



Final Environmental Report
Frederick House River – Wanatango Falls
Hydroelectric Generating Station Project



FOREWORD

The Final Environmental Report

Xeneca Power Development Inc. (Xeneca), the project proponent, is pleased to present the Final Environmental Report (ER) for the proposed Wanatango Falls Hydroelectric Generating Station on the Frederick House River (the “project”). This document represents the culmination of important and considerable joint effort among Xeneca, regulatory agencies, local residents, public stakeholders and Aboriginal communities over the last four years. It was prepared to meet the requirements of the Ontario *Environmental Assessment Act* and the objectives of the *Green Energy Act*.

One function of this Final report is to advise the public and government ministries and agencies on the outcomes of the completed studies and consultations. Xeneca has welcomed comments and questions about the proposed project throughout the ER preparation period.

Submission of this final report under the Waterpower Class Environmental Assessment (EA) process represents a significant milestone in the obligations to the Ontario Power Authority under the Feed-In Tariff (FIT) contract issued to Xeneca for this undertaking. In order to initiate construction, Xeneca is required to successfully satisfy the requirements of the Waterpower Class EA, and subsequently obtain all applicable provincial and federal regulatory permits and approvals; receive approval for final engineering design; and obtain approval of detailed plans and specifications, all within a relatively aggressive schedule. Xeneca has undertaken a multitude of investigations and studies of the project site spanning a four year period (2010 to 2013) that has included natural habitat studies; archaeological investigations; water quality and fish tissue sampling; geotechnical studies; public and agency consultation; and engagement with Aboriginal communities. Xeneca is pleased with the contribution of all agencies in reaching this milestone and looks forward to a continued positive working relationship on the detail design, permitting and construction parts of the project to meet the FIT program contractual agreements to have the project in-service by October 2018.

Advancing Provincial Strategies

The government of Ontario is steadfast that a reliable supply of clean energy is necessary to maintain a strong economy and a healthy and prosperous quality of life for Ontario’s growing population.

The provincial government has also placed a priority on expanding the amount of energy produced from renewable energy sources. Renewable energy development is a cornerstone of the province’s future prosperity and its commitment to protecting the environment. The Ministry of Natural Resources (MNR) has stated that renewable energy projects contribute to the environmental, social and economic wellbeing of the province. Renewable projects such as

waterpower help reduce the impacts of climate change and provide sustainable sources of energy. Supporting the government's green energy initiative, the MNR makes Crown land available for renewable energy development including waterpower (Ministry of Natural Resources,

http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@renewable/documents/document/stdprod_087667.pdf). The proposed Marter Township project helps fulfill the MNR mandate to support the government's green energy initiative.

Waterpower continues to help to fuel Ontario's growth and is the backbone of Ontario's renewable power supply. In 2011, 22% of electricity generated in Ontario came from hydroelectric facilities. Waterpower has a number of benefits over other sources of clean energy since it can easily respond to sudden changes in energy needs and the facilities generally have long life cycles, on the range of 75 to 100 years. Waterpower is a reliable, clean, local and naturally recurring source of energy. The Ministry of Energy document referenced below notes the additional benefit of water level and flow management provided by reservoirs and dams that help to support recreational activities and contribute to public safety by minimizing flooding (Ministry of Energy, <http://news.ontario.ca/mei/en/2010/08/waterpower-projects-support-local-communities.html>).

Waterpower is a key contributor to implementing the Ontario government's 20-year Long-Term Energy Plan, Building Our Clean Energy Future. This plan includes building the largest expansion in hydroelectric power in almost 40 years (Ministry of Energy, <http://news.ontario.ca/mei/en/2011/02/long-term-energy-plan-takes-another-step-forward.html>). The government of Ontario has committed to continue to grow its hydroelectric capacity with a target of 9,000 MW by adding new facilities and maximizing the use of Ontario's existing facilities. The proposed Wanatango Falls GS project will help to fulfill this commitment.

Renewable energy development is a cornerstone of the province's future prosperity and its commitment to protecting the environment. The Ministry of Natural Resources (MNR) has stated that renewable energy projects contribute to the environmental, social and economic wellbeing of the province. Renewable projects such as waterpower help reduce the impacts of climate change and provide sustainable sources of energy. Supporting the government's green energy initiative, the MNR makes Crown land available for renewable energy development including waterpower (Ministry of Natural Resources, http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@renewable/documents/document/stdprod_087667.pdf).

Moving Forward

This Final Environmental Report is the foundation of Xeneca's planning and development process that will be used to inform the subsequent detail design and permitting/approval stages. This document is also a record of the binding commitments of Xeneca as it proceeds with development and operation of the proposed project.

EXECUTIVE SUMMARY

Xeneca Power Development Inc. (Xeneca) proposes to construct a 3.7 MW hydroelectric power generating station (GS) at the site known as “Wanatango Falls” on the Frederick House River, located in Mann Township, approximately 26 kilometres (km) northwest of the Town of Iroquois Falls and 22 km south of the Town of Cochrane. The project received a Feed-in Tariff contract from the Ontario Power Authority (OPA), which stipulates facility commissioning by October 2018.

This Final Environmental Report (ER) documents the environmental assessment (EA) process undertaken in support of the proposed project. This EA was completed in accordance with the provincial Class Environmental Assessment for Waterpower Projects as required under the Ontario *Environmental Assessment Act*. The purpose of an environmental assessment is to ensure that potential effects are identified, evaluated and considered in the planning stages of a project, allowing for the avoidance or minimization of the negative impacts and the optimization of the positive impacts in advance of the regulatory permitting phase that governs the construction and operation phases. Furthermore, the EA process is designed to ensure the proponent of a project undertakes meaningful engagement of all parties who wish to be involved in the planning process. In the context of environmental assessment, the environment considered includes the natural/physical, socio/economic, and cultural/human landscape in which the project is proposed to be developed and operated.

Effects of an undertaking may be either positive or negative, and are assessed for their significance based on such factors as value, duration, magnitude, geographic extent, and reversibility. Negative impacts can then be avoided or mitigated through planning and further project refinement and where required, through provision of compensatory measures to offset impacts which cannot be mitigated against in accordance with the mandatory regulatory approvals framework. The residual environmental effects are those which mitigation cannot address and these must be assessed against existing or reasonably foreseeable activities to determine whether there is a potential for cumulative effects to a specific area or resource. Significant residual effects may lead to project redesign or rejection of the proposed undertaking.

This Environmental Report has been organized in the following format:

- Introduction and project overview;
- Description of the regulatory framework under which the project is being assessed;
- Identification of the existing conditions of the environment in which the project is situated;
- A technical description of the proposed project as conceptualized, including its physical makeup, construction requirements, and proposed operational regime;
- Discussion of stakeholder engagement efforts undertaken throughout the EA process, and the results of those engagements;

- Identification of the likely effects of the project, both positive and negative, proposed mitigation measures to avoid the negative impacts, residual effects, offsetting measures where required, and proposed construction and operational monitoring initiatives;
- Identification of regulatory approvals which will be required prior to the construction and operations phases of this undertaking;
- Conclusions and recommendations.

An environmental assessment is meant to enhance the project as it is presently conceptualized through site specific investigations in consultation with regulatory bodies, interested parties, First Nation and Aboriginal communities and the general public. The EA presents a conceptual project design to inform on the general scope of the project both in terms of potential impacts to the environment and anticipated socio-economic benefits of the project. A final project design is required in support of securing regulatory permits and approvals.

Throughout the environmental planning process, Xeneca has endeavoured to understand the environment in which the project would be built by undertaking an extensive information and data collection program. Data on areas of the environmental setting of the project was collected by discipline experts including:

- Stage 1 and 2 archaeological assessments;
- A natural environment characterization and impact assessment;
- A high level erosion study and fluvial geomorphic assessment on the riverine system in the zone of influence;
- Database analysis and mapping;
- Wetland assessment and routing of connection line and access roads corridors;
- A statistical analysis of historical hydrological data;
- Hydraulic analyses;
- Conceptual engineering design; and
- Baseline surface water quality program.

The proposed mitigation measures have been developed using recognized industry standards and best management practices, through the discipline expertise of the EA team members, and in accordance with the regulatory framework which governs the proposed project. Xeneca will continue to work closely with provincial and federal regulators during the formal review of this document, and through the detailed design, permitting, construction, and operational phases of the project. Xeneca is committed to verification of the implementation and effectiveness of the mitigation measures and offsetting measures detailed in this document. As part of this effort, Xeneca will regularly issue a Project Implementation Report to agencies to update the project status, provide results of on-going environmental assurance and verification programs, and results of monitoring and mitigation programs.

A summary of the existing conditions at the proposed project site, the project details and the findings of the environmental assessment is presented below.

Physical Environment

The site of the proposed Wanatango Falls GS is approximately 10 km downstream of the existing Frederick House Lake Dam and approximately 500 m upstream of Zevery's Bridge. The Frederick House River originates in Night Hawk Lake and flows northerly approximately 9 km to Frederick House Lake. From Frederick House Lake, the river continues to flow north until it joins the Abitibi River.

The general topography of the area is characterized by extensive low lying flats and poorly drained areas and slow flowing streams. In proximity to the site, the Frederick House River flows through a well-defined, narrow flood plain. The proposed project site is located in the northern Clay Belt, within the Abitibi greenstone belt of the Canadian Shield.

Ecology

The surrounding landscape is composed of a black spruce forest community, interspersed with a few tributary-related wetlands. Vegetation communities identified within the study area represent one forest and three wetland communities. No designated natural areas or significant vegetation species or communities exist in the study area. Wildlife studies conducted in 2010 and 2012 indicated that a variety of wildlife was found to be using the study area.

Aquatic studies completed from 2010 through 2012 indicate the presence of twenty-six (26) fish species within the study area reach of the river. Suitable spawning habitat for several of these species, including Lake Sturgeon (*Acipenser fulvescens* Pop.2), Walleye (*Sander vitreus*) and Shorthead Redhorse (*Moxostoma macrolepidotum*) was confirmed. The presence of two fish species of conservation concern, Lake Sturgeon and Goldeye (*Hiodon alosoides*) were confirmed in the confines of the Frederick House River within the project area. Lake Sturgeon are also known to exist above and below the proposed facility on the Frederick House River. Walleye, Northern Pike (*Esox lucius*), Sauger (*Sander canadensis*), and Lake Sturgeon were judged to be the valued ecosystem components.

Ten Species at Risk (SAR) birds are flagged below as having the potential to occur within the study area based on breeding ranges determined by the Ontario Breeding Bird Atlas (2007); these include: olive-sided flycatcher (*Contopus cooperi*), chimney swift (*Chaetura pelagica*), peregrine falcon (*Falco peregrinus*), short-eared owl (*Asio flammeus*), common nighthawk (*Chordeiles minor*), bobolink (*Dolichonyx oryzivorus*), rusty blackbird (*Euphagus carolinus*), Black Tern (*Chlidonias niger*), Bank Swallow (*Riparia riparia*) and Barn Swallow (*Hirundo rustica*).

A total of one hundred and nine (109) bird species were observed during the field investigations, and eighty (80) bird species were confirmed to have potential to regularly occur and/or breed within the vicinity of the project area. Field studies noted breeding evidence of two bird SAR: Canada Warbler (*Wilsonia canadensis*) and Bald Eagle (*Haliaeetus leucocephalus*).

A review of the Ontario Mammal Atlas indicated that two mammal Species at Risk may be present within the Wanatango Falls GS project area: the Northern Myotis (*Myotis septentrionalis*) and Little Brown Myotis (*Myotis lucifugus*).

No significant herpetofaunal species were identified in the vicinity of the proposed project area.

Archaeological Sites, Built Heritage and Cultural Heritage Resources

Due to its proximity to a major water source and the existence of rapids, it was concluded that areas of high archaeological potential exist for the proposed Wanatango Falls site. The Stage 1 Archaeological Assessment was completed in January 2011. The project team identified areas of high archaeological potential along the river, and recommended a Stage 2 investigation. The Stage 2 Archaeological Assessment identified three pre-contact archaeological sites; given that these sites were of further archaeological value, it was recommended that the project area be subject to a Stage 3 assessment, and if required, a Stage 4 assessment. These are planned for completion in the spring of 2015. The MTCS provided a partial clearance for the construction at Wanatango Falls GS in a letter written to Xeneca on August 12, 2013, in which they indicated that the ministry concurs with the conclusion that construction prior to the Stage 3 assessment will not affect the archaeological sites, as more than 300 m separate these sites from the proposed construction areas. No built heritage structures were encountered within the project area during the Stage 2 Archaeological Assessment.

General Land and Water Use

The Frederick House River is considered a managed waterway due to the presence of other water control structures (e.g. Frederick House Lake Dam) as well as an existing water management plan on the waterway.

The Frederick House River is a non-scheduled navigable water under the new *Navigation Protection Act (NPA)*, and therefore the proposed project does not automatically require approval from Transport Canada under the *NPA*. Xeneca nonetheless has the option to submit an Opt-in Request to Transport Canada to review the associated works under the *NPA*. Xeneca may wish to do this in order to proceed with the added assurance that the work's interference with navigation is sanctioned under the *NPA*.

No protected areas are located in the immediate vicinity of the proposed project.

Aboriginal Land and Water Use

The site falls within the Taykwa Tagamou Nation, Mattagami First Nation and Matachewan First Nation area of interest. Other First Nations with an interest in the project include Wahgoshig and Flying Post. The Métis Nation of Ontario (and the local Northern Lights Métis Council) are also engaged in project consultations. Engagement of First Nations and Aboriginal communities was initiated in mid-2010, and will continue into project implementation. Xeneca has provided project information to Identified Aboriginal communities and Local Aboriginal communities under the guidance of the Ministry of Natural Resources. A Draft Aboriginal Consultation Plan for the project was provided to the Communities for their input in August of 2011. Through consultation with Aboriginal Communities, Xeneca has received input that has been incorporated into the project design and operation. Xeneca has been working toward possible community benefits (business to business arrangements) with Identified Aboriginal Communities as directed by the Ministry of Natural Resources.

Project Description

Originally, two design alternatives were considered for the Wanatango Falls GS, a “low dam option” and a “high dam option”. The locations of the built structures (powerhouse, spillway, fish passage, etc.) are identical in both options, the only difference being the height of the water control structures and the resulting headpond. The “high dam option” is the proponent’s preferred option for overall power production, although the implementation of this option requires agreements with upstream riparian landowners whose properties overlap with the proposed headpond. At the time of writing of this report, Xeneca was in the process of negotiating the last outstanding agreement with an upstream riparian landowner.

The “low dam option” would use a gross head of approximately 7.5 metres (m) and have a headpond extending 0.5 km upstream. The preferred “high dam option” would use a gross head of 9 m and a headpond extending 8.6 km upstream, for a total inundation area of 72.5 ha.

The proposed headworks structures will be constructed across the watercourse and will consist of a combination of spillways topped with Obermeyer gates and embankment dams. A single 170-m long embankment dyke will be constructed across the island between the two spillways.

An open conveyance channel will conduct flows from the river to an intake before directing them through one or two turbines with a combined name plate capacity rating of 3.7 megawatt (MW).

The station will be connected to the provincial electrical power supply grid via a 27.6 kilovolt (kV) power line as per its FIT Contract, and extending approximately 43.6 km from the GS. Impact and mitigations regarding power lines are to be addressed through a screening process that will take part outside of the Class EA for Waterpower Projects.

Access to the site will be accomplished through use of the Newmarket Concession Road 5 and 6 (also known as the Reaume Esker Road), and through use of old logging roads on the east and west banks of the river to access the site directly. These roads will require significant surface re-grading and widening to support construction vehicles and equipment. Some new access road construction will be required.

The detailed design will benefit from input by the public and regulatory agencies during the review of the Environmental Report. The proponent necessarily reserves the right to variances between the conceptual design presented herein and the detailed engineering design subsequent to the completion of the environmental assessment, provided that such variances do not materially and negatively impact the environment beyond the scope of the impacts described herein. Plan and Specification Approval (*Lakes and Rivers Improvement Act*) will determine the final design using the Class EA as a guideline.

Construction Strategy

Assuming the issuance of the Statement of Completion by September 2014, site preparation activity is planned for the fall of 2015. Construction of the proposed facility is scheduled to take place between January 2016 and December 2017 with commissioning of the facility anticipated by March 2018. Under the terms of the FIT contract awarded to Xeneca, the facility must be commissioned no later than October 2018.

Construction activities will begin following the issuance of regulatory approvals and authorizations, and will be subject to the requirements of applicable legislation, industry guidelines and best management practices. Xeneca will provide results of ongoing environmental assurance and verification programs.

Operation Strategy

The operation strategy was developed based on the conceptual engineering design, available environmental data and the findings of various studies. A “modified run-of-river” mode of operation is proposed for the Wanatango Falls GS, in which the operation of the facility would vary between run-of-river and intermittent depending on the flows in the river. When natural flows are below the maximum capacity of the turbines (50 m³/s), but above the required minimum environmental flow (2 m³/s), water will be stored during off-peak hours for use during peak hours, affecting water levels upstream and flows downstream.

For the proposed Wanatango Falls GS, water levels in the headpond will experience a maximum daily fluctuation of 1 m. Daily fluctuations in water levels downstream of the facility will be controlled such that daily fluctuations in water levels do not exceed ± 10 cm as measured at Neeland’s Rapids (approximately 24 km downstream).

Operations will not impact the Frederick House Lake Dam located approximately 10 km upstream of the Wanatango Falls GS. Operations will also not impact the other three dams located on the Abitibi River (Island Falls, Abitibi Canyon and Otter Rapids), downstream of the junction of the Abitibi and Frederick House Rivers. In order to minimize negative environmental impacts, limits were set to the depth and area of the inundation zone, which in turn limits storage to a few hours operation time during moderate and low flows.

Special operating restrictions will be implemented during key events (e.g. sturgeon and walleye spawning). These restrictions would be triggered at specific water temperatures at which these events are known to occur. The proposed operations and operating restrictions are presented in an Operating Plan annexed to this report.

The operating plan of the facility at Wanatango Falls will ultimately be incorporated into the existing Abitibi River Water Management Plan in cooperation with MNR as outlined in the *Lakes and Rivers Improvement Act* after achieving commercial operation.

Federal, Provincial, and Municipal Agency and Stakeholder Consultations

In accordance with the Class EA for Waterpower Projects, consultation was conducted with government agencies, stakeholders and the public at large to gain a better understanding of the project area and to identify potential concerns and issues related to the proposed development. Further, comments, concerns and advice have been incorporated into project design and operation. Engagement with First Nation and Aboriginal communities was initiated by Xeneca in 2010, and is expected to continue throughout final permitting, design and the lifecycle of the Project.

