservoir but not Walleye or other fish species downstream of the New Post Creek waterfalls (see Section 4.3.10).”</td></tr>
<tr><td>47.</td><td>4.3.5 Plankton, Aquatic Vegetation and Benthic Macroinvertebrates</td><td>• It should be identified that benthos within the proposed inundation area will also experience accumulation of methyl mercury (MeHg) due to flooding of the surrounding land, wetlands and vegetation.</td><td>The following paragraph will be inserted at the end of Sections 4.3.5 and 3.2.5 of the ER and Aquatic Environment TSD, respectively:
“Anticipated mercury increases in zooplankton and benthic macroinvertebrates due to the proposed inundation area are discussed in Section 4.3.10.2.”</td></tr>
<tr><td>48.</td><td>4.3.5 Plankton, Aquatic Vegetation and Benthic Macroinvertebrates (continued)</td><td>• Given that it is expected that “Overall benthic macroinvertebrate biomass in the inundated area will increase in response to an increase in substrate area. ”, and “ The benthic macroinvertebrate communities currently present in the lotic environmental conditions of New Post Creek would be replaced by those adapted to more lentic conditions.”, it is recommended that post-operational monitoring of benthos be carried out to identify new benthic macroinvertebarate communities, as well as the establishment of new benthic macroinvertebarate areas.</td><td>As indicated in the response to Comment 6, a benthic macroinvertebrate community sampling program (using standard techniques) will be undertaken in the proposed headpond and at locations previously sampled downstream of the proposed intake weir location during operation of the proposed GS.</td></tr>
<tr><td>49.</td><td>4.3.8 Fish Habitat Loss and Gain/Enhancement Flooding Upstream into Tributary Stream</td><td>• The draft ER should be supported by aerial photos of each New Post Creek tributary to be inundated as a result of the proposed development. A figure should be prepared for each tributary, depicting the extent (area) of flooding for both the lower level of the “pulsing” operating band of 0.5 m and the upper level of the operating band. The figures should also include the vegetation communities; highlighting wetland areas, as is depicted in Figure 3.6d. The same should be done for the main channel of New Post creek to be inundated. If for some tributaries the difference in water levels between the bottom and top of the operating band is negligible, this should be discussed within the report.</td><td>Figures 4.13d and 3.1d in the ER and Terrestrial Environment TSD, respectively, have been revised to demarcate (with hatch overlay) the wetland areas to be inundated by the proposed headpond in six of the ten tributaries.

The wetland areas to be inundated by the proposed headpond in the six tributaries at the maximum operating level of 187.00 and 186.50 m.a.s.l. (the pulsing water level limits) are presented below:

<table><tr><th>Tributary</th><th>187.00 (km²)</th><th>186.50 (km²)</th></tr><tr><td>1 (#523)</td><td>0.110111</td><td>0.078310</td></tr><tr><td>2 (#491)</td><td>0</td><td>0</td></tr></table></td></tr>
</table>

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			3 (#554) / 0 / 0 4 (#550) / 0.001031 / 0.001031 5 (#545) / 0 / 0 6 (#520) / 0.034560 / 0.033422 7 (#505) / 0 / 0 8 (#489) / 0.003962 / 0.002934 9 (#509) / 0.003918 / 0.002396 10 (#495) / 0.012717 / 0.007153 As indicated in the response to Comment 28, the following statement will be included in the ER and Aquatic Environment TSD: "During pulsing , the wetland areas to be inundated at the minimum and maximum operating levels are 12.5 ha and 16.4 ha, respectively, a difference of only 3.9 ha."
50.	4.3.10.2 Potential Mercury Biomagnification in Fish	• The following additional factors may influence mercury levels in fish due to the proposed development and should be added to those listed under this section: ◦ Hydraulic residence time of the system;	Hydraulic residence time will be added to the list of factors with the following discussion: The short hydraulic residence time in the proposed headpond may contribute to a faster recovery period for the proposed Project, i.e., the faster the removal of mercury, the faster recovery times.
51.	4.3.10.2 Potential Mercury Biomagnification in Fish (continued)	• Minimum and maximum residence times, based on min and max depths and flows ◦ The type of terrain to be flooded and amount of remaining organic material; specifically, the percentage of land to be inundated that is comprised of wetlands; ◦ Area of wetland that may not be inundated, but may be flow contributors to the inundated area and headpond;	Type of terrain will be added to the list of factors with the following discussion: Flooded wetlands have been suggested to sustain increased MeHg production longer than flooded uplands (Bodaly *et al*., 2004, St. Louis *et al*., 2004, Hall *et al*., 2005) inferring that the smaller the wetland area inundated the faster the recovery of mercury body burden in fish to regional background levels. As indicated in Section 4.4.5.3, of the total terrestrial inundation area of 129.9 ha, only 3.7 ha consist of organic meadow marsh, organic shallow marsh and open water marsh, whereas an additional 16 ha consist of mineral thicket swamp and organic thicket swamp. Approximately 84% of the total wetland area (19.7 ha) to be inundated is associated with the ten tributaries (16.6 ha) draining into the

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
			proposed headpond. Significant enhancement of mercury methylation is not anticipated due to this relatively small area of inundated wetland area. It should be noted that mercury attenuation predictive models do not take into account the area of wetland inundation. It is also expected that mercury contributions from wetland areas that will not be inundated will remain unchanged. <u>References</u> Bodaly, R.A., K.G. Beaty, L.H.Hendzel, A.R. Majewski, M.J. Paterson, K.R. Rolfhus, A.F. Penn, V.L. St. Louis, B.D. Hall, C.J.D. Matthews, K.A. Cherewyk, M. Mailman, J.P. Hurley, S.L. Schiff and J.J. Venkiteswaran. 2004. Experimenting with hydroelectric reservoirs. Environ. Sci. Technol. 38: 347A-352A. Hall, B.D., V.L. St. Louis, K.R. Rolfhus, R.A. Bodaly, K.G. Beaty, M.J. Paterson and K.A. Peech Cherewyk. 2005. Impacts of reservoir creation on the biogeochemical cycling of methyl mercury and total mercury in boreal upland forests. Ecosystems 8: 248-266. St. Louis, V.L., J.W.M. Rudd, C.A. Kelly, R.A. Bodaly, M.J. Paterson, K.G. Beaty, R.H. Hesslein, A. Heyes and A.R. Majewski 2004. The rise and fall of mercury methylation in an experimental reservoir. Environ. Sci. Technol. 38: 1348-1358.
52.	4.3.10.2 Potential Mercury Biomagnification in Fish (continued)	• Information on impacted and surrounding wetlands is important as they are considered long-term contributors of MeHg and have longer hydraulic residence time.	See response to Comment 51. As indicated in the response to Comment 51, it is expected that mercury contributions from wetland areas that will not be inundated will remain unchanged.

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53.	4.3.10.2 Potential Mercury Biomagnification in Fish (continued)	• Under Mitigation Measures draft ER indicates that the headpond/reservoir (flooded) area will be cleared; however, the report should clarify if tributary areas proposed to be inundated will also be cleared.	As indicated in the first bullet of the fifth paragraph (p. 4-62) under the sub-heading "Mitigation Measures" in Section 4.3.10.2 of the ER, clearing, cleaning and removal of all trees and significant vegetation (large woody shrubs) will occur from the proposed inundated area. This would include the tributary areas.
54.	4.3.10.3 Summary and Conclusions	• It is agreed that post-inundation fish mercury body burden monitoring be carried out on Northern Pike should a population become established in the proposed inundated area. It is further recommended this sampling program be combined with a fish movement assessment to help determine if a Northern Pike population becomes established from Little Abitibi River fish.	As indicated in the response to Comment 6, *assessment of effects on* fish populations and species richness (including possibly Northern Pike) will be monitored in the proposed headpond one and five years after initiation of GS operation. In addition, THg body burden in any piscivorous fish population, if established in the headpond, will be monitored one year and five years after the start of operations. This THg body burden monitoring would continue based on findings of significant elevated concentrations every subsequent five years until mercury concentrations decline to previous background.
55.	4.3.10.3 Summary and Conclusions (continued)	• The report recommends that post-inundation fish mercury body burden monitoring take place; however, it does not offer specifics regarding scheduling of monitoring, locations, size and number of fish, etc. A water quality and fish tissue sampling program has been suggested in attachments; however, it is recommended that such sampling be coordinated with other fish community and movement (telemetry) assessments.	As indicated in the response to Comment 6, CRP/OPG will prepare a draft Monitoring Program document incorporating clearly stated monitoring objectives, identification of performance indicators and measurement endpoints, data collection methods and protocols, monitoring frequency and reporting requirements. The draft Monitoring Program will be provided to MNR, DFO, MOE and JWG for review and comment. The final Monitoring Program will be submitted to MNR, DFO, MOE and JWG prior to proposed GS commissioning. It should be noted that it would be impossible to co-ordinate the movement (telemetry) assessments of individual fish and their subsequent capture for mercury analysis to determine whether there is a relationship between exposure and mercury body burden.