Key concerns identified through public consultation included impacts to water levels, the local economy, recreation, fisheries impacts and impacts to terrestrial mammals. Ontario Power Generation owns and operates several generating stations on the Frederick House River, and is recognized as a stakeholder for the proposed Wanatango Falls development.

A Project Description was provided to relevant federal and provincial agencies at the onset of the EA process to formally initiate regulatory discussion for the project. A Notice of Commencement for the project was advertised in local publications on July 29, 2010 (a revised notice was subsequently issued on November 11, 2010), in accordance with the Class EA for Waterpower Projects. Subsequent to the issuance of the Project Description, an EA Coordination meeting was held with both provincial and federal regulators to discuss the undertaking, collect information on regulatory approval and permitting requirements, and project scoping. In the early stages of the planning process, the Canadian Environmental Assessment Agency acted as the Federal Environmental Assessment Coordinator for the proposed undertaking, but in accordance with the July 2012 enactment of the revised *Canadian Environmental Assessment Act*, a federal screening is no longer required for this project.

Key concerns identified by agencies during the planning process to date include potential impacts to fisheries and fish habitat; mercury levels in fish tissue; and wildlife.

Potential Project Effects

The environmental assessment examined the project's potential environmental impacts. Where possible, adverse impacts will be avoided or prevented and mitigation measures will be implemented to minimize those impacts that cannot be avoided or prevented. Negative project impacts have been discussed with potentially impacted stakeholders.

In order to minimize potential erosion effects, the maximum daily fluctuations and the rate of change of upstream water levels will be limited. The proposed operating parameters presented in the proposed Operating Plan were selected to allow for a certain amount of fluctuation in headpond water levels without impacting private property upstream of the Wanatango Falls GS.

Given the significant variations in river flows currently experienced (as a result of the operating regime of the Frederick House Lake Dam), and that operations at the Wanatango Falls GS will be modified run-of-river, water temperatures in the headpond are not expected to change significantly compared to existing conditions. Modified run-of-river operations will also produce downstream variability in water depth, flow velocity and wetted perimeter until the river reaches a lake or a confluence with a major tributary. A downstream minimum environmental flow of 2.0 m³/s is proposed to be continually passed over the dam spillway to maintain ecological habitat viability within the variable flow reach. No modified operations will occur during Walleye and Lake Sturgeon spawning in order to ensure fish reproduction is not adversely affected.

As a preferred option, as expressed through traditional knowledge from First Nations, no fish passage is proposed as part of this project. To mitigate against negative impacts associated with the fragmentation of the Lake Sturgeon population in the river, an extensive netting and relocation program is proposed in order to relocate Lake Sturgeon out of the headpond and into the Frederick House River downstream of the Wanatango Falls GS. As an alternate (non-preferred) option, a fishway would be constructed along the downstream side of the embankment dyke.

Offsetting habitat will be required for approximately 1,550 m² of fish spawning habitat, namely 500 m² of spawning habitat that will be impacted by the construction of the tailrace, and 1,050 m² of spawning habitat whose functionality will be altered as a result of inundation. Under the preferred, "no fishway" option, offsetting habitat will be constructed entirely downstream of the Wanatango Falls GS. Under the alternate option in which a fishway is constructed, offsetting habitat would be constructed both upstream and downstream of the facility. Under either option, offsetting habitat will be developed in consultation with the Ministry of Natural Resources and Fisheries and Oceans Canada.

The applicable regulations will be respected in order to ensure the health and safety of all contractors, construction crews and operational staff. For the safety of the public, access will be restricted during construction activities. Safety measures will be erected to restrict public access to the work areas. These measures may include fencing and signage while ensuring that routes are maintained to allow the public to bypass the construction area.

Once operational, access to the immediate vicinity of the facility will be restricted to maintain public safety. Safety measures including signage, fencing, gates, barriers and warning devices will be considered during the development of a Public Safety Plan (PSP). The PSP will be completed prior to commissioning and will address both access and operation-related safety issues. It is not the intent to restrict access to fishing or recreational uses where safety considerations are not an issue.

Consideration was also given to impacts specifically related to potential accidents and malfunctions that may occur during the construction and operation of the facility. The proper implementation of mitigation measures and best management practices will minimize the likelihood of accidents such as spills and leaks during the construction period. A spill response plan will be developed for the construction program to manage any accidental releases of contaminants required for the operation of construction equipment; any releases of contaminants will be reported to the Ministry of the Environment Spills Action Centre. A detailed list of mitigation measures to be implemented during the construction program is provided in this Environmental Report.

In order to preserve the aesthetic quality of the project area, the proponent will strive to maintain and enhance vegetative buffers between the river, roads and any ancillary works. The proponent will seek to preserve or enhance recreational values in the area of Wanatango Falls.

Positive Impacts:

The construction and operation of the proposed facility will introduce new employment opportunities to the towns of Cochrane and Iroquois Falls and the surrounding region, including First Nations and Aboriginal communities. Direct economic activity to build a waterpower project in Ontario is approximately \$5 million per megawatt, half of which is generally spent locally in procuring construction labour and materials, consulting and legal services, trucking and other services such as accommodation, food and fuel. There will also be a significant return to the people of Ontario paid through the Gross Revenue Charges (GRC) and provincial and federal income taxes. Returns to the people of Ontario will continue past the 40 year contract, for as long as the facility is in operation. Direct and indirect job creation associated with the construction activities is estimated to be approximately 46,700 and 70,050 person-hours of work, respectively.

Benefits to Aboriginal communities, including employment opportunities, are being discussed as outlined in the Aboriginal Consultation Plan. Discussions also include MNR's "Business to Business" relationship process for Identified Aboriginal Communities. Xeneca has voluntarily committed to support the Crown's consultation responsibilities to the Aboriginal Communities and its fiduciary obligations as defined within Bill 150, Green Energy and Green Economy Act, 2009 (GEA), and the Ontario Power Authority's Feed-In Tariff process and other related Crown objectives.

Additional economic benefits will include revenue generated from local sourcing of materials, equipment and services (where available). The project will improve local infrastructure to the benefit of mines, forestry, and tourism and recreational users.

The project will provide to the region a source of reliable and clean electricity for 75+ years that will help meet local demand for homes and support local supply during interruptions to service such as ice storm and blackouts.

As a lower cost source of electrical production, waterpower will assist in keeping provincial electricity prices economical and help displace fossil fuel and nuclear sources of generation, and improve system reliability.

In terms of long term generation of jobs and prosperity, the development of the Wanatango Falls GS and other current projects will help support Ontario's existing waterpower industry that employs 1600 direct and 2000 indirect jobs within a renewable sector that has significant potential of global growth according to the International Energy Agency which is estimated to exceed all other renewable sources.

New projects such as Wanatango Falls GS will help Ontario's waterpower industry facilitate a generational knowledge transfer that will allow it to compete in the global market for the potential 575,000 MW of new supply and 875,000 MW of refurbishments. Domestic development of waterpower has been stagnant in Ontario since the 1990s, and the Wanatango Falls GS would provide this Ontario industry an opportunity to showcase its talents and expand so as to meet the growing global demand for equipment and expertise for waterpower maintenance and development.

Other environmental benefits are estimated at:

- The displacement of 13,226 metric tons of carbon dioxide equivalent per annum;
- Reduction of annual greenhouse gas emissions equivalent to 2,593 passenger vehicles; or,
- The sequestering of carbon from nearly 1141 hectares of pine or fir forests.

Cumulative Effects

Cumulative effects are the long term changes resulting from the combined effects of successive actions on the environment, and can result from the interaction of residual effects from multiple projects in a given area or multiple activities acting on a single ecosystem component.

The proposed operations of the Wanatango Falls GS were developed to mitigate against potential cumulative impacts with water regulation from the Frederick House Lake Dam (FHLD), located approximately 10 km upstream. The FHLD is shut down and not releasing flow on average 100 days per year; during such periods of zero flow, leakage from the stop logs and tributary input result in flows being approximately 2 m³/s at the site of the proposed Wanatango Falls GS. The Wanatango Falls GS will operate in such a way that the magnitude of fluctuations in flows and levels will generally remain within the range occurring under existing conditions as a result of regulation by the FHLD. Rather, there may be an increase in the frequency of peaking events, e.g. during periods when day-to-day flow releases from the FHLD are relatively stable and there is sufficient inflow into the Wanatango Falls GS' headpond to permit modified run-of-river operations.

To mitigate against cumulative impacts associated with increased fish stranding at Zeverly's Rapids (approximately 500 m downstream), a pathway will be notched from the large pool in which fish stranding is known to occur under existing conditions. Monitoring will confirm the effectiveness of this mitigation measure and, if needed, further mitigation will be developed in consultation with MNR and DFO.

While the preferred, "no fishway" option will result in the fragmentation of Walleye, Sauger and Goldeye, these species are prevalent in the Frederick House River both upstream and downstream of the proposed Wanatango Falls GS site, and sufficient habitat exists for these species on either side of the GS to sustain the different populations. With the implementation of the proposed capture and relocation program for Lake Sturgeon in the headpond, in combination with the provision of offsetting habitat, it is not anticipated that the development of the GS will exacerbate the existing level of fragmentation of Lake Sturgeon in the river.

Monitoring and Follow-up Programs

Monitoring programs have been proposed for the construction, post-construction and operation phases of the development. These programs will ensure that mitigation measures and industry best management practices are being properly implemented and adverse effects are minimized.

Conclusion

It is anticipated that the implementation of offsets, to be discussed with the MNR and DFO, will minimize the negative residual impacts associated with the loss of potential fish spawning habitat in the proposed headpond and in the footprint of the tailrace of the Wanatango Falls GS. It is the conclusion of this environmental assessment that there will be no additional significant negative residual environmental effects after application of mitigation measures and offsetting measures.

There are also many positive economic effects associated with the project which are considered to off-set any potential environmental impacts. These include: the tangible economic benefits for the local communities and the regional/provincial economy, employment and training opportunities, the creation of reliable and secure green energy for the province, and the generation of electricity through a renewable energy supply in support of the province's *Green Energy Act*.

The proponent believes the project provides net positive environmental and socio-economic impacts to the region and the province. The ER and the project also meet the desired direction of the "One Window" on energy procurement and the objectives as defined within the *Green Energy Act*.

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LIST OF ANNEXES

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- Annex V: Archaeological Assessments
- Annex VI: Lines and Roads

Acronyms

AAND	Aboriginal Affairs and Northern Development (formerly Indian and Northern Affairs Canada)
ARD	Acid Rock Drainage
ARFMI	Abitibi River Forest Management Inc.
BMA	Bear Management Areas
CEAA	<i>Canadian Environmental Assessment Act</i>
CEA Agency	Canadian Environmental Assessment Agency
DFO	Fisheries and Oceans Canada
DZOI	Downstream Zone of Influence
EA	Environmental Assessment
EAA	<i>Environmental Assessment Act</i>
EC	Environment Canada
ELC	Ecological Land Classification
ER	Environmental Report
ESA	<i>Endangered Species Act</i>
FEAC	Federal Environmental Assessment Coordinator
FIT	Feed-In Tariff
FHLD	Frederick House Lake Dam
FMP	Forest Management Plan
FN	First Nation
FRMG	First Resource Management Group
GEA	<i>Green Energy Act</i>
GRC	Gross Revenue Charges
GS	Generating Station
HADD	Harmful alteration or disruption or destruction of fish habitat
INAC	Indian and Northern Affairs Canada
LRIA	<i>Lakes and Rivers Improvement Act</i>
LOI	Letter of Intent
ME	Ministry of Energy
MNDM	Ministry of Northern Development and Mines
MNO	Métis Nation of Ontario
MNR	Ministry of Natural Resources
MNR-RSFD	MNR Resource Stewardship and Facility Development Projects
MOE	Ministry of the Environment
MOU	Memorandum of Understanding
MTCS	Ministry of Tourism, Culture and Sport
NCIR	Northern Communities Investment Readiness Program
NDA	Non- Disclosure Agreement
NLCA	Night Hawk Lake Cottages Association
NOC	Notice of Commencement

NOL	Normal Operating Level
NPA	<i>Navigation Protection Act</i>
NRCan	Natural Resources Canada
NRSI	Natural Resource Solutions Inc.
NWPA	<i>Navigable Waters Protection Act</i>
OFSC	Ontario Federation of Snowmobile Club
OMNR	Ontario Ministry of Natural Resources
OPA	Ontario Power Authority
OPG	Ontario Power Generation
OWA	Ontario Waterpower Association
PIC	Public Information Centre
PSW	Provincially Significant Wetland
PWQO	Provincial Water Quality Objectives
QP	Qualified Person
Q ₉₉	Streamflow exceeded 99% of time
Q ₉₅	Streamflow exceeded 95% of time
Q ₈₀	Streamflow exceeded 80% of time
Q ₅₀	Streamflow exceeded 50% of time
Q ₂₀	Streamflow exceeded 20% of time
Q _{EA}	Downstream environmental flow target
Q _{COMP}	Compensatory flow (between dam and tailrace)
Q _{MED}	Median streamflow value
Q _{TMAX}	Maximum turbine capacity
Q _{Tmin}	Minimum turbine flow
Q _{TL}	Limited turbine flow – modified ROR
Q _{HWM}	Streamflow corresponding to high water mark
7Q2	2 year return period 7-day-average-low flow
7Q10	10 year return period 7-day-average-low flow
7Q20	20 year return period 7-day-average-low flow
Q1:2	High streamflow event; occurrence of 1 in 2 yr
Q1:100	High streamflow event; occurrence of 1 in 100 yr
RA	Responsible Authority
ROR	Run-of-River
ROW	Right-of-way
SAR	Species at Risk
SARA	<i>Species at Risk Act</i>
SFL	Sustainable Forest Licenses
SIP	Site Information Package
TC	Transport Canada
TTN	Taykwa Tagamou Nation
UTM	Universal Transverse Mercator Units

VEC	Valued Ecosystem Component
WHS	Woodland Heritage Services
WPSMG	Waterway Public Safety Management Guideline
WMU	Wildlife Management Unit
WMP	Water Management Plan
ZOI	Zone of Influence

Units

°C	degree Celsius
cm	centimetre
ha	hectare
km	kilometre
km ²	kilometre squared
kV	kilovolts
kW	kilowatt
kWh	kilowatt hour
m	metres
mm	millimetres
m ²	square metres
masl	metres above sea level
m/s	metres per second
m ³ /s	cubic metres per second
MW	megawatt
MWh	megawatt hour

1. INTRODUCTION

This section presents an introduction to waterpower in Ontario, an overview of the proposed project, and the methods used to complete the work presented herein.

1.1 WATERPOWER IN ONTARIO

Hydroelectricity is generated from water, a naturally replenished source making waterpower both a renewable and sustainable resource. Waterpower currently accounts for approximately one-quarter of Ontario's installed capacity and electricity production (OWA Class EA, January 2014). The greenhouse gas emissions from a hydroelectric generating station are effectively zero. Waterpower generation provides peak and base load energy, which replaces non-renewable sources of power such as coal and natural gas. Some waterpower facilities are designed and operated to store energy (water) until it is needed for peak periods of usage.

Hydroelectric generating stations are long-lived, lasting upward of eighty (80) years; there remain operating waterpower facilities in the province that were constructed at the turn of the 20th century. In 2009, the Ontario *Green Energy Act* (GEA) was enacted with the aim of making the province a global leader in clean, renewable energy. The Feed-in Tariff (FIT) Program administered by the Ontario Power Authority (OPA) was established under the GEA to encourage the development of renewable energy in Ontario while phasing out the province's coal-fired electricity by 2014. The FIT program was designed to promote economic activity, the development of renewable energy technologies and the creation of new green industries and jobs.

1.2 INTRODUCTION TO PROJECT

Xeneca Power Development Inc. (Xeneca) is proposing the construction of a 3.7 megawatt (MW) hydroelectric generating station (GS), the Wanatango Falls GS, on the Frederick House River to meet government and energy regulatory goals and objectives to generate sustainable and reliable hydroelectric power.

The proposed project is located in Mann Township, approximately 26 kilometres (km) northwest of the Town of Iroquois Falls and 22 km south of the Town of Cochrane. The proposed project was awarded a 40-year FIT contract from the OPA which, subsequent to a successful Environmental Assessment (EA) outcome, would see the facility commissioned and delivering electricity to the provincial supply grid by October 2018. *(Note: in a June 26, 2013 directive to the OPA, the Minister of Energy stated that existing waterpower FIT contracts were to be offered a 3-year extension to the Milestone Date for Commercial Operation. Prior to the announcement of the 3-year extension, the Wanatango Falls GS had a commissioning date of October 2015.)*

Two options, described in greater detail in Section 3, are being considered for the height of the water control structures. The preferred option, called the “High Dam Option” (also referred to as “Option 1” in the supporting material of this ER), would have a gross head of 9.0 metre (m) and an inundation area extending approximately 8.6 kilometres (m) upstream. The alternate, “Low Dam Option” (also referred to as “Option 2”), would have a gross head of 7.5 m and a headpond extending 0.5 km upstream. The proposed locations of the GS components (water control structures, powerhouse, etc.) are identical in both options. A site location map is provided as Figure 1, showing the extent of inundation of the High Dam Option with the longer headpond.

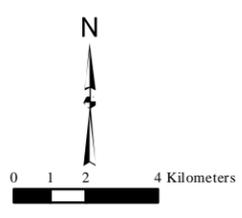
Additionally, two options are being considered with respect to the provision of fish passage at the Wanatango Falls GS. Following extensive consultation with Taykwa Tagamou Nation (summarized in Section 6.6.5), the preferred option is to *not* construct a fishway, instead focussing effort on creating compensatory habitat downstream of the Wanatango Falls GS. The alternate option is to construct a fishway, accompanied with the provision of compensatory habitat mostly upstream, with some downstream, of the dam.



Imagery 2012 + ArcGIS Online Basemaps - UTM 17N - Produced by N Collard - Mar. 24, 2014

Wanatango Falls - Site Location and Zone of Influence

- * OPG Frederickhouse Dam
- + Connection Point
- Zone of Influence
- New Access Road
- ⋯ Proposed Power Lines
- ⋯ Existing Power Lines
- Railway
- Provincial Parks



The components of hydroelectric projects evaluated by the Waterpower Class EA can include reservoirs or head ponds, water control structures, water conveyance structures (canals or penstocks), powerhouses, and access routes. Connection lines rated less than 115 Kilovolts (kV) and transformer stations rated less than 115 kV are also components of the overall project, but the assessment of these components is not required under the Waterpower Class EA; any information related to the connection line presented in this report is provided for the information of the reader (see also the discussion in Section 1.4.1 on the MNR-RSFDP Class EA process).