Comment	Binder/Page/Section/ Line or Paragraph	Details	CRP/OPG Response
56.	4.3.10.3 Summary and Conclusions (continued)	• As part of post-inundation monitoring, the monitoring program should also investigate how the project may impact the aquatic environment with respect to the potential for changing the river/lake bottom to anoxic conditions, thus increasing the potential for Hg methylation to occur.	As indicated in the response to Comment 13, it is anticipated that due to the short hydraulic residence time isothermal conditions are expected during the summer, which will be confirmed by temperature/D.O. profile monitoring. As indicated in the response to Comment 28, a number of studies have shown that the mercury methylation rate in sediments is significantly higher in aerobic systems than in anaerobic systems, particularly when under anoxic conditions large amounts of sulphides are present which will make the mercury less available for methylation due to the formation of the almost insoluble mercuric sulphide (Fagerstrom and Jernelov, 1971; Jacobs and Keeney, 1974; Bisogni and Lawrence, 1975; Compeau and Bartha, 1983; Berman and Bartha, 1986). <u>References</u> Berma, M. and R. Bartha. 1986. Control of the methylation process in a mercury-polluted aquatic sediment. Environ. Pollut. (Ser. B): 41-53. Bisogni, J.J., Jr. and A.W. Lawrence. 1975. Kinetics of mercury methylation in aerobic and anaerobic aquatic environments. J. Wat. Pollut. Contr. Fed. 47: 135-152. Compeau, G. and R. Bartha. 1984. Methylation and dimethylation of mercury under controlled redox, pH, and salinity conditions. Appl. Environ. Microbiol. 48: 1203-1207. Fagerstrom, T. and A. Jernelov. 1971. Formation of methyl mercury from pure mercuric sulphide in aerobic organic sediment. Water Res. 5: 121-122.

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			Jacobs, I.W. and D.R. Keeney. 1974. Methylmercury formation in mercury treated river sediments during in situ equilibration. J. Environ. Qual. 3: 121-126.
57.	4.3.10.3 Summary and Conclusions (continued)	• It is recommended that post-development water quality monitoring including temperature and dissolved oxygen and the development of temperature and dissolved oxygen profiles should occur for the new reservoir, immediately upstream of the main dam. This should be conducted at the same frequency as recommended for water quality sampling.	As indicated in the response to Comment 13, temperature/D.O. profile monitoring will be undertaken during the summer to confirm the anticipated isothermal conditions due to the short hydraulic residence time.
58.	4.3.10.3 Summary and Conclusions (continued)	• The draft ER earlier mentions the development of an Environmental Effects Monitoring program. The Ministry is in support of such a program; however, specific details of the monitoring may need to be developed in consultation with the MOE, MNR, DFO and First Nation stakeholders. As part of the final ER the proposed EEMP should include specifics with respect to the features and parameters to be monitored; frequency and schedule of sampling; sampling locations, including maps; and any special sampling procedure. The proposed EEMP should include the proposed mercury monitoring program, which incorporates the mercury monitoring recommendations outlined in Appendix B.	As indicated in the response to Comment 6, CRP/OPG will prepare a draft Monitoring Program document incorporating clearly stated monitoring objectives, identification of performance indicators and measurement endpoints, data collection methods and protocols, monitoring frequency and reporting requirements. The draft Monitoring Program will be provided to MNR, DFO, MOE and JWG for review and comment. The final Monitoring Program will be submitted to MNR, DFO, MOE and JWG prior to proposed GS commissioning.