For each of the project components, there are direct activities associated with their construction, operation and maintenance (e.g. removal of vegetation in the project footprint and the initial filling of the headpond). There are also indirect activities related to the maintenance and operation of these facilities, including small volumes of non-hazardous waste generation and their disposal, and possibly backup generating systems powered by fuel.

The process of conducting this EA entailed the examination and evaluation of each component of the proposed development and their potential effect on each aspect of the current environment. Environmental effects may include, but are not limited to, alteration/loss/gain of natural features, flora or fauna and their habitat, ecological functions, natural resources, air and water quality, and cultural or heritage resources. Environmental effects may also include the displacement, impairment, or interference with existing land uses, land use and resource management plans, businesses or economic enterprises, recreational uses or activities, cultural pursuits, social conditions and economic attributes.

1.3.1 Addendum Provisions for Environmental Reports

Should changes be proposed to the Wanatango Falls GS from what is presented in this ER, Xeneca must determine if the addendum provisions outlined in Section 8.8 of the Class EA for Waterpower Projects (January 2014) apply to the project change. Similarly, these addendum provisions must be applied if, following the construction/implementation of the project as described in this ER, Xeneca wishes to make a minor modification to the Wanatango Falls GS project (i.e. a modification that is below the threshold for a significant modification under the Electricity Projects Regulation). A significant modification is any expansion of or change in the facility that would increase the name plate capacity of the facility by 25% or more). If a significant modification is considered at any time in the future a full Class EA planning process would be required to assess the effects of the change.

The addendum provisions of the Class EA for Waterpower Projects would require the proponent to determine whether the proposed change(s) may result in new negative effects to the environment. In such a scenario, an Addendum to the ER must be prepared, outlining the proposed changes, the rationale for proposing and the implications of these changes, and a review of the mitigation measures that will be applied to minimize these effects. As with the ER

presented herein, an Addendum to the ER would be subject to a minimum 30-day review period with the opportunity to request a Part II Order.

1.4 APPROACH TO THE ENVIRONMENTAL SCREENING PROCESS

The EA team included internal departments within Xeneca (i.e., personnel from the Corporate Affairs and Communications (including Public Affairs and Aboriginal Relations), Environmental Affairs, Engineering, and Legal Affairs departments) as well as technical consultant firms retained by Xeneca for the proposed undertaking as such:

- Canadian Projects Ltd. (CPL)
- Hatch
- Howe Gastmeier Chapnik Ltd.
- Hutchinson Environmental Sciences Ltd.
- KBM Resources Group
- KGS Group
- Natural Resource Solutions Inc. (NRSI)
- BluMetric Environmental Inc.
- Ontario Resource Management Group Inc. (ORMG)
- ORTECH Consulting Inc.
- Northern Bioscience
- Parish Geomorphic Ltd.
- Woodland Heritage Services Ltd. (WHSL)

1.4.1 Legal Framework

As a waterpower development with an installed capacity less than 200 MW, this project is subject to the Class EA for Waterpower Projects (herein referred to as the Waterpower Class EA planning process developed by the OWA as approved by the Ontario Ministry of the Environment (MOE) in October 2008 (revised January 2014) under the Ontario *Environmental Assessment Act (EAA)*. The Frederick House River has water control infrastructure in place in other sections of the waterway and the river is currently managed for water levels and flows. The proponent has categorized the proposed waterpower facility at Wanatango Falls as a ‘new project on a managed waterway’ in accordance with the definitions found in the Waterpower Class EA (see Appendix A of this report).

The EA team also reviewed other applicable environmental assessment guidelines and legislation regulating small hydroelectric developments in the Province of Ontario, and determined that the following regulatory processes and guidelines may be applicable to this undertaking:

- Federal Requirements for Waterpower Development Environmental Assessment Processes in Ontario – Practitioner’s Guide (DFO-OWA, 2010);

- The Water Management Planning Guidelines for Waterpower, Ontario (MNR, May 2002);
- Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction (OWA, 2012);
- Best Management Practices Guide for Lake Sturgeon (OWA, 2009);
- Community Guide to Waterpower Development (OWA – Waterpower Working Group, Undated).

The proposed project will also require an authorization from Fisheries and Oceans Canada (DFO) under the new *Fisheries Act*. The Frederick House River is not a scheduled navigable water under the new *Navigation Protection Act (NPA)*, and therefore the proposed project does not require approval from Transport Canada. Xeneca nonetheless has the option to opt in and request an assessment and review of the associated works under the *NPA*.

In the early stages of the planning process (2007), the federal regulatory approvals triggered the requirement for a screening-level environmental assessment under *Canadian Environmental Assessment Act (CEAA)*. However, since the enactment of the new *CEAA, 2012* a federal screening is no longer required. As such, this ER document is primarily intended to meet the Waterpower Class EA requirements though, in an attempt to be comprehensive, federal regulatory information requirements have been addressed wherever possible.

Based on a preliminary review of the project, the MNR indicated that the assessment of the connection line to be constructed as part of the project would also be subject to review under the Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects, Ministry of Natural Resources (MNR-RSFD Class EA). Subsequent amendments were made to Ontario Regulation 334 under the *EA Act* (s. 15.0.1) that exempt any undertakings by or on behalf of the Crown that are being carried out only for the purposes of implementing a renewable energy project. Waterpower projects are subject to the requirements of the *EA Act* under Ontario Reg. 116/01, with the Waterpower Class EA as the primary planning process. The proposed connection line for the Wanatango Falls GS falls into a 'Category A' undertaking as per O. Reg. 116/01 and is therefore exempt from an EA requirement. As the Ministry responsible for managing most Crown resources, through disposition, approval and permits under a number of statutes, MNR has indicated that it still requires information to support decisions related to the disposition, approvals or permits required for power line projects. As such, Xeneca has included preliminary information on the connection line route in this document and in public information centres towards satisfying future permitting consultation requirements.

1.4.2 Characterize Local Environment of Proposed Development

The EA team collaborated in the completion of a Potential Effects Identification Matrix. To begin the planning process, this matrix was included in the Project Description document (Appendix B) developed by Xeneca, and circulated to regulators. The EA team worked with many stakeholders

at the local, provincial and federal levels to ensure that the local environment including physical, social/cultural and economic aspects were well understood.

The EA team completed the following tasks to characterize the local environment in the proposed development areas:

- A detailed literature review of existing information available through provincial and federal databases. The reviewed documents are identified in the References in Section 17 in this document and in the technical reports referenced throughout this document.
- Field investigations to supplement the terrestrial and aquatic biology record available for the site. The EA team undertook detailed field investigations throughout the project area to document existing conditions and assess the potential effects of the project on these conditions. The results of these studies are presented throughout this document. This information and the expert advice of the EA team members are presented throughout this document.
- Stage 1 and Stage 2 Archaeological Assessments to supplement the available historical record for the site. A Stage 3 Archaeological Assessment is currently in the planning phase and will be completed in the spring of 2015.
- Engineering field investigations to supplement the topography, water depth and hydrology data. A statistical analysis of historical hydrological data was completed. Hydraulic modeling was also undertaken to assess flow depths and velocities. Steady-state and unsteady-state hydraulic models were developed using HEC-RAS. Detailed reports are found in Annex I.
- A leaf-off aerial photography program was undertaken for all power line routes (20 centimetre (cm) resolution) utilizing digital true colour RGB ortho-photography. This was later augmented by a ground-truthing exercise for route segments running along existing roads. Each of the forest management companies that held Sustainable Forest Licenses (SFL's) were consulted regarding the project sites and additional information was obtained from the licensees.
- A geomorphic assessment to characterize existing channel form and processes, including sediment dynamics, in the Frederickhouse River in and around the project site. The potential impacts of the proposed project on sediment dynamics and slope stability were assessed. The geomorphic assessment report can be found in Annex I.

1.4.3 Identify Potential Environmental Effects

In the preliminary stages of the planning process, the EA team used a consultative approach to identify the potential effects of the project through completion of the Potential Effects Identification Matrix from the Class EA for Waterpower Projects (see Appendix B of this report). The matrix is useful in determining the data gathering and analysis program, and it was circulated to regulators at the beginning of the EA planning process.

In examining the potential effects of this project, the EA team considered the construction and operation/maintenance phases of the project, and their potential impacts within the determined upstream and downstream Zone of Influence (ZOI). It should be noted that the project is expected to last for more than 75 years, and the legislative requirements for decommissioning may evolve substantially over that time period. Additionally, a proper assessment of the impacts of decommissioning the Wanatango Falls GS requires a solid understanding of baseline conditions, which in this case, are the characteristics of the biophysical and socio-economic environment prior to the start of any proposed decommissioning activities.

Knowing that the biophysical and socio-economic environment may evolve substantially over a period of 75+ years, any assessment of decommissioning impacts, if conducted at this early stage of project development, would be speculative at best. As such, decommissioning activities are not assessed as part of this EA; the planning and approval of decommissioning will be addressed through the applicable legislation in place at that time (planning and other applicable regulations).

1.4.4 Identify Required Mitigation, Monitoring or Additional Investigations

Based on their areas of expertise, members of the EA team developed a summary of recommended actions to prevent or mitigate negative effects of the proposed undertaking on the environment. These mitigation measures were compiled based on the information collected during the study period (field and desktop), through consultation with government agencies, the information collected through the public consultation initiative, and Aboriginal engagement efforts. The residual effects, those that cannot be prevented, avoided or fully mitigated) are identified and classified based on their significance. It should be noted that residual effects also include the positive benefits that would be achieved through the lifecycle of this project to ensure that all potential net effects are afforded consideration.

Recommendations for environmental monitoring, where on-going data collection will be required to monitor short-term or longer term effects (i.e., those that would be experienced during construction and those that may be experienced subsequent to commissioning) are included within this document. Environmental monitoring, if required, during both construction and operation will be subject to regulatory approval at the permitting stage in advance of construction.

Xeneca has offered formal commitments related to the undertaking which may be required in advance of permitting, including additional data and information collection activities. A list of commitments proposed by Xeneca in support of the Wanatango Falls waterpower development is summarized in Section 15, and throughout the main document and annexes.

1.4.5 Agency and Public Consultation and Aboriginal Communities Engagement

The consultation and engagement initiatives were designed to co-ordinate all applicable requirements for the regulatory, public and Aboriginal community notification, engagement and consultation. The results of these initiatives are presented within this document. The regulatory agencies, public interest groups and communities, First Nations (FN), other Aboriginal groups and additional stakeholders identified during the EA planning process for the Wanatango Falls GS project include:

Canadian Environmental Assessment Agency (CEA Agency)
Aboriginal Affairs and Northern Development Canada (AANDC, formerly known as Indian and Northern Affairs Canada (INAC)
Fisheries and Oceans Canada (DFO)
Transport Canada (TC)
Environment Canada (EC)
Natural Resources Canada (NRCan)
Health Canada (HC)

Mattagami Conservation Authority

Ministry of Aboriginal Affairs (MAA)
Ministry of Tourism, Culture and Sport (MTCS)
Ministry of Energy (ME)
Ministry of the Environment (MOE)
Ministry of Natural Resources (MNR)
Ministry of Transportation (MTO)
Ministry of Northern Development and Mines (MNDM)
Ontario Waterpower Association (OWA)

Town of Iroquois Falls

Town of Cochrane

Flying Post First Nation
Matachewan First Nation
Mattagami First Nation
Taykwa Tagamou Nation
Wahgoshig First Nation
Northern Lights Métis Council
Wabun Tribal Council
Métis Nation of Ontario

AbitibiBowater
Abitibi River Forest Management Inc.
Cochrane Board of Trade
Coureurs de Bois Adventures
Friends of High Falls
Iroquois Falls Community Development
Jackpine Snowmobile Club
Kirkland Lake District Game & Fish Protective Association
Ontario Federation of Anglers and Hunters
Ontario Federation of Snowmobile Clubs
Ontario Power Generation
Temiskaming Shores & Area Chamber of Commerce
Temiskaming Shores & Area Tourism Information Centre
Tri-Town & District Chamber of Commerce
Interested members of the public

A summary of the key consultation activities is provided below:

- A Notice of Commencement and a subsequent revision to the Notice were issued by Xeneca. The Notice of Commencement was advertised in local media. The first Notice of Commencement was issued on July 29, 2010. The Notice of Commencement was revised and re-issued on November 11, 2010.
- A Project Description for the hydroelectric generating station was issued on March 18, 2011 to provincial ministries, municipal stakeholders and the OWA and circulated federally through the Federal Environmental Assessment Coordinator (FEAC). The Project Description is provided in Appendix B.
- The Project Description was distributed to eight FN and Aboriginal communities (Taykwa Tagamou Nation, Matachewan FN, Mattagami FN, Flying Post FN, Wahgoshig FN, Northern Lights Métis Council, Métis Nation of Ontario, and Wabun Tribal Council) in December 2010 and/or in May 2011. Additional communities were added to the distribution list after the proponent received a Site Information Package (SIP) from the MNR, which listed the identified and local Aboriginal communities in the area. Aboriginal engagement and consultation initiatives in support of this undertaking are detailed in Section 6.6. A record of Aboriginal consultation is provided as Appendix E.
- An EA Coordination meeting attended by federal and provincial regulators was held on April 20, 2011. A complete record of Agency consultation is provided in Appendix C, and is summarized in Section 6.3.
- The first Public Information Centre (PIC) was held in Cochrane, Ontario on March 24, 2011. A second PIC was on June 26, 2012. A record of public consultation is provided in Appendix D, and summarized in Section 6.4.

- Advertisements, mandatory notifications, and correspondences for the Wanatango Falls GS project are discussed further in this report and copies are provided in their respective appendices.
- In October 2011, a formal Notice of Completion and an ER was provided to the agencies, ministries, FN, Aboriginal groups and other local stakeholders that were identified during the EA planning process for a 30-day formal review period.
- On April 3, 2012, Xeneca voluntarily withdrew its Notice of Completion for the Wanatango Falls project in order to incorporate the responses to comments as well as findings from recent field studies into an updated ER. A second Draft ER was circulated to key agencies in October 2012 in order to facilitate an efficient regulatory review of the final document.
- This Final ER is being provided to regulatory agencies, FN, Aboriginal groups and made available for electronic review to local stakeholders that were identified during the EA planning process. As per the Class EA for Waterpower Projects, the Final ER will be available for a 37-day formal review period (June 30, 2014 to August 5, 2014). Hard copies of the ER are placed in the following public viewing locations:
 - Timmins Public Library
 - Town of Cochrane municipal office
 - Iroquois Falls Public Library
- During the review period, all reviewers (regulator, public and Aboriginal groups) have the opportunity to submit comments on the Final ER. It is anticipated that as early as possible during the review period, participants will contact Xeneca directly to identify any outstanding issues and engage with the proponent to resolve these issues to both parties' satisfaction.
 - If, at the end of the review period, the stakeholder is not satisfied with Xeneca's proposed resolution, the stakeholder may make a written request to Xeneca to extend the review period in order to continue the discussion. If this request is not provided and/or the issue is unresolvable the stakeholder may make a written request to MOE for a Part II Order prior to the closing date of the review period. Such requests are to be compliant with requirements of the Class EA for Waterpower Projects as outlined in Section 8.6, Part II Order Provisions.
 - Once the proponent has met the requirements of the Waterpower Class EA and has resolved all outstanding issues raised during the formal review period, and satisfactorily addressed any Part II Order requirements (if filed), the proponent may file a Statement of Completion.

2. EXISTING CONDITIONS

This section provides a description of the existing environmental conditions in the proposed project area.

2.1 LOCATION AND LAND OWNERSHIP IN PROJECT AREA

For the purpose of this report, the project site includes the area where the majority of the civil works (i.e., dam, powerhouse) are proposed. The project footprint includes the project site, the affected areas upstream and downstream in the river, and ancillary components such as new access roads and to some extent, the connection line routes.

The proposed project is to be located at the Wanatango Falls site on the Frederick House River, approximately 26 km northwest of the Town of Iroquois Falls and 22 km south of Town of Cochrane (Figure 1). The site is located in the Township of Mann in the District of Cochrane. The approximate geographic coordinates for the site are (latitude, longitude): 48.8573°, -81.0675°.

The built structures associated with the Wanatango Falls GS will be located on provincial lands; as will be discussed in Section 3.1, the selection of the “high dam option” requires agreements with landowners due to the encroachment of the proposed headpond waters on private property. The “low dam option” headpond would only inundate Crown land.

2.2 EXISTING INFRASTRUCTURE

2.2.1 Water Control Structures and Water Management Plan

The Frederick House Lake Dam is located approximately 10 km upstream from the Wanatango Falls GS site. The dam is operated by Ontario Power Generation (OPG). Water level/flow manipulations at the Frederick House Lake Control Dam by OPG already significantly affect the levels and flows between the existing dam, the Wanatango Falls GS site, and beyond.

The operating regime for the Frederick House Lake Dam is established in the Water Management Plan (WMP) for the Abitibi River under the Ontario *Lakes and Rivers Improvement Act* (LRIA). Under the LRIA, facility operators are required to comply with the established operating regimes (i.e., required flows and levels).

Island Falls, owned and operated by H2O Power LP, is the next dam downstream in the watershed, located on the Abitibi River more than 100 km downstream of the proposed site of the Wanatango Falls GS. The lag time from the Wanatango site to Island Falls is approximately 15 hours under normal flow conditions (personal communication, H2O Power LP, July 2013).

2.2.2 Roads and Power Lines

An existing power line is located east of the site along the Highway 11 corridor (MNR SIP).

From the Town of Cochrane, the Wanatango Falls GS project site is accessible from roads travelling down the east or west side of the Frederick House River. The west side of the Frederick House River is accessible via the Dunn Lake Road located approximately 10 km west of

Cochrane off of Highway 11. The existing road condition was determined to be suitable for construction and operation traffic associated with the proposed facility.

The east side of the Frederick House River is accessible via the Newmarket Concession Road #5/6 (also known by the names Potter Station Road and Reaume Esker Road), a secondary year-round road located 29 km south of Cochrane, off Highway 11. On the east side of the river in the vicinity of the project site, a well-used former logging road travels south-east along the river, roughly 100 m back from the shore.

The Newmarket Concession Road #5/6 can also be used to access the west shore of the river, using the bridge at Zevery's Rapids (Zeverly's Bridge). There are existing logging roads on the west side of the river between Zevery's Bridge and the project site (approximately 500 m) that are no longer in use and are largely grown-over.

Zeverly's Bridge, a permanent vehicular crossing, owned by MNR, spans the Frederick House River roughly 500 m north of the proposed dam site. The bridge spans 40 m and has a width of 3.35 m. The bridge was observed to be in good condition and is rated to a maximum weight capacity of 35 tons.

Access road details are provided in Annex VI.

An existing power line is located east of the site along the Highway 11 corridor (MNR SIP). A new power line will be required to the Wanatango Falls GS site (see Section 3.3 for details).

2.3 TOPOGRAPHY

The general topography of the area is characterized by extensive low lying flats and poorly drained areas and slow flowing streams. The Frederick House River flows through a well-defined, narrow flood plain at the project site.

2.4 CLIMATE

In Northern Ontario, the climate is primarily continental, with cold winters and mild summers moderated by the effects of the Great Lakes. Most precipitation falls in the form of summer showers and thunderstorms; winter snowfall amounts can be significant. During the winter months, Northern Ontario can have prolonged periods of extreme cold.

For the Town of Cochrane, mean daily temperatures range from a high of 17.4 degrees Celsius (°C) in July to a low of -17.5°C in January. Mean maximum daily temperatures (mean of past 30 years) reach a peak in July of 24.2°C, with 38.9°C being the highest daily temperature on record. The mean minimum daily temperatures are reached in January (-23.9°C) with -44.2°C being the coldest day on record. Annual precipitation averages 831.3 millimetres (mm) with

rainfall accounting for 558.1 mm of that total. On average, July is the wettest month and February is the driest. (Canada's National Climate Archive, 2009).

2.5 OVERBURDEN GEOLOGY

The site is located in the northern Clay Belt and as a result gray luvisols and gleysols found on the clayey lacustrine and loamy tills are the dominant soils in the ecoregion. Poorly drained soil conditions also result in areas of muskeg, organic peat and black muck. Field investigations completed during the Stage 2 archaeological assessment encountered soils that were dominantly glaciolacustrine with clay being the dominant grain size. Local deposits of sand and some sandy soils were also encountered during the field investigations.

2.6 BEDROCK GEOLOGY

The Wanatango Falls GS project site is situated in the Abitibi greenstone belt of the Canadian Shield. Bedrock immediately surrounding the project site (within approximately 500 metres (m)) consists of the ultramafic intrusive rock dunite. Further out from the project site, bedrock is formed by mafic and intermediate volcanic rocks in addition to dunite. In the study area, the Frederick House River follows deposits of glacial till belonging to the Cochrane Formation. Approximately 50 m away from either bank of the river are coarse-grained glaciolacustrine deposits of the Barlow-Ojibway Formation.

2.7 HYDROGEOLOGY

A review of MOE's electronic well records database revealed there are no water well records within a 1-km radius of the project site (Accessed April 1, 2014) (MOE, 2014). There are privately owned lands along the waterway and therefore permanent or seasonal domestic water supplies that might draw from the Frederick House River.

The Town of Cochrane, approximately 22 km to the north of the project site, draws its water supply from three drilled wells ranging between 43 and 51 m in depth. The hydrogeology is conceptualized as consisting of three main hydrostratigraphic units, a silty clay aquitard, an upper sand aquifer, a lower sand and gravel aquifer all overlaying the Precambrian bedrock which functions as an aquitard underlying the region.

Information on groundwater in the area of the project may be provided through the investigative geotechnical holes that are to be drilled around the site during the project.

2.8 RIVER GEOMORPHOLOGY AND HYDROLOGY

The following information was sourced from existing background data and data collected during field investigations.

The Frederick House River originates from Night Hawk Lake and flows north for approximately 9 km to Frederick House Lake, whose outflows are controlled by the Frederick House Lake Dam. At the location of the proposed Wanatango Falls GS, approximately 10 km downstream of the Frederick House Lake Dam, the Frederick House River has a drainage area of 2,970 kilometres squared (km²). More than 75 km downstream of the Wanatango Falls GS site, the Frederick House River joins the Abitibi River.

Two notable rapids are located downstream of the proposed Wanatango Falls GS site on the Frederick House River, and are referenced throughout this report. The first, Zeverley's Rapids, is a 50-m long riffle section located approximately 600 m downstream of the project site; a bridge passes over the river at these rapids. The next notable rapids are Neeland's Rapids, approximately 24 km downstream of the Wanatango Falls GS site. Neeland's Rapids, spanning a total length of approximately 2.4 km, are characterized by four distinct moderate-gradient fast water sections separated by stretches of wide, slow-moving pools and runs.

The majority of the tributaries within the study area are relatively small, first or second order streams originating from surface run-off or wetlands. The only significant tributary input between the project site and Neeland's Rapids is the Wicklow River, whose confluence with the Frederick House River is located approximately 15 km downstream of the proposed Wanatango Falls GS site. The total incremental drainage area between the proposed location of the Wanatango Falls GS and Neeland's Rapids is estimated to be approximately 500 km², representing a 17% increase to the 2,970 km² drainage area at the project site.

The Frederick House River flows over the Northern Clay belt which results in muddy turbid water due to fine suspended clay particles within the water column (Seyler, 1997). The river channel is contained within a well-defined, narrow flood plain with bottom substrates consisting predominately of sand and clay. Bedrock outcrops located along significant faults are present within the Frederick House River. However, the overall gradient is more consistent than rivers located on the Canadian Shield.

The dominant landform at the proposed site of the Wanatango Falls GS is glaciolacustrine plain with clay and silt materials present, and the area is characterized by low local relief and dry drainage. The river channel at the general project location is characterized by an alternating sequence of long stretches of relatively flat water separated by short, steep reaches of exposed bedrock with rapid and turbulent flow.

The proposed site for the Wanatango Falls GS is located on one such bedrock reach. At this location, the river flow is split by a large island vegetated with coniferous trees, and both the river channel and the island are lined by boulders and exposed bedrock.

During field investigations, the river banks were examined for signs of erosion and bank instability. Overall they appeared to be stable. The results of a rapid geomorphic assessment also indicated that the channel is in a stable regime system. The rapid assessment included conducting reach-based synoptic survey and collection of detailed cross-section and sediment data to extend existing topographic data, and to assess potential sediment transport and bank erosion issues for the hydroelectric corridor.

Detailed information on the erosion potential assessment and the geomorphic assessment for the project site can be reviewed in Annex I.

2.8.1 Water Levels, Flow and Movement

The mean annual flow of the Frederick House River at the project site is approximately 33.2 cubic metres per second (m^3/s) based on simulated natural daily flow data from 1939 – 1994 (see the Hydrology Review by Hatch (2009) in Annex I of this ER).

Currently, flows in the Frederick House River at the Wanatango Falls GS site are controlled by OPG's Frederick House Lake Dam, located approximately 9 km upstream, which is operated to provide seasonal storage and flow regulation for the operation of waterpower facilities downstream on the Abitibi River. As a result, the Frederick House River below the OPG dam is subject to highly variable flows and water levels over the course of any given year.

Based on level logger data collected by Xeneca at 15-minute intervals downstream of the Frederick House Lake Dam, from October 2010 to August 2011, the average daily water level fluctuation was recorded as being 5 cm, with the maximum recorded daily water level fluctuation being 89 cm (see also the Water Level Fluctuation Analysis (CPL, 2012) in Annex I). The level logger data also indicated extended periods of time (multiple weeks) where no flow is released from the Frederick House Lake Dam.

Additionally, based on flow statistics provided to Xeneca by OPG for the Frederick House Lake Dam for the period 1994 to 2011, flows of near 0 m^3/s are released 27% of the time in a typical operating year (equivalent to 100 days per year) (see the April 16, 2013 letter to Cochrane District MNR in Appendix C). The timing of these zero flow releases vary from year to year, but were found to occur primarily between the end of March to the end of September. Due to seepage from the Frederick House Lake Dam and tributary input, flows at the proposed Wanatango Falls GS site are approximately 2 m^3/s when no flows are being released from the Frederick House Lake Dam. Further tributary input downstream of Wanatango Falls contributes another 2 m^3/s of flow before reaching Neeland's Rapids (24 km downstream), such that flows at Neeland's Rapids are estimated to be approximately 4 m^3/s during periods of zero flow releases from the Frederick House Lake Dam (or only seepage flows).

2.8.2 Surface Water Quality

Water quality and fish sampling was conducted at Xeneca Power Development's proposed hydroelectric facility at Wanatango Falls on the Frederick House River northwest of Iroquois Falls, Ontario. The sampling was conducted to describe the conditions of water quality and mercury concentrations in fish prior to hydroelectric facility development and serve as a temporal reference with which to compare post-development conditions.

2010 Studies

A preliminary surface water quality investigation was undertaken in 2010 to examine ambient characteristics of the waterway. Two sampling events (spring and summer) were conducted in 2010 at three different locations: two in the vicinity of Zevery's Bridge (approximately 500 m downstream of the proposed Wanatango Falls GS) and one approximately 8.5 km upstream of the Wanatango Falls GS. During the sampling events, general observation and characteristics of each sampling location was assessed and recorded (i.e. water level, current, color and odour).

The results were compared to the Provincial Water Quality Objectives (PWQO) to establish ambient water quality conditions in the vicinity of the proposed project location. The PWQO were established by the MOE in 1994. Under the *Ontario Water Resources Act*, the MOE has jurisdiction of all surface and ground waters in Ontario. The reader will note that several of the parameters subjected to analyses do not have a PWQO objective.

For the May 2010 sampling event, PWQO exceedances in aluminum, chromium, iron and total phosphorus were recorded at the sampling site near Zevery's Bridge, and the upstream sampling site recorded exceedances in aluminum, chromium and iron. The inverse was recorded during the July 2010 sampling event: the sampling site near Zevery's Bridge recorded exceedances in aluminum, chromium and iron, while the upstream sampling site recorded exceedances in the same three parameters as well as total phosphorus.

Results of the 2010 surface water sampling are provided in Annex IV.

2012-2013 Studies

A detailed investigation into surface water quality on the Frederick House River was developed subsequent to the release of the MOE's draft guidance document titled "From Class EA to Permit to Take Water: A Guide to Understanding the Ministry of the Environment's (MOE) Technical Requirements for Waterpower," (January, 2012) and subsequent discussions between Xeneca and the MOE. The following is a summary of the water quality studies conducted in 2012 and 2013, as reported in detail in the document, "Pre-Development Water Quality and Mercury in Fish Tissue", in Annex IV of this ER.

There is no provincial water quality monitoring network station on the Frederick House River. Generally, water quality in most Ontario Rivers is closely tied to the river's hydrograph. There are notable differences in water quality associated with the spring freshet, during the summer low-flow period, and during the late fall mid-flow period.

Predevelopment water quality samples were collected approximately 500 m downstream of the proposed facility (immediately upstream of Zeverley's Bridge) in the spring of 2012 and 2013. The baseline sampling location was selected as representative of existing water quality conditions both immediately downstream of the proposed facility, and in the proposed inundation area. Samples were collected during three periods; during the spring freshet, during the summer low flow period, and during fall increasing flows. The baseline water quality conditions ought to be similar to future water quality conditions at the future upstream reference site which will be located above the inundation area. The baseline water quality samples will provide a comparative benchmark against water quality in the project area after the development of the generating station. This will allow for an assessment of whether the project is affecting water quality both within the area of inundation and immediately downstream of the facility. No appreciable tributaries or inputs that would affect water quality between the facility and the future upstream reference site were identified. The post-development upstream reference point will be located below the Frederick House Lake Dam and, above the extent of inundation of the Wanatango Falls GS. Two other post-development sampling locations will be located as follows: one within the inundation area upstream of the dam, and one directly below the dam site.

The 2012 and 2013 baseline spring sampling events were completed on April 16, 2012 and May 16, 2013. The results indicated that the Frederick House River in the project area has good water quality, with some influences from urban and industrial developments located upstream. The results were consistent with rivers whose watersheds are located on glaciolacustrine deposits, and are naturally turbid as a result of mineral overburden erosion and in-channel sedimentation. Nutrient concentrations in the river are moderate. Dissolved oxygen was found to be high; water aeration from the upstream OPG dam may affect oxygen concentrations in the project area. Most metal concentrations were below PWQOs and the laboratory's detection limit, with the exception of aluminum and iron (all sampling events), copper and cobalt (all summer and fall events), silver and zirconium (summer 2012 only), and zirconium alone in the fall of 2013. Aluminum and iron were likely elevated as a result of naturally abundant metals sorbing to suspended solids in the river, which is a common occurrence in turbid waters.

Cobalt and copper concentrations above PWQO's in spring and summer may be from naturally occurring sources in the metals-rich Precambrian shield rocks upstream or residual impacts from upstream mining.

The high concentrations of silver and zirconium in the summer 2012 duplicate sample, and zirconium in the fall 2012 sample, may indicate mine-related impacts. Silver is abundant in the mine deposits around South Porcupine and Timmins but is otherwise rare in the environment,

and zirconium is used to prevent corrosion in industrial applications such as mine tailings processing, but it is very rare naturally.

The fluctuating nature of these metals should be taken into consideration during post-development monitoring when differences between natural variability and impacts of hydroelectric generation are assessed.

The seasonal trends in water quality at the facility were not typical of a remote northern Ontario river where suspended solids, organic carbon, metals and nutrients concentrations are highest during the spring freshet, lowest during the summer low flow and relatively high during increasing flow in late fall. In the Frederick House River, flows through the project area are currently controlled by the upstream OPG dam, and conditions likely reflect its operation and upstream natural and human-related variation. Water quality in the project area may be strongly controlled by the operating regimes of the OPG dam and its effects will have to be considered following development of the Wanatango Falls GS facility.

A detailed discussion of the 2012 and 2013 baseline analytical results, including spring, summer and fall sampling, is available for review in Annex IV (Pre-Development Water Quality and Mercury in Fish Tissue, Hutchinson Environmental Services Ltd., March 31, 2014).

Methyl Mercury

Mercury is naturally present in soils and rocks in Ontario and is enhanced by atmospheric deposition from human sources such as the combustion of coal and some mining related operations. Inundating land with water results in the partial release of inorganic mercury accumulated in the vegetation and soils. Decomposition of flooded organic matter in soils and vegetation enhances the methylation of mercury to the bioavailable and toxic form of methyl mercury. Mercury and methyl mercury may biomagnify within the food chain and can pose a health concern to humans. Mercury concentrations in fish may increase rapidly after impoundment and will decrease and stabilize in subsequent years. This cycle has been observed in experimental inundation in northern Ontario and in large-scale hydroelectric projects in Quebec and Northern Manitoba over the last 30 years, where mercury is also present in the soils and vegetation of impounded areas from natural and anthropogenic sources.

Large piscivorous fish tissue samples were obtained from Walleye and Sauger during field visits in 2011 and 2012, and analyzed to determine the existing level of total mercury in fish tissue in the Study Area (see Annexes III and IV). The results of total mercury concentrations for the project area and upstream of the OPG dam are summarized below:

Within the project area, the maximum concentration of total mercury in large fish was 0.48 µg/g (wet weight), the minimum was 0.12 µg/g and the median was 0.29 µg/g. Upstream of the OPG dam, the maximum concentration of total mercury in large fish was 0.49 µg/g, the minimum was

0.13 µg/g and the median was 0.24 µg/g, however the statistical power of the results is low due to the sample size (n = 5) and the results include two Saugers. If the results for only Walleye are considered, the maximum total mercury concentration remains 0.49 µg/g, the minimum increases to 0.21 µg/g and the median increases to 0.28 µg/g with reduced statistical power.

The MOE publishes fish consumption advisories for Ontario water bodies (“Guide to Eating Ontario Sport Fish,” 2013) recommend monthly consumption limits for sport fish. The methyl mercury threshold limits underlying the suggested consumption advisories are:

- 0.26 µg/g – for Sensitive Populations (i.e., children or women of child bearing age) monthly consumption restrictions suggested above this value.
- 0.52 µg/g – for Sensitive Populations no consumption suggested above this value.
- 0.61 µg/g – for the General Population, suggested consumption restriction above this value.
- 1.84 µg/g – for the General Population, no consumption suggested above this value.

The median values of large fish under the existing conditions for the Project area and upstream of OPG dam are slightly above the ‘monthly consumption’ restriction for the Sensitive Population. The highest concentrations at both locations are below the ‘no consumption’ restriction for Sensitive Population. The median values are not inconsistent with the wide range of existing condition baseline values documented on other rivers by Xeneca (i.e. Blanche River - 0.16 µg/g, Vermillion River – 0.18 µg/g, Ivanhoe River – 0.57 µg/g, and Kapuskasing River – 0.90 µg/g).

2.9 ECOLOGY

The background information and records review on the existing natural heritage of the project area was supplemented by data collected from other sources including existing reports, mapping, and occurrence records. Aquatic habitat and terrestrial habitat investigations in support of the proposed generating station project were launched in 2010 to supplement the information provided by the MNR. A copy of the SIP provided by the MNR is located in Appendix A.

2.9.1 Study Area

The study area for field investigations was defined based on the area of impact as it was understood at the initiation of the project. The study area is larger than the project footprint and the actual ZOI. In 2010, at the early stages of the EA, it was predicted that variable outflows from the Wanatango Falls GS would only extend 400 m downstream and as such the extent of field investigations in 2010 were developed around that preliminary estimate. In early 2011, following the refinement of engineering details, the predicted length of the variable flow reach was extended to 2 km downstream of the facility. Afterwards, the downstream limit of impacts was placed at a point 24 km downstream of the proposed Wanatango Falls GS (the end of the downstream zone of influence, as will be discussed in Section 7.1), an additional reconnaissance

trip to characterize aquatic and wetland habitat was completed in July 2012 and extended to the crest of Sankey Rapids, approximately 33 km downstream of Wanatango Falls.

Additionally, dynamic hydrological modeling has determined that inundation and water level fluctuations for the high-dam option (worst-case scenario) may be experienced up to 8.6 km above the proposed facility (previously estimated to be 8.2 km). Field work conducted in 2011 and early 2012 were carried out based on that revised extent. Therefore, the study area determined for natural heritage investigations encompassed the following areas:

- Footprint of the proposed built structures (water control structures, powerhouse, tailrace, etc.). Descriptions of the proposed generating station components themselves are provided in further detail in Section 3.2;
- Proposed inundation area (discussed in Section 5.1);
- Downstream zone of influence (discussed in Section 7.1);
- Temporary construction areas (discussed in Section 4.2);
- Access roads (proposed new roads, temporary roads and existing roads requiring upgrades) (discussed in Section 3.3.1);
- Power line route (discussed in Section 3.3.2).

Inundation Area, Built Structures and Downstream Zone of Influence

Table 1 provides a summary of the aquatic and terrestrial field surveys completed to date within the proposed spatial limits of the inundation area, the footprint of the proposed built structures, and the downstream zone of influence. In addition, an additional 120 m beyond the spatial limits of the areas of impact were also assessed.

Table 1: Summary of Ecological Field Studies Within the Proposed Inundation Area, Footprint of Built Structures and Downstream Zone of Influence

	Ecological Study	2010	2011	2012	2013
Aquatic	Fish Community Surveys	√	√		
	Riverine Index Netting (RIN) Sampling		√		
	Walleye Spawning Surveys	√	√	√	
	Lake Sturgeon Spawning Surveys	√		√	
	Northern Pike Spawning Surveys		√		
	Fish Passage Study		√		
	Mercury Fish Tissue Analysis		√	√	
	Fish Habitat Characterization		√	√	
	Benthic Macroinvertebrate Sampling		√		
Terrestrial	Breeding Bird Surveys	√			
	Incidental Wildlife Surveys	√	√	√	
	Vegetation Community Assessments	√		√	√

Power Line Routes

Comprehensive study on the proposed power lines and access routes was carried out by three separate consulting firms and included examination of a 500 m corridor along the line and road routes. For power line routing, three separate corridors were originally proposed and all three were studied in detail, however, two of the options were ultimately abandoned due to issues in obtaining agreements for the required point of connection. Study included database mapping of pertinent heritage and land values within 2 km of the proposed routes, to assess potential impacts. Habitat mapping and environmental values identification were completed using high resolution ortho-photography. To refine mapping and values assessments consultations were held with local SFL holders. Ground truthing surveys were completed to determine the condition of existing roads and water crossings, and to assess the requirement for upgrades. Provincially significant wetlands in the areas of the proposed route were assessed using a rapid assessment technique. Information on district-level heritage values was obtained from MNR. To determine the locations of potential habitats for SAR, ELC assessment was performed along a 600 m corridor of the proposed lines and routes.

Access Roads and Construction Areas

The proposed new access roads (temporary and permanent), the existing roads requiring upgrades and the proposed construction areas were surveyed for species at risk, wetlands and other important ecosystems, significant wildlife habitat, and other valued ecosystem components. Species lists for vascular plants, mammals, birds, reptiles and amphibians were compiled. Targeted surveys for species at risk known to inhabit the study area were conducted. All observations were georeferenced.

The detailed findings of the natural habitat investigations are provided in Annex III of this document. A brief summary of the findings are presented below.

2.9.2 Terrestrial Habitat and Species - Inundation Area, Dam Footprint and Downstream Reaches within ZOI

Vegetation

Results of the vegetation community delineation were separated into communities identified within the upstream zone of inundation and the downstream ZOI.

The study area is dominated by a black spruce forest community, interspersed with a few tributary-related wetlands. Within 120 m of the proposed development activities and resulting inundation area, there are a total of four vegetation communities (one forest and three wetland communities):

- Black Spruce-Pine Conifer-Moist, Fine
- Mineral Thicket Swamp
- Mineral Meadow Marsh
- Mineral Shallow Marsh

Within the downstream ZOI, four small marsh features were characterized during the July 2012 reconnaissance trip downstream of Zeverly's Landing.

- Wetland 1 - Mineral Meadow Marsh
- Wetland 2 - Mineral Meadow Marsh
- Wetland 3 - Mineral Shallow Marsh
- Wetland 4 - Mineral Meadow Marsh

No significant vegetation species are known to exist in the study area. Two riparian vegetation communities were identified including Mineral Meadow Marsh (B 142N) and Mineral Shallow Marsh (B 148 N). Two wetlands were represented by Mineral Meadow Marsh (B 142 N), and these were situated within the downstream study area 600 m downstream of Zeverly's Rapids along the east bank, and two kilometers downstream of Zeverly's Rapids. For Mineral Shallow

Marsh (B 148 N), these areas were found approximately 7 km downstream of Zevery's Rapids on the west side of the river, and at a point 22 km downstream.

Birds

A total of 109 bird species were observed within the study area during site investigations in 2010, 2011 and 2012. A total of 61 bird species were observed during morning breeding bird surveys on June 18 and July 9, 2010. Of these species, 36 species demonstrated possible breeding evidence, while 21 species demonstrated probable breeding evidence. Only six species, American robin (*Turdus migratorius*), spotted sandpiper (*Actitis macularia*), bald eagle (*Haliaeetus leucocephalus*), mallard (*Anas platyrhynchos*), American black duck (*Anas rubripes*) and hooded merganser (*Lophodytes cucullatus*), were confirmed breeding within the study area based on confirmed breeding evidence. The remaining 46 species were observed without any breeding evidence.

The OBBA (BSC et al. 2010) identified eight significant bird species from the vicinity of the study area, Black Tern (*Chlidonias niger*), Canada Warbler (*Cardellina canadensis*), Olive-sided Warbler (*Contopus cooperi*), Short-eared Owl (*Asio flammeus*), Common Nighthawk (*Chordeiles minor*), Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyx oryzivorus*) and Rusty Blackbird (*Euphagus carolinus*).

During field surveys conducted in 2010, 2011 and 2012, two significant bird species, Bald Eagle (*Haliaeetus leucocephalus*) and Canada Warbler (*Cardellina canadensis*), were observed within the study area.

Herpetofauna

Seven species of herpetofauna are known to occur within the vicinity of the study area. Spring and summer field work has confirmed the presence of the eastern garter snake (*Thamnophis sirtalis sirtalis*), American toad (*Bufo americanus*), spring peeper (*Pseudacris crucifer*) and wood frog (*Rana sylvatica*). No herpetofaunal species at risk were observed during field visits.

Mammals

A total of thirty-two (32) mammal species have been identified as being potentially present within the project area. Evidence of fifteen species was observed during field visits, all of which are common species with secure populations within Ontario, such as the black bear (*Ursus americanus*), moose (*Alces alces*) and beaver (*Castor canadensis*).

While evidence of River Otters (*Lontra canadensis*), Gray Wolves (*Canis lupus*), Mink (*Mustela vison*), Canada Lynx (*Lynx canadensis*) and a Black Bear were noted, observations or evidence of Marten or Fishers were not documented. A Canada Lynx was observed crossing the river approximately 1.6 km downstream from the Frederick House River Dam upstream limit of the

study in July 2012. Evidence of wolves were observed within the study area in 2010, 2011 and 2012.

No significant mammal species were observed by biologists during site investigations. Two SAR mammal species, the Northern Myotis (*Myotis septentrionalis*) and Little Brown Myotis (*Myotis lucifugus*), may be present within the project area according to the Ontario Mammal Atlas. No other significant mammal species have been identified within the project area.

Insects

During the reconnaissance trip in July 2012, EA team biologists made incidental observations of four odonate species: Lake Darner (*Aeshna eremita*), Ashy Clubtail (*Gomphus lividus*), Ebony Jewelwing (*Calopteryx maculate*) and River Jewelwing (*Calopteryx aequabilis*) as well as an unidentified Bluet species (*Enallagma* spp.). A single species of butterfly, the Atlantis Fritillary (*Speyeria atlantis*), was observed within the study area. One species of bumblebee was also observed (*Bombus vagans*). No insect species of conservation concern were identified within the project area. For a full description of the results of the 2010-2012 terrestrial ecological assessment, including complete lists of all documented species and assessment methods, please refer to the Natural Environment Characterization and Impact Assessment Report which is appended to this document as Annex III.

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2.9.3 Terrestrial Habitat and Species - Lines and Roads Corridors

A detailed description of the considered routes for the power lines and access roads required as ancillary components of the proposed Wantango Falls GS facility are described in Section 3.3 of this document. In total, 3 options were investigated for development of power lines (see Figure 3). These options were further subdivided into 5 distinct sections for further analysis.

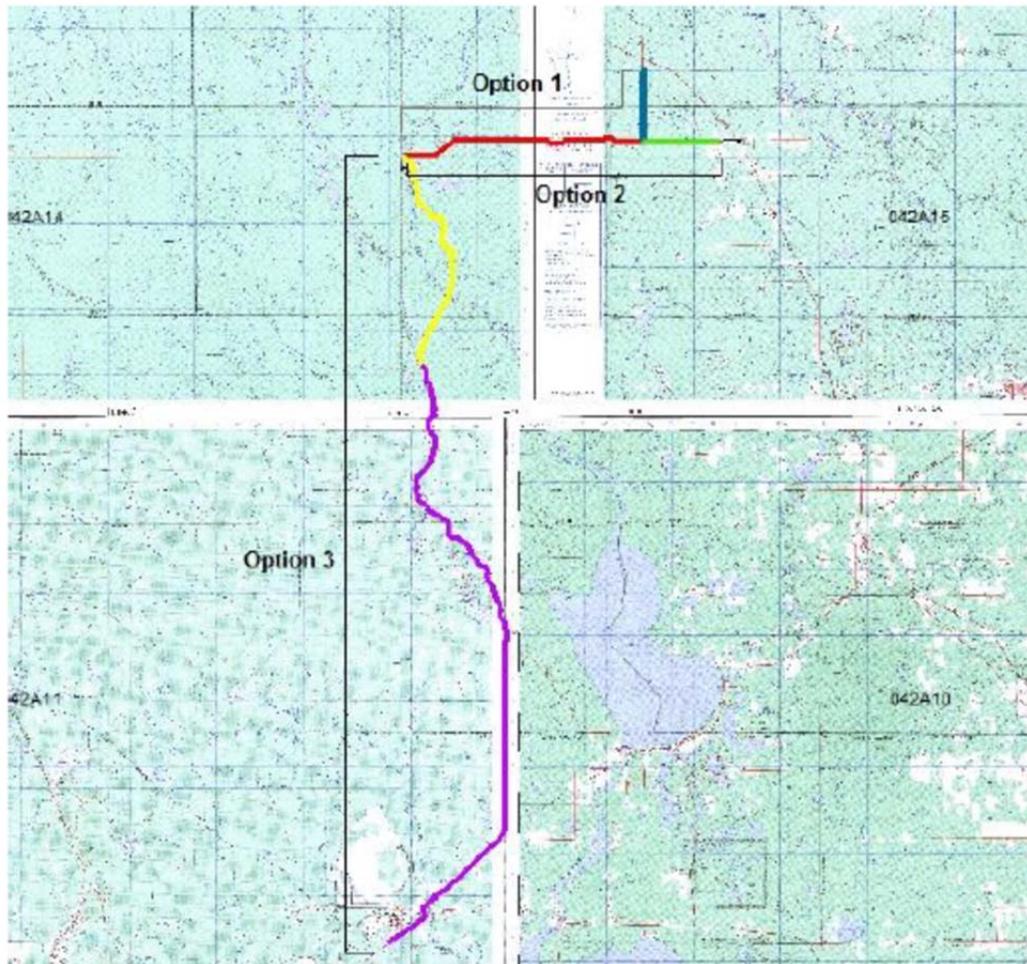


Figure 3: Options for Power Line Development. (Note: through three options were previously considered for the power line development, only the route marked as 'Option 3' is currently being pursued.)

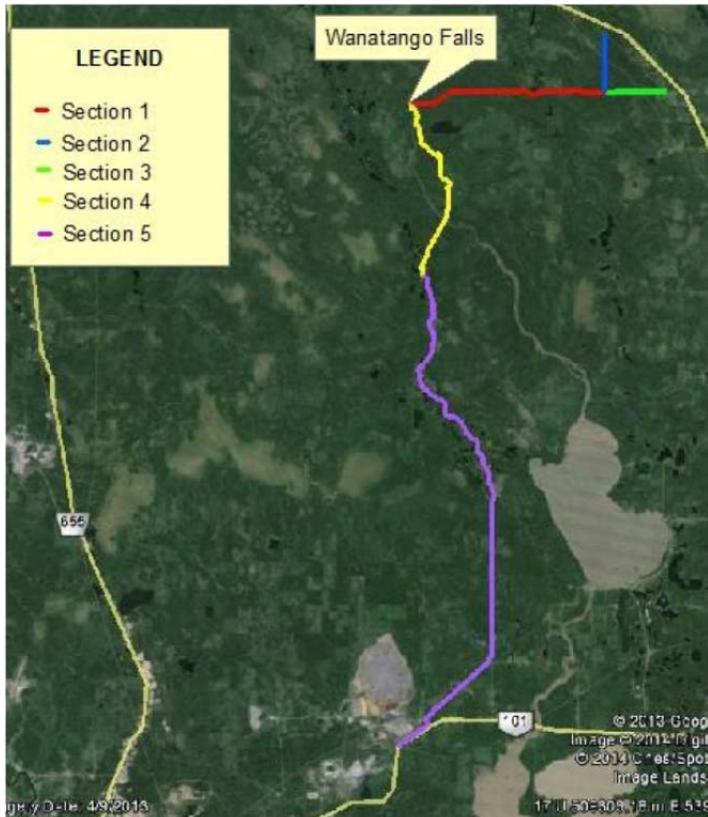


Figure 4: Ground-truth Surveys of Potential Power Line Corridors (Note: Sections 4 and 5 represent the preferred route for the power line corridor).

Please refer to Figure 4 which illustrates the three optional routes that were considered and the five distinct sections that were analyzed for road/power corridor development.

Most of the proposed Wanatango Falls road and project footprint development area is dominated by aspen-birch hardwood (Ecosite B088) and spruce-fir conifer (Ecosite B085) stands. Cedar dominated conifer stands (Ecosite B084) are common adjacent to the river with shrub dominated communities (Ecosite B080) common on seasonally flooded areas along the river banks, while adjacent areas support very large white spruce stands. Jackpine-black spruce conifer (Ecosite B012) stands occur on scattered bedrock outcrops, these stands have very low productivity, with very little understory and thick feathermoss communities.

In the vicinity of the road development areas, forests along the east bank of the river are relatively mature with little sign of historical logging. Upland areas on the west side of the river have all been logged within the last 40 years and are in varying states of regeneration, with cut stumps and old logging roads prevalent. Much of the forest east of the river is estimated to be about 70 years old.

Understory vegetation communities are typical of the region with bunchberry, Canada mayflower, dwarf raspberry, bluebead lily and feathermosses occurring on most sites. Canada yew is found near the river and is abundant in places. Shrub habitats along the shoreline support diverse vegetation communities very different from those in the adjacent forests including ostrich fern, joe-pye weed, and water avens. Black ash occurs incidentally along the shorelines.

Wetlands in the study area for the line and road corridors are predominantly large wetland complexes consisting mostly of Black Spruce swamps on organic soils. Marshes are also present, mostly on Beaver-influenced streams. Fens are found in basins isolated from contact with stream water. Bogs were not observed, but possibly misclassified as fen in the FRI and in the present study. A total of 12 wetlands were classified as provincially significant. For more information on the assessment of wetlands within the lines and roads power area, please refer to Appendix IV, Subsection 6, Wetlands Rapid Assessment, April 2013.

The line and road corridor areas within 500 m of the proposed roads and power lines are primarily composed of Trembling Aspen dominated mixedwood forests on deep clay soils. Black Spruce becomes the dominant species in lower areas and White Cedar dominated conifer stands are common adjacent to the river. Forests along the east bank of the river are estimated to be about 70 years old with little sign of historical logging. Upland areas on the west side of the river have all been logged within the last 40 years and are in varying states of regeneration, with cut stumps and old logging roads prevalent. Wetland habitat is uncommon in the study area. There are no rare vegetation communities within the study area.

Vegetation - Options 1 and 2

The first 11.4 km of both options 1 and 2 of the proposed power line route are located along the Reaume Esker Road, an existing maintained gravel road (Section 1 as referred to in Figure 4, above). On either side of the road in a 3 m wide corridor, early succession and mid-succession vegetation present is associated with a Black Spruce and Speckled Alder swamp. Three separate wetlands are located in this area. The remainder of Section 1 passes through swamp habitat, a wetland (referred to as Wetland 1), two permanent streams, a logged area, an additional stream, swamp habitat, and a clearcut area.

Section 2 includes a gravel access road that is located within a Black Spruce/Speckled Alder swamp habitat. Specific roadside features include two distinct stream channels, wetland habitats which intersect Marie Esker Road, stream intersections, a natural gas pipeline, a marsh wetland (beaver pond) with an active beaver lodge, and another hydro line corridor.

Section 3 includes a portion of the Newmarket Concession Road 5/6, which passes through a Black Spruce and Alder swamp habitat. After the first 2.1 km, the road passes through a mixedwood forest habitat. Specific features include a roadside wetland habitat containing a permanent stream, an unused forest access road, the Tunis Power Plant connecting to a natural

gas pipeline, a small permanent stream, agricultural fields and rural housing, another hydro corridor, and the Wicklow River. At the eastern extent of the proposed power line route, an existing hydro line runs along the southern shoulder of the road and connects with the main line.

Vegetation - Option 3

Approximately 35.2 km of the proposed option 3 route coincides with existing roads. The remaining 8.4 km of the proposed route will be located in undisturbed or not recently disturbed mixedwood habitat, with the exception of a wetland crossing at Wetland 7.

Section 4 of the Option 3 northern route includes the northernmost 11.5 km of route before the route joins up with existing roadways. A total of 6 major wetlands were located within 500 m of the Section 4 route. The first 190 m of the option 3 route runs along the Frederick House River through the edge of a mixedwood forest. The next 4.1 km is dominated by a mixedwood forest with dense canopy closure and understory vegetation that includes Balsam Fir and Balsam Poplar.

Other features along the Option 3 route include wetlands, a natural clearing, a woodland stream, open natural forest with early succession shrubs, an existing access road that is overgrown with vegetation, a Speckled Alder swamp with Black Spruce and Tamarack, and a man-made clearing. At 7.2 km from Wanatango Falls, all access routes converge into a dense, undisturbed mixedwood forest that contains a woodland stream. The proposed power line route crosses the Frederick House River 7.2 km downriver of the proposed dam site. At this location, the river is approximately 50 m wide and the forest is Black Spruce direct to the river's edge.

The southern portion of Option 3 (referred to as Section 5) comprises the southern 32.1 km of the preferred Option 3 route and coincides with existing maintained roads (24.9 km gravel, and 7.2 km paved). The existing forest habitat is mixedwood forest. A total of four major wetlands were located within 500 m of the road corridor.

The Wanatango 7 wetland intersects the proposed route 13.9 km from Wanatango Falls where a marsh habitat is present with a large open stream channel that is surrounded by Black Spruce. Approximately 15.5 km from Wanatango Falls, the same wetland intersects the proposed route. Here, the wetland is a small stream that passes through a culvert under the existing roadway. The same wetland again intersects the proposed route 16.2 km from Wanatango Falls. Here the habitat is a small stream on the west side of the road which turns into a large open-water marsh on the east side of the road, interconnected by a metal culvert. The proposed route also runs within 20 m of a small lake, and within 10 m of Ice Chest Road. An existing hydro line runs along the eastern shoulder of Ice Chest Lake Road.

A wetland (referred to as Wetland 5) intersects the proposed power line route twice at 28.3 and 29.7 km from Wanatango Falls before the route opens to a natural clearing comprised of herbaceous species and low shrubs. Beyond the clearing, the route passes through a Black Spruce swamp. At 32.3 km before Wanatango Falls, the route again intersects Wetland 5 at a location where narrow-leaved and broad-leaved shrubs and Black Spruce dominate. Further along, the proposed route passes within close proximity of two residences, an aggregate pit, a residential roadway and a hydro line, and runs parallel to a railroad for 3.6 km. The proposed route passes over the Porcupine River 40.9 km from Wanatango Falls, then veers east and follows the Highway for the remaining 2.1 km. Habitat along this portion of the route is primarily industrial and residential development interspersed with natural forest. The proposed Option 3 route ends at a power corridor that runs east-west and intersects Highway 101 43.6 km from Wanatango Falls.

Birds

A total of 30 species of birds was observed in the lines and roads corridor studies, the most common of which were Red-eyed Vireo, Ovenbird, and Swainson's Thrush. Canada Warbler, a forest-nesting bird species at risk, was discovered in the study area and several bird species at risk have been documented nearby.

Wildlife

Eight mammal species were documented during 2013 fieldwork. An active beaver dam is present on the tributary west of the river and cuttings were commonly observed. Other furbearers such as marten, red fox, lynx, mink and river otter, are common in the surrounding forest management unit (ARFMI 2012) and no doubt inhabit the study area. No small mammal trapping was completed but several species of mice, voles, and shrews probably occur in the study area. Moose, deer and woodland caribou are present within the study area, which falls within Wildlife Management Unit 30 which is part of Cervid Ecological Zone B. Wolf, black bear and lynx also occur within the study area. Moose is the predominant ungulate in the area. White-tailed Deer are uncommon and localized and Woodland Caribou formerly occurred in the area. Grey Wolf, Canada Lynx and Black Bear also inhabit the area.

Suitable habitats for Little Brown Myotis and Northern Myotis, both SAR, are known to occur in the area, although no individuals were found. Use of maternal trees was not documented, but suitable snag trees are present in the study area. No caves or abandoned mines (potential hibernacula) are known to occur within 1 km of any proposed activities. Bats may use the Frederick House River as foraging habitat.

With the exception of bat maternity colonies, no other significant wildlife habitats are present within the study area.

The Wanatango Falls area is within the Kesagami Range for Woodland Caribou. Although there are apparently no recent caribou sightings in the area and little or no suitable caribou habitat, the impacts of the proposed project may need to be assessed at the range level.

2.9.4 Aquatic Habitat and Species

Aquatic resource information was collected during the 2010, 2011 and 2012 field seasons. This work included characterization of aquatic habitat, benthic invertebrate surveys and a variety of fish surveys. Details of these surveys are presented in Annex III.

Habitats within the Frederick House River have been characterized from 8.6 km upstream of the proposed GS to 24 km downstream at Neeland's Rapids, consistent with the study area that was delineated by Xeneca. Habitat characterization could not be completed in the river immediately below Frederick House Lake Dam as due to access restrictions. This habitat was characterized through aerial imagery and observations made at a distance. The value of each habitat was determined through field surveys such as spawning surveys (egg mats, presence/absence), fish community sampling (RIN, electrofishing in tributaries), benthic invertebrate sampling (Hester-Dendy plates), habitat characterization and vegetation surveys.

A total of seventeen (17) fish species were documented during the 2010 field studies. In 2011, an additional eight (8) species were documented. In 2012, an additional one (1) species was documented. Below is a list of the species documented during the field studies:

- Lake Sturgeon (Southern Hudson Bay - James Bay population) *Acipenser fulvescens* Pop.2
- Longnose Sucker (*Catostomus catostomus*)
- White Sucker (*Catostomus commersoni*)
- Northern Redbelly Dace (*Chrosomus eos*)
- Lake Cisco (*Coregonus artedii*)
- Lake Whitefish (*Coregonus clupeaformis*)
- Mottled Sculpin (*Cottus bairdi*)
- Brook Stickleback (*Culaea inconstans*)
- Northern Pike (*Esox lucius*)
- Goldeye (*Hiodon alosoides*)
- Mooneye (*Hiodon tergisus*)
- Pumpkinseed (*Lepomis gibbosus*)
- Burbot (*Lota lota*)
- Shorthead Redhorse (*Moxostoma macrolepidotum*)
- Blacknose Shiner (*Notropis heterolepis*)
- Emerald Shiner (*Notropis atherinoides*)
- Spottail Shiner (*Notropis hudsonius*)
- Mimic Shiner (*Notropis volucellus*)

- Yellow Perch (*Perca flavescens*)
- Logperch (*Percina caprodes*)
- Trout-perch (*Percopsis omiscomaycus*)
- Longnose Dace (*Rhinichthys cataractae*)
- Sauger (*Sander canadensis*)
- Saugeye (*Sander canadensis x Sander vitreus*)
- Walleye (*Sander vitreus*)
- Creek Chub (*Semotilus atromaculatus*)

For the study area as a whole, the documented fish community to date includes twenty-six (26) fish species representing ten (10) families. The presence of twenty-six (26) species is indicative of a diverse fish community with a range of feeding and temperature preferences. This allows the existing fish community to function as a self-sustaining ecosystem.

Within the identified fish community, only Lake Sturgeon is listed as a SC both provincially and federally. The remainder are relatively common and widely distributed across Ontario. A total of five (5) Lake Sturgeon were captured in May 2012: four (4) upstream and one (1) downstream of the Wanatango Falls GS site. In July, 2012 the Cochrane District MNR conducted additional Lake Sturgeon sampling above Wanatango Falls and captured eleven (11) Lake Sturgeon in total. Included in these fish were the three (3) captured and tagged in the spring, as well as one (1) fish that had been tagged below Neeland's Rapids in 2009 (C. Chenier pers. comm., 2012).

Based on available background information, an additional six (6) fish species are known to exist in the area. These species are relatively common and widely distributed in Ontario:

- Brown Bullhead (*Ameiurus nebulosus*)
- Rock Bass (*Ambloplites rupestris*)
- Golden Shiner (*Notemigonus crysoleucas*)
- Johnny Darter (*Etheostoma nigrum*)
- Iowa Darter (*Etheostoma exile*)
- Brook Trout (*Salvelinus fontinalis*)

For a full description of the results of the 2010 - 2012 aquatic field investigations, including complete lists of all documented species and assessment methods, the reader is directed to the Natural Environment Characterization and Impact Assessment Report which is appended to this document as Annex III. Below is a brief summary of the findings in selected areas.

Proposed Inundation Area

Immediately downstream of the Frederick House Lake Dam, within the proposed inundation area (Figure 5), a bedrock feature is present. This feature may represent potential spawning habitat for Walleye, Shorthead Redhorse and Lake Sturgeon.



Figure 5: Frederick House Lake Dam

Approximately 8.5 km upstream of the proposed Wanatango GS, a large riffle is present that could provide potential spawning habitat for Walleye, Shorthead Redhorse, and Lake Sturgeon. The riffle has a bankfull width of 55 m and a length of 25 m during low flows. At the base of this riffle, a 3 m deep pool is situated. The pool substrate is predominantly sand, and presents potential spawning habitat for Goldeye and Mooneye, and foraging habitat for Shorthead Redhorse, Lake Sturgeon and other bottom-feeding species.

Approximately 8.2 km upstream of the proposed Wanatango GS, a series of three riffles/fast water is present and extend for approximately 300 m. These features are composed predominantly of bedrock, boulder, cobble and gravel. These features present potential spawning habitats for Walleye, Shorthead Redhorse and Lake Sturgeon.

Another riffle/pool combination with a 65 m in length riffle is situated downstream of the aforementioned habitat. This habitat presents potential additional spawning habitat and foraging habitat (pool habitat).



Figure 6: Fastwater Feature 8.1 km Upstream of Proposed Dam Site

Approximately 8.1 km upstream of the proposed Wanatango Falls GS, an additional riffle section (bankfill width 45 m). Portions of the riffle are dry and protruding from the water creating an island at low flows, and under high water conditions, the entire area is submerged presenting a riffle section that is located within the center of the river with a deeper channel on either side. Potential spawning habitat for Walleye, Shorthead Redhorse and Lake Sturgeon are located here.

Downstream of this riffle section a backwater area is present creating potential spawning habitat for Goldeye and Mooneye, as well as, potential foraging habitat for Shorthead Redhorse and Lake Sturgeon. Within this area, aquatic vegetation was observed with a combination of encrusting and filamentous algae.

The site of the proposed Wanatango Falls GS, at Wanatango Falls proper, is located 550 m downstream of a small vegetated island. A bedrock ledge, 1.5 m in height, extends from the vegetated island to the western bank. During low flow conditions most of the bedrock ledge is exposed with numerous small chutes present across its width. During bankfull conditions the entire bedrock ledge is submerged. The substrates on the western side of the island and the chute feature are dominated by sheer bedrock.

The east side of the island is characterized by a narrow channel approximately 5 m in width. Along the east side of the island, extensive riffle habitat is present and presents potential spawning habitat for Walleye, Shorthead Redhorse and Lake Sturgeon. At the base of Wanatango Falls, a 20 m x 20 m pool was observed with a predominantly bedrock substrate. This pool presents potential spawning habitat for Goldeye and Mooneye, as well as foraging habitat for Walleye and other predatory fish species.



Figure 7: Islands Upstream of Dam Site

Directly downstream of these features a second small bedrock island was located where the majority of the river flows is directed toward the west side of the river. During periods of higher water levels, flow passes over the island. A large back water eddy was present along the east side downstream of the bedrock chutes. A large, deep pool was located between the proposed dam site and the above-mentioned islands.

With exception to the upstream areas already described, the remainder of the inundation area has a relatively uniform channel width averaging 55 to 60 m wide. The substrate types include sands, clays, and relatively fine material. Some emergent aquatic vegetation is present along the sandy shorelines (common arrowhead, curly white water crawfoot and green-fruited bur-reed), and along the west side of the river, a small back-bay wetland (mineral shallow marsh) is situated which has limited connectivity to the river channel through a narrow channel. Along the eastern shoreline, two additional mineral shallow marshes are present and provide habitat for species that spawn in submergent and emergent vegetation.

Proposed Wanatango Falls GS Location

The proposed Wanatango Falls GS location falls within a 300 m section of alternating riffle and pool habitat, each with varying substrates and flow patterns, and divided by several large bedrock islands into two defined channels. An 80 metre long riffle channel is situated along the eastern channel. The constant flow within this riffle section and the substrate composition (cobble and boulder) make this riffle section a potential spawning location for Walleye, Redhorse spp. (*Moxostoma* sp.), Sucker spp. (*Catostomus* sp.) and Lake Sturgeon. A 120 m long additional riffle section is situated downstream of a river meander and provides additional fish spawning habitat primarily composed of boulder and bedrock. Just below this riffle, a large pool section (52 x 20 m) marks the end of the eastern channel where it forms a confluence with the western channel. Only aquatic vegetation (algae) was observed on the bedrock and boulders.



Figure 8: Dam Site, East Bypass Channel and West Channel Falls Facing Upstream

The western channel, which is composed of a series of small riffles and pools, is dominated by bedrock with deposits of boulder and cobble. This riffle section does not present a potentially significant spawning habitat since flows and substrates are not optimal.



Figure 9: Falls in West Channel at Dam Site

During periods of high water levels a secondary overflow channel was present along the west bank. The downstream end of this channel contains a short narrow riffle which joined in the above mentioned riffle. Further downstream of this riffle is a pool and small back water area.

Downstream of this pool, the western channel was further divided into two channels with steep bedrock banks. The westernmost of these channels contains a 55 m long riffle with mixed substrates that may provide spawning habitat for Walleye, Shorthead Redhorse, and Lake Sturgeon. The eastern side-channel is partially braided and may provide potential spawning habitat. However, high flow rates within this riffle section may make less than ideal spawning habitat.

A slowly-flowing pool followed by a combination riffle-pool segment with bedrock chute was situated downstream of the western channel. The riffle habitat upstream of the chute does not present potential fish spawning habitat because of the potential obstacle to fish migration that the chute presents.

Downstream Study Area

Where the western and eastern channels converge, immediately downstream of the proposed Wanatango Falls GS location, a scoured bedrock pool is present. Below this, a series of pool, run and riffle sections are present. The riffle section during high flow periods may create potential spawning habitat for Walleye, Shorthead Redhorse, and Lake Sturgeon.



Figure 10: Zevery Bridge and Rapids

Zeverly's Rapids

Approximately 0.6 km below the proposed Wanatango Falls GS location, Zeverly's Rapids is present. This feature was a 50 m riffle section ranging in width from 6 m at low flows to 32 m at bankfull. The flow through this riffle section was highly variable ranging from very slow flow over bedrock outcroppings on the upstream side of the bridge to very high flow where the channel narrows to a bedrock chute at the downstream side of the riffle. Though the substrates and flow rates within the chute feature do not present spawning habitat the boulder and cobble deposits upstream within the riffle do present potential spawning habitat for Walleye, Shorthead Redhorse and Lake Sturgeon. Potential spawning habitat may occur during periods of high flow along the eastern side of the bedrock chute as there are pockets of bedrock and smaller substrates present.

Immediately downstream of the scoured bedrock of Zeverly's Rapids, a large pool (100 m x 125 m wide in spring conditions) was present. Downstream of the rapids, a mineral meadow marsh is located, which during high flows likely provides spawning habitat for species such as Northern Pike.



Figure 11: Facing Downstream from Zeverly Bridge

Approximately 1.45 km downstream of Zeverly's Rapids is a pinch point followed by a pool feature. Bedrock is the primary substrate at this location. The MNR have determined this to be the overwintering area for local Lake Sturgeon. Substrates along the edge of the pool were cobble and boulders. Though the substrates at the pinch point do not present spawning habitat, the pool may provide feeding and staging location for numerous different species.

A wetland located approximately 2 km downstream of Zeverly's Rapids is noted. Two active beaver dams were observed at this location. Due to the change in elevation, it was noted that there is no connectivity to the main river channel and therefore, no accessible spawning habitat.

A mineral shallow marsh was noted 4.8 km downstream of Zeverly's Rapids. This marsh was noted to be connected to the river during high flow and likely provides spawning habitat for species including Northern Pike.

The river exhibits fairly uniform substrate and depth characteristics for approximately 16.8 km downstream of the pinch point area. Some shallow river areas and islands are documented within this stretch of river.

Neeland's Rapids

Neeland's Rapids is located 24 km downstream of the proposed Wanatango Falls GS and was composed of four fast water sections separated by stretches of wide, slow-moving pools and runs that together, stretch for approximately 2.4 km. This feature offers cobble, boulder and gravel substrates that are suitable for spawning for a variety of fish species including Walleye, Sauger, and Lake Sturgeon, as well as a significant area for benthic production. A small island is present on the west bank, and at this location fish stranding may occur at low flows. Below this feature,

on the western bank, a 2.5 m high section of bedrock exists where backwater flooding has potential for fish stranding during low flows.



Figure 12: Facing Downstream at Neeland's Rapids

Complex habitat in the form of riffles, rapids, pools and backwater areas begin approximately 120 m downstream from the first fast water section and from here water flows around a large bedrock island 70 m long by 17 m wide. The main flow is directed around the west side of the island. Water levels on the eastern side of the island are very low and may form small channels through scoured bedrock and rubble, or small standing pools. Certain areas of the rapids provide potential for fish stranding during summer low flows. At the bottom of Neeland's Rapids, a large pool feature provides refuge for species during the summer months and may also act as a staging area for spawning species.

Tributaries

Within the study area, a total of twenty-nine tributaries drain into the Frederickhouse River, and were assessed for fish habitat. Six of these tributaries are located upstream of the proposed Wanatango Falls GS (within the proposed headpond area) and the remaining 22 are located downstream of the proposed site (within the downstream ZOI). One tributary was downstream of the ZOI. Within the inundation area, tributaries showed very little connection to the river, appeared to be dry or were not anticipated to experience the effects of inundation, or were not assessed. Detailed habitat characterization, fish community data and impacts have been included in Sections 3.2.1.4, 3.2.2, 6.2.2.2, 6.2.3.2 and 6.2.5.2 of the Natural Environment Characterization and Impact Assessment Report (Annex III).

2.9.5 Species At Risk and Species of Conservation Concern

The project team has compiled a list of significant species from background review and direct field observation. In the scope of this EA, a species is considered significant if:

- 1) They are a Species at Risk (SAR); i.e. they are listed as Endangered or Threatened within Ontario, and are thereby warranted legislative protection under the *Endangered Species Act (ESA)*;
- 2) They are a Species of Conservation Concern (SCC); i.e. they are known to have sensitive populations, being:
 - a. Designated as Special Concern within Ontario;
 - b. Assigned a conservation status (S-Rank) of S1 to S3 or SH; and/or
 - c. Designated as Threatened or Endangered by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) federally, *but not provincially* by the MNR.

Table 2 provides a list of Species at Risk and Species of Conservation Concern that were identified through a review of background information and observed during field surveys. No SAR (provincially Threatened or Endangered species) were observed within the study area.

Table 2: Species at Risk and Species of Conservation Concern known to Occur in the Study Area (proposed inundation area, construction areas, footprint of built structures and access roads) (NRSI, 2014 and Northern Bioscience, 2014; see Annex III)

Species	S-Rank (NHIC 2010)	Listing under COSEWIC (2012)	Species at Risk in Ontario (SARO) list (MNR 2013)	Suitable habitat in the study area (Yes/No)	Observed during EA field studies (Yes/No)
Common Nighthawk (<i>Chordeiles minor</i>)	S4B	T	SC	Yes	No
Peregrine falcon (<i>Falco peregrinus anatum/tundrius</i>)	S3B	SC	THR	No	No
Chimney Swift (<i>Chaetura pelagic</i>)	S4B	T	THR	Yes	No
Bobolink (<i>Dolichonyx oryzivorus</i>)	S4B	T	THR	No	No
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	S4B	T	SC	Yes	No
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	S4B	NAR	SC	Yes	Yes
Canada Warbler (<i>Wilsonia canadensis</i>)	S4B	T	SC	Yes	Yes
Bank Swallow (<i>Riparia riparia</i>)	S4B	T		Yes	No
Short-eared owl (<i>Asio flammeus</i>)	S2N, S4B	SC	SC	No	No
Rusty blackbird (<i>Euphagus carolinus</i>)	S4B	SC	NAR	Yes	No
Barn Swallow (<i>Hirundo rustica</i>)	S4B	T	THR	No	No
Black Tern (<i>Chlidonias niger</i>)	S3B	NAR	SC	Yes	No
Eastern Wood-Pewee (<i>Contopus virens</i>)		SC		Yes	No
Little Brown Myotis (<i>Myotis lucifugus</i>)	S5	E	END	Yes	No
Northern Myotis (<i>Myotis septentrionalis</i>)	S3?	E	END	Yes	No
Lake Sturgeon (Southern Hudson Bay – James Bay) (<i>Acipenser fluvescens</i>)	S3	SC	SC	Yes	Yes
Goldeye (<i>Hiodon alosoides</i>)	S3			Yes	Yes

Legend

S2 – Imperiled
 S3 – Vulnerable
 S4 – Apparently Secure
 END/E – Endangered
 THR/T – Threatened
 SC – Special Concern
 NAR – Not at Risk

The proposed site for the Wanatango Falls GS also falls within the south end of the Kesagami Range for Woodland Caribou (*Rangifer tarandus caribou*). However, in the vicinity of the proposed Wanatango Falls GS site, there have been no known recent sightings of caribou, and little or no suitable caribou habitat (Northern Bioscience, 2014, in Annex III).

2.9.6 Significant Wildlife Habitats

Significant Wildlife Habitat (SWH) is designated using criteria from the Significant Wildlife Habitat Technical Guide (OMNR, 2000), and can be categorized into one of four broad categories:

- Seasonal Concentration Areas of Animals
- Rare Vegetation Communities or Specialized Habitat for Wildlife
- Habitat for Species of Conservation Concern (recall the criteria for such species in Section 2.9.6)
- Animal Movement Corridors

A combination of screening exercises and field investigations were conducted in order to identify SWH that may be present in the footprint of built structures and the hydrologic Zone of Influence (see NRSI, 2014 in Annex III) and the construction areas and access roads (see Northern Bioscience, 2014 in Annex III). The findings are summarized in the sections below.

Significant Wildlife Habitat – Footprint of Built Structures and Newly Inundated Lands

Based on the evaluations completed to date, the following confirmed significant wildlife habitats exist within the proposed footprint of the built structures and the inundation area of the Wanatango Falls GS;

- Otter Denning Sites;
- Bald Eagle Nesting, Foraging and perching Habitat; and
- Canada Warbler Nesting and Foraging Habitat.

Bald eagles have been confirmed as nesting at the upstream extent of the proposed inundation area, and foraging and perching along the river has been documented for the same general vicinity.

SWH was identified for otter denning both upstream and downstream of the proposed site of the Wanatango Falls GS. Although no den sites were directly observed, denning is assumed to occur as groups of otters, including juveniles, were observed during field visits.

An adult male Canada warbler (Species of Conservation Concern) was recorded singing during breeding bird surveys in 2010. The singing was recorded within the Black Spruce – Pine Conifer Forest (B114), a vegetation community found along the west side of the Frederick House River

along the proposed inundation area. This vegetation community was therefore identified as SWH for this species.

Significant Wildlife Habitat – Access Roads and Construction Areas

The following SWH were identified as being potentially present or confirmed present within the proposed construction areas and access roads.

Seasonal Concentration Areas of Animals:

- Bat Maternity Colonies (Possible)

Specialized Habitat for Wildlife:

- Waterfowl Nesting Area (Possible)
- Bald eagle and osprey nesting habitat (Possible)
- Woodland raptor nesting habitat (Probable)
- Seeps and springs (Confirmed)
- Aquatic feeding habitat (Possible)
- Denning sites for Mink, Otter, Gray wolf, Eastern Wolf, Canada Lynx, Marten, Fisher and Black Bear (Possible)
- Rendezvous sites (Possible)
- Amphibian Breeding Habitat – Wetlands (Possible)
- Amphibian Breeding Habitat – Woodlands (Confirmed)

Habitat of Species of Conservation Concern:

- Special Concern and Rare Wildlife Species – Canada Warbler (Confirmed)

Animal Movement Corridors:

- Amphibian Movement Corridors (Possible)
- Cervid Movement Corridors (Present)
- Furbearer Movement Corridors (Possible)

2.9.7 Valued Ecosystem Components

The term Valued Ecosystem Component (VEC) is being utilized to identify species that are not considered SAR but are nonetheless of importance for reasons such as recreation, sustenance or sensitivity. Within the Wanatango Falls GS study area, the VECs were identified by MNR in 2010, and are limited to fish species:

- Walleye

- Sauger
- Northern Pike
- Lake sturgeon

Walleye, Sauger and Northern Pike are widely sought after in recreational fishing, and Lake Sturgeon is designated as a Species of Conservation Concern. These four VECs are discussed further in the sections below.

While Brook Trout have been identified as being present in the Frederick House River (Seyler, 1997) and have potential to be considered VECs, they have not been captured in the study area. The record of Brook Trout indicates that its distribution of resident communities is mainly in tributary streams with occasional residence in the main channel. The migrating community is not anticipated to be present within the Frederick House River. Ongoing study by local MNR district is underway to learn more about the migration patterns of the sea run Brook Trout community within the Moose River Basin.

Walleye

Walleye are a predatory fish species with broad distribution covering much of the eastern United States and central Canada. Found in both lakes and rivers, they are tolerant of a broad range of environmental conditions. Walleye is a widely sought-after recreational and subsistence fishery, and is often considered the finest freshwater foodfish. It may also be the most economically valuable fish species in Canadian inland waters.

Field studies conducted indicate that resident populations of Walleye occur both upstream and downstream of Zevery's Rapids and Wanatango Falls. The area from Zevery's Rapids to Wanatango Falls contains three areas of boulder/cobble/gravel that represent potential spawning habitat. Additional areas of potential spawning habitat are present in the proposed inundation area upstream of Wanatango Falls.

Sauger

Sauger bears similarities to Walleye in terms of feeding and spawning habitat but has slower growth and may be less adaptable. They do however usually succeed over Walleye in very turbid waters. Sauger spawn during a 2-week period in the spring, often immediately after Walleye spawning. The two (2) species are known to hybridize in natural settings. Within the Frederick House River, Sauger are limited to portions of the river falling within the Clay Belt. During the field studies, Sauger were captured both upstream and downstream of Wanatango Falls. The area from Zevery's Landing to Wanatango Falls contains three areas of boulder/cobble/gravel that represent potential spawning habitat. Additional areas of potential spawning habitat are present in the proposed inundation area upstream of Wanatango Falls.

Northern Pike

Northern Pike on the Frederick House River represent a VEC as they are a targeted species for recreational and subsistence fishing. Northern Pike spawn in the spring over aquatic vegetation and seasonally inundated vegetation such as the marshes and wetland found throughout the project area (both upstream and downstream of the proposed project location). The west side of the island immediately downstream of Zevery's Landing is another potential spawning area for Northern Pike. During field studies in the spring of 2011, Northern Pike were captured downstream of the proposed dam site.

Lake Sturgeon

The Lake Sturgeon is a large bodied, long lived fish and has low adult mortality (Houston, 1987). It is a bottom feeder that has a highly variable diet.

Lake Sturgeon have a long life cycle that is characterized by a normal onset of sexual maturity occurring at 12 to 20 years for males and 20 to 30 years for females (Houston, 1987), and a typical life span of approximately 50 to 80 years (Scott and Crossman, 1973). Between spawning events, dispersion and migration may range from localized movement of less than 5 km (Threader and Brousseau, 1986) to much larger migrations between foraging, over-wintering and spawning habitat (Sandilands, 1987). Migration for spawning purposes can involve travel up river on the order of 200 to 400 km (Kempinger, 1988; Vladykov, 1955).

Lake Sturgeon typically spawn over cobble and boulder substrates in swift flowing water 0.3 to 6 m deep (Scott and Crossman 1973, Threader et al 1998). Other studies have documented spawning in waters 9 to 12 m deep (Manny and Kennedy 2002). They are broadcast spawners, and have adhesive eggs that will adhere to many surfaces. It is important that spawning take place over prime substrates as the eggs will remain where they first adhere throughout the incubation period (Scott and Crossman 1973, Threader et al 1998). Substrates should be larger than 15 cm in diameter and be free of silt and algae. It is common for Lake Sturgeon to spawn at the downstream end of impassable barriers and dams in water depths of 1 to 5 m (Auer 1982).

The timing of Lake Sturgeon spawning is highly dependent on water temperature and separate runs may occur within a season as temperatures fluctuate. Optimal spawning temperatures are reported to be in the range of 14 to 16°C (Auer 1982, Kempinger 1988, Auer 1996), although spawning activity may occur anywhere in the range of 8.5 to 18°C (Scott and Crossman 1973, Harkness 1923; Nichols et al. 2003). It is also important to note that spawning occurs at intervals measured in years, occurring every 4 to 6 years in females and every 2 to 3 years in males (Harkness and Dymond, 1961; Scott and Crossman 1973; Kempinger, 1988).

In 2012 Lake Sturgeon were captured in the spring above Wanatango Falls proper indicating that Lake Sturgeon have migrated above Zevery's Landing. Additional sampling targeting Lake Sturgeon was conducted in July 2012 by the Cochrane MNR, which also resulted in the capture of Lake Sturgeon. One of the Lake Sturgeon captured by the MNR had been tagged in 2009 below Neeland's Rapids which shows Lake Sturgeon are able to pass through Zevery's Landing, the proposed GS site and Wanatango Falls proper.

Lake Sturgeon present above Wanatango Falls may utilize the fast water features upstream, including immediately below the Frederickhouse Lake Dam, to spawn. They may also migrate past Zevery's Landing to spawn.

2.10 ARCHAEOLOGICAL SITES

2.10.1 Project Footprint

Stage 1 and Stage 2 Archaeological Assessments were completed for the proposed project by to gain an understanding of the cultural heritage and archaeological potential of the area. The completed Stage 1 and 2 reports and noted correspondence are appended in Annex V. A summary of key findings is presented below.

The location of the proposed project at Wanatango Falls, as with most sites with waterpower potential, was determined during the Stage 1 assessment to have high archaeological potential due to its proximity to a major water source and the existence of rapids. In the past, rapids would have required river travellers to go around the rapids by means of a portage. It is therefore reasonable to assume that a portage trail exists at this location on one or both sides of the river.

A Stage 1 (desktop study) archaeological and cultural heritage assessment was carried out by Woodland Heritage Services for the proposed hydro development. Areas of archaeological potential were identified within the project area during the study.

Stage 2 field investigations were completed in August 2011. The Stage 2 assessment involved conducting test-pit surveys at all areas with confirmed archaeological potential. Subsurface testing and surface inspection resulted in the recovery of artifacts and the identification of three pre-contact archaeological sites: Wanatango Falls 1 (DfHg-1), Wanatango Falls 2 (DfHg-2), and Chert Beach (DeHg-3). All three sites have been registered with the MTCS and are now protected under the Ontario *Heritage Act*.

Due to the lack of Stage 2 identified diagnostic artifacts and features at each of the above noted sites, conclusions could not be drawn with respect to the age and cultural affiliation of the three sites. A Stage 3 Assessment was recommended at each site due to the potential for disturbance (and potential requirement for mitigation), the lack of comparable sites and general lack of knowledge about small pre-contact sites in the watershed.

The MTCS provided a partial clearance for the construction at Wanatango Falls GS in a letter written to Xeneca on August 12, 2013. They indicated that the ministry concurs with the conclusion that construction prior to the Stage 3 assessment will not affect the archaeological sites, as more than 300 m separate these sites from the proposed construction areas. Xeneca intends to comply with this letter and will proceed with the Stage 3 work (and, where necessary, Stage 4 work) in the spring of 2015. This work has not yet been completed.

2.10.2 Marine Archaeology - Wanatango Falls, Frederick House River

The following opinion has been formulated by Dr. John Pollock, a registered Ontario archaeologist (P016) responsible for conducting the Stage 1 and 2 archaeological research at Xeneca's Wanatango Falls project on the Frederick House River. Based upon recent direction from MTCS, licensed archaeologists who have been directly involved in the archaeological background research of a subject area can provide an opinion about the necessity for a marine archaeology assessment.

The background research did not reveal that this section of the Frederick House River has any significant historical ties. While the river was certainly used for travel by fur traders and First Nations peoples, the particular characteristics of the Wanatango falls and rapids would have required portaging around the rapids. The falls and rapids are in bedrock in which the water falls steeply and includes vertical drops.

Archaeological surveys were undertaken to locate the west side former historic portage at Wanatango as marked on early maps, but no definitive on ground evidence of the former portages was recorded. The original portage obviously has not been used in the past fifty years or more.

There is no historical evidence or evidence provided during public consultation of significant local historical events at this location. There are no historical plaques or previous archaeological studies. Consultation with First Nations and local community open houses did not raise any specific information about the Wanatango project that would indicate marine archaeological resources are present.

There are no visible indications of any early settlements on the Frederick House River at this location. There are no monuments, trails, structures, foundations, fences, historic roads or rail corridors.

There is no evidence for early industrial use for this stretch of the Frederick House River. There are no mill foundations, early bridge pilings or other features to suggest early historical use of the area.

The archaeological assessment did find evidence for pre-contact archaeological resources along this stretch of river. Three pre-contact sites were located but these are not beside the rapids or falls. While without doubt that Native people have been using this stretch of river since the beginning of time, no evidence for activities at the falls/rapids were encountered and in fact the location of the pre-contact sites suggest that the portage was used to bypass the falls and rapids on land.

Based upon the above information, the potential for marine archaeological resources on the Frederick House River at Wanatango Falls is low and that a marine archaeology assessment is not required.

2.10.3 Roads, Power Lines and Laydown Areas

A Stage 1 and 2 archaeological assessment of roads, power lines, and laydown areas was completed by Woodland Heritage Services and the final report was submitted to Xeneca on May 7, 2014.

Roads

The areas of proposed road development are short sections extending from the existing roads, one heading east from the southwest trending road, and one heading west from the southeast trending road; this area also includes a proposed powerhouse and powerhouse yard, as well as temporary laydown areas and a stockpile area. Both the east and west access are old logging roads, with gentle slopes and extensive existing disturbances. On the west side, one area with high archaeological potential was identified along a small creek crossing. Test pitting was undertaken in this area with no findings. For areas closer to the river, evaluation of both the east and west sides did not identify any high potential areas due to the steep slopes and rugged terrain in these areas. It was determined that no further archaeological assessment for the roads component is required.

Power Line

The bulk of the power line is planned to follow existing roads north to just northeast of Little Lake in Little Township where then it will travel overland 3.8 km to the northeast, connecting with the southern extent of an existing forest access road. During this leg, it will cross the Frederick House River. It will then follow this road north and west where it will then branch off the road and travel overland to the north then west where it crosses over a gully hosting a wetland with saturated soils.

Two areas of archaeological potential were located as result of the Stage 1 assessment of the proposed power line. One is associated with Flint Creek, and the other with an unknown creek to the north. It was recommended that both of these areas be assessed in a Stage 2 archaeological resource assessment.

The Stage 2 Report included inspection of 11 separate areas which included stream crossings where open water channels were present, and wetland areas. Area 1, the Porcupine River crossing, was used as a travel route in the past and some areas of archeological potential were identified. Area 5 was identified as a potential area due to its proximity to neighbouring lakes. Area 9 represented a potential area because of the power line crossing over the Frederick House River, however this area was already assessed as part of the previous Stage 2 assessment work. Areas 10 and 11 include two creeks; Flint Creek and an unnamed Creek were identified as having archaeological potential. None of the other power line areas inspected were identified as having potential. No archaeological finds were made during the Stage 2 assessment and no further study was recommended.

It was also recommended that if previously undisturbed areas are required for the development of the power line along the already existing roads **outside** the disturbed road ROW in high potential areas, then additional (new) Stage 2 assessment work should also be undertaken in these areas.

2.11 BUILDINGS AND STRUCTURES

The proposed undertaking would be located in a remote area with no existing road access or infrastructure. During the Stage 2 archaeological field assessment no evidence of any standing cabins, ruins or former cabins or other heritage features were found. Therefore, it was concluded that there were no built heritage resources present in the project area. Cultural Heritage Landscapes.

As no build heritage structures were encountered and the area is a remote natural area, there were no cultural heritage landscape issues identified.

Current Land and Water Use

2.11.1 Land Use/Land Policies

The majority of the study area lies on Crown land, with the only exception being the upstream end of the proposed inundation area, where private land exists. Impacts to upstream and downstream land owners/resource users have been identified and consultation efforts completed as directed by the OWA Waterpower Class EA. Moreover, agreements with private landowners, required for inundation requirements, are either completed or in the final negotiation stage.

The development area is situated in the Crown land area known as the Southern Resource Area (G1745), a 1,243,127 ha general use area extending through the Cochrane, Kirkland Lake, Timmins and Hearst Districts. Forestry is the predominant land use activity in the Southern resource Area, with commercial tourism and recreational activities including hunting, fishing and snowmobiling identified as land use objectives. According to MNR's Crown Land Use Atlas Policy report the land use priorities in this area are forest management and mineral exploration

and development. Recreation will also be encouraged in a manner that maintains a minimum of conflict with resource use/extraction activities (MNR, 2006).

Commercial activities allowed on Crown land in proximity to the project include aggregate extraction (generally not permitted in shoreline areas), bait fishing, commercial fur harvesting, commercial hydro development, timber harvesting, commercial tourism, mineral exploration and development, peat extraction and wild rice harvesting. Crown land can be disposed of for road development and maintenance, rural residential use, agricultural use and cottaging purposes (MNR, 2006).

Municipal planning controls are in effect for portions of this area around the Towns of Iroquois Falls, Smooth Rock Falls and Cochrane. Land use in these areas will conform to these controls (MNR, 2006). Xeneca will work with MNR and local stakeholders to determine if, and where, existing uses of the land (trails, roads etc.) may be impacted. Xeneca will work to ensure impacts are avoided or mitigated.

2.11.2 Access

The Wanatango Falls GS site is accessible via the Newmarket Concession Road 5 & 6, and by trails leading from this road running along both sides of the river. Newmarket Concession Road crosses the Frederick House approximately 500 m downstream (north) of the proposed Wanatango Falls GS site, at Zevery's Rapids. The MNR-owned bridge crossing (also called Zevery's Bridge) spans 40 m and has a width of 3.35 m. The bridge is rated to a maximum weight capacity of 35 tons; the structure was observed to be in good condition.

2.11.3 Recreation Use and Commercial Tourism

The Ministry of Natural Resources Site Information Package (SIP) noted that the project area and the surrounding area are valued for snowmobiling, hunting and fishing (Appendix A). Similarly, the Abitibi Forest Management Plan (FMP) lists ample recreational opportunities such as canoeing, fishing and camping to exist in the immediate area. The area both upstream and downstream of the project site on the Frederick House River is included within the FMP.

Tourism is one of the top economic driving forces of the Northeast region and communities that are within and adjacent to Abitibi River Forest. The Ministry of Tourism and Culture (MTC) gathered statistical data concerning the economic impact of tourism on the region of the Abitibi River Forest (MTC Census Division 56: Cochrane District). In 2008, 663,000 visitors to the Cochrane District tourism area accounted for \$98.6 million in visitor expenditures. This spending generated \$59.3 million in direct and indirect contributions to gross domestic product (GDP), generating \$35.6 million in labour income and salaries and 998 part-time, full-time and seasonal jobs. Total taxes generated as a result of visitor spending in the Cochrane census division reached \$32.3 million including \$183,000 in municipal taxes (Ontario Ministry of Tourism 2008).

The quality of fishing and hunting is regarded as the most common reason for resource-based travel followed by tranquility and solitude. Other outdoor activities such as trapping, camping, canoeing and snowmobiling are specified as important recreational uses of the general area. All these activities benefit local suppliers of outdoor recreation equipment as well as local hotels, motels, restaurants, outfitters, and businesses.

Xeneca remains committed to working with recreational and tourism users to minimize impacts and achieve potential benefits.

2.11.4 Cottaging

The proposed Wanatango Falls GS site is located about 10 km downstream of the existing OPG Frederick House Lake Dam. The Nighthawk Lake Cottagers Association (NLCA), which represents the cottaging community located on Nighthawk Lake, which is located upstream of the OPG dam above Frederick House Lake. Correspondence between the proponent and NLCA has confirmed that the proposed Xeneca project will not have any effects on the operation and water level of the Frederick House Dam, the Frederick House Lake River or Nighthawk Lake. There are several private recreational properties located downstream of the proposed dam site. Xeneca has corresponded with these property owners regarding project impacts and required authorizations have been obtained with all but one landowner. Discussions are continuing with this landowner.

2.11.5 Snowmobiling

Snowmobiling is an important winter outdoor activity for local residents and tourists in the area. The network of trails in the area is a major tourist attraction, which again greatly contributes to the local economy.

The area around the proposed Wanatango Falls project is located within the Ontario Federation of Snowmobile Club (OFSC)'s District 15. The Northern Corridor Du Nord Snowmobile Association (District 15), situated in Northeastern Ontario along Highway 11 between Cochrane and Hornepayne, is a member of the OFSC. The snowmobile association is managed by a volunteer board of directors.

The project location is south of the 33.6 km OFSC loop trail (L103) and falls under direct supervision of the Polar Bear Riders Club. This club operates and maintains a network of about 450 km's of groomed snowmobile trails surrounding the town of Cochrane, Ontario. This pathway (L 103) is utilized and maintained by the OFSC; existing arrangements with the Sustainable Forestry Licensee ensure unrestricted safe use of the corridor during the winter months.

The Jackpine Snowmobile Club of Iroquois Falls is an additional Club in the broader area.

No known issues regarding snowmobiling or trail use have been identified in regards to the Wanatango project.

2.11.6 Boating/ Kayaking/ Canoeing

The SIP for the site provided by the MNR mentions that it is not known if this section of the Frederick House River is used as a canoe route. However, during a discussion with stakeholders during a Wanatango Falls PIC held in June 2012, it was noted that there was occasional use of the falls for canoeing/kayaking. Appropriate measures (signage etc) will be undertaken by Xeneca to ensure safety for recreational users of the river. Further, Xeneca will ensure a bypass portage route will be created and maintained to re-establish continuity of access between the areas upstream and downstream of the project.

2.11.7 Camping

There are existing hiking trails that run along both sides of the river and serve as access to several camps located between Wanatango Falls and Zeverly's Bridge.

2.11.8 Area Aesthetics

Although the general Wanatango Falls project area has been relatively undeveloped, it has been used for many years by residents of the region for various recreation activities and nature appreciation. The river and falls have an aesthetic value with local residents and recreational users. Discussions with tourists and recreational users, comment forms from Public Information Centres, as well as stakeholder e-mails and input have assisted in determining the frequency and intensity of use of the natural resource at the Wanatango Falls site.

Extensive planning and consultation has been done to plan the Project in a manner that is minimally visually intrusive and retains as many of the existing aesthetic features as possible. Xeneca proposes mitigation measures that include a fishway that could potentially attract visitors. Moreover, Xeneca is committed to working together with stakeholders and agencies to enhance recreational amenities, by preserving the area aesthetics, as well as improved road access, potential boat launches area, picnic shelters, interpretive signage, etc. Further detail on the fishway is provided in Section 3.2.7.

With respect to commercial/tourism related economic impacts, it is Xeneca's opinion that the project will not significantly affect the aesthetics, fishery or tourism at the site and, in fact, may be enhanced with the above mentioned improvements to road access, boat launch, parking etc.

2.11.9 Navigation

The Frederick House River is navigable by small watercrafts, but is not formally listed as “scheduled” navigable water under the *Navigation Protection Act* and is therefore not subject to the provisions of the Act. The rapids along Wanatango Falls proper present a possible barrier to navigation for some watercrafts, however there are hiking/ATV trails running along the downstream shoreline. A boat launch, accessible by ATV is also located just upstream of the dam site.

2.11.10 Mining/ Mineral/ Aggregate Extraction

Mineral extraction and development as well as aggregate extraction are permitted uses in the Southern Resource Extraction Area. The area is reported to have a generally high potential for occurrences of base metals (MNR, 2005a).

Two private aggregate pits are located on the Dunn Road. Both pits are licensed to M.J. Labelle Co. Ltd (#11669 & #11717). M.J. Labelle Co. Ltd. also has another licensed pit approximately 4.7 km Northwest of the Dunn Road (#44756).

Three aggregate pits are located 20 kilometers north of the project site. These include the following:

1. C Villeneuve is listed as the permit holder for site 11669, located at the beginning of the Dunn road. It is permitted for 100,000 tons / year with licensed area of 31.4 ha.
2. M.J. Labelle Co. Ltd 44756, located approximately 4.7 km North West of the Dunn Road. It has an unlimited yearly tonnage with a small licensed area of 6.2 ha.
3. M.J. Labelle Co. Ltd 11717, located at the beginning of the Dunn road. It has limited tonnage up to 3,000 tons / year with licensed area of 11.5 ha.

An OPG site is located south of the Wanatango GS project site (ID 6368) with a licensed area of 4.4 ha and a permit for extraction of 10,000 tons/year.

Custom Concrete (Northern) has a stationary concrete batching plant located in Cochrane & Iroquois Falls as well as five portable batching plants and 30 concrete batching trucks.

According to Debicki (2010), several mining claims exist near the project site, one of which is within one kilometre of the dam.

According to the MNM CLAIMaps website, there are several active mining claims (#1154612, #1154613, #1154614, #1190501, #1154618, #1154617, and #1154616) near the site location mainly claimed by one holder with whom Xeneca has entered into information sharing and other discussions.

Two mining claims, both south and north of site location, are being explored by Tres-Or Resources Ltd. for nickel, copper and platinum group elements (PGE). All mining claims are registered until at least 2014.

As of 2008, the surface rights of an area along the Wanatango Falls location were withdrawn from prospecting, staking out, sale or lease in accordance with the terms of Order No. W-P-04/08, under Section 35 of the *Mining Act*. The area was withdrawn from mining activities by the MNR as the proposed site for the Wanatango Falls waterpower project including a dam and generating station. The site will be subject to long-term waterpower lease agreement via the *Public Lands Act*.

One condition of the lease will be that fencing, signage, warning devices and gates shall be located on the dam site within the Crown Lease area to ensure that access to Crown land is not restricted. Signage that is not located on Crown Lease requires a land use permit. The current roads, trails, and water crossings must remain usable and accessible by the public.

2.11.11 Hunting

Hunting is a popular recreational activity practiced by many local residents and some non-residents in this area. The MNR has identified the Frederick House River and surrounding area as valued area for hunting and fishing. Easier access through numerous forest roads in the general area helps recreational users access hunting of large game species (Crown Atlas Policy report). Big game (moose and black bear), small game (ruffed grouse, spruce grouse and snowshoe hare) and waterfowl (ducks and geese) are commonly hunted in the area. All areas of the province have been divided into geographically distinct Wildlife Management Units (WMUs) for the purposes of managing wildlife populations. There is one WMU in the study area, WMU 30. Open hunting seasons for the various wildlife species potentially hunted in the site vicinity are provided below:

Table 3: Hunting Season Dates

Species Open	Hunting Season
Black Bear	August 15 – October 31
Moose	Archery: September 20 – October 5
	Gun: October 11 – November 15
Grouse	September 15 – December 31
Weasel	October 25 – end of February
Red Fox	September 15 – end of February
Snowshoe Hare	September 1 – June 15
Deer	Archery: September 1 – September 15
	Gun: October 11 – November 15

In order to manage black bear populations and provide resident and nonresident hunting opportunities, Crown Land areas known as Bear Management Areas (BMAs) are assigned to commercial camp owners for the purposes of providing bear hunting services. Resident hunters may hunt wherever there is an open season, provided they have a valid license and game seal for use in that specific WMU in which they are hunting. There are two BMAs located within the study area (CC-30-011 and CC-30-016) (see the SIP in Appendix A).

Game species have large territorial ranges and though they do have regular interaction with aquatic habitats (for water, consumption of aquatic species, and cooling), they tend to use different habitats at different times of the year and move around to find the best food and cover available to them. Xeneca's operations are not expected to have a significant impact on hunting activities since hunters are able to target these species in other locations near the project site.

2.11.12 Fishing

The Frederick House River is a tributary to the Moose River and lies within the Moose River basin. It originates in Night Hawk Lake and flows north approximately 9 km to Frederick House Lake.

Fishing is noted to be a significant recreational activity in the area (MNR SIP). Members of the angling community noted their use of the hiking trail system (used during the snow-free season) along the east side of the river during the March 24, 2011 Public Information Centre (PIC). The majority of anglers in the general area are local residents fishing both upstream and downstream of the project location and virtually all angling is road-based. Pickerel (Walleye) and Northern pike are the preferred sport species in the study area according to PIC surveys.

Although the MNR does not compile statistics associated with fishing or most outdoor recreational activities, an economic study conducted by Engel Consulting Groups for the MNR in 2003 estimated that the actual expenditures per person per day for fishing (for non-lodge, non-remote based fishing) were \$95.43, with a willingness to pay estimate of \$28.35, resulting in a total economic value of \$123.78 per day or \$146.58 in 2012 dollars.

Xeneca has consulted with members of the angling community and any commercial operators using the site and no outstanding issues have been identified. The proponent has also agreed to compensate the community and/or operator if demonstrated losses due to plant construction and/or operation are provided.

2.11.13 Trapping and Baitfish Harvesting

Commercial trapping of fur bearing animals and baitfish harvesting are both identified as important recreational and employment activities within the project area. There are no known trapping or baitfish cabins present within the project's zone of influence. One baitfish license (CO 2249) overlaps with the project area, but the specific baitfish harvesting area is not

known, and two trap lines (CC033, CC044) overlap with the project area. The Frederick House River forms the boundary between the two trap lines CC033 and CC044. (NRSI, 2014 Natural Environment Impact Assessment and Characterization Report). All Crown land open for trapping in the province has a registered trapline system to control trapping. Each trapline represents a specific geographical area, in which the holder of the trapline licence is allowed to conduct trapping activities. Each trapline is issued a quota for the animals which can be trapped within the area. The quota is specific to each trapline, being based on past harvest levels, or recent furbearer population surveys.

The site is located within trapline CC033 as identified in Appendix A, though the Frederick House River forms the boundary between trap lines CC033 and CC044. The land use guidelines for this area indicate that efforts will be made to increase the harvest of furbearers to quota levels (MNR, 2006). The site is also located within one Baitfish license area, (CO2249) (see the SIP in Appendix A).

Furbearers potentially harvested from the study area include Beaver, Muskrat, Marten, Raccoon, Canada lynx, Black bear, Red squirrel, Striped skunk, River otter, Mink, Fisher, Red fox and Weasel. Open seasons for these species are listed below:

Table 4: Furbearer Open Trapping Season Dates

Furbearer Open Trapping Seasons	
Species	Open Season
Beaver	October 15 – March 31
Otter	October 15 – March 31
Canada Lynx	October 25 – last day of February
Mink	October 15 – last day of February
Muskrat	October 5 – May 21
Fisher	October 25 – last day of February
Marten	October 25 – last day of February
Red fox	September 15 – last day of February
Raccoon	October 15 – January 15
Red squirrel	October 25 – last day in February
Weasel	October 25 – last day in February
Skunk	No closed season
Black bear	August 15 – October 3

During the June 2012 PIC, a trapline operator expressed support for the project noting that the proposed development could improve his trapping, particularly for beaver. Xeneca is committed to work with trappers to ensure that traplines along access roads are not disrupted. Moreover, Xeneca will compensate trapline operators if demonstrated losses due to plant construction and/or operation are provided.

2.11.14 Forestry

The study area is situated within the Abitibi River Forest, managed by the Abitibi River Forest Management Inc. (ARFMI), under its SFL. The First Resource Management Group (FRMG) is the agent for ARFMI, undertaking all forest management activities from its office in Englehart, Ontario.

The Abitibi River Forest extends west from the Quebec border to just past the town of Smooth Rock Falls. It encompasses approximately 3.5 million ha, of which 3.05 million ha is forested land. Productive forested land accounts for 2.45 million ha. Spruce is the most abundant commercial species within the forest (comprising 68%), followed by poplar (27%), white birch, other conifers and cedars (FRMG, 2012).

The FMP identifies future forest harvesting, site preparation and regeneration areas, as well as infrastructure requirements such as expanded logging road networks.

Although no known commercial forestry is taking place in the vicinity of the project, Xeneca has identified significant harvesting and forest management activities taking place in the Abitibi Forest. The following companies are identified as harvesting timber from this forest and may be contracted to provide goods and services for Xeneca's Wanatango project during the construction stage:

- True North Hardwood Plywood (Cochrane)
- Georgia Pacific Northwoods LP (Englehart)
- Abitibi Bowater (Iroquois Falls)
- Tembec Industries (Timmins and Cochrane)
- Little John Enterprises Ltd. (Timmins)
- Wahgoshig Resources (Wahgoshig First Nation)

For the project construction, the responsibility for the removal of merchantable timber will be outlined in an Overlapping Agreement between Xeneca and ARFMI (the SFL holder) prior to the MNR issuing a Forest Resource License.

The Reaume Esker Road is a regularly used forest access road and is scheduled for maintenance in the 2011-2012 Annual Work Schedule. Xeneca will consult with the forest license holder to ensure that traffic flow on this road is not impeded for other users during the project construction period.

2.11.15 Protected Areas

A background database review was conducted for the identification of protected areas, which include Areas of Natural and Scientific Interest, provincially significant wetlands, conservation reserves, migratory bird sanctuaries and provincial/federal parks. No protected areas in the immediate vicinity of the proposed project were identified.

2.12 ABORIGINAL LAND AND WATER USE

2.12.1 Reserves and Communities

In Ontario, First Nation (FN) communities have strong historical and traditional ties to the land, rivers and lakes. As such, Xeneca is prepared to work with FN at varying levels, depending on community interests, goals and objectives.

Four FN communities were contacted and consulted by the MNR during the planning process that lead to the release of this waterpower site. These communities include Flying Post, Matachewan, Mattagami and Wahgoshig FNs. Xeneca is currently engaged in consultation with these communities. Engagement and consultation initiatives are detailed in Appendix E.

Characteristics of the communities are noted below:

Taykwa Tagamou Nation (formerly New Post Nation)

The northern reaches of the study area were the traditional territory of the Taykwa Tagamou Nation. Taykwa Tagamou Nation, formerly New Post RN, is a Cree RN located 14 km southeast of Cochrane. As of July 2012, they had a total registered population of 449 people. The reserve, New Post 69A, occupies an area of approximately 117 ha with an on-reserve population of 126 (AANDC, 2012).

Matachewan First Nation

Matachewan FN is a Cree FN community located south of the study area. The present day Reserve set aside for Matachewan FN under Treaty Nine (Indian Reserve No. 72) is located northeast of the town of Matachewan on a land base of 4,159 hectares, and includes Baptiste Lake, Turtle Lake and Bird Lake. These lakes are all part of an interior portage route linking the upper Montreal River to the Abitibi River, by way of the Watabeag and Black Rivers.

According to AAND, as of June 2012, the on-reserve population was 40 persons, with a total registered population of 664. Many off-reserve band members live in the towns of Matachewan and Kirkland Lake (AANDC, 2012).

Wahgoshig First Nation

Wahgoshig FN (formerly Abitibi-Ontario Band of Abitibi Indians), an Anishinaabe (Algonquin and Ojibwa) and Cree FN, is located near Matheson in the Cochrane District (east of the study area).

The FN was signatory to Treaty Nine on 7 June 1906 at the Hudson's Bay Company post on Lake Abitibi. The Wahgoshig FN reserve (officially Abitibi 70), created by Treaty Nine, encompasses 7770 ha; the north end meets the south shore of Abitibi Lake, which divides northeastern Ontario from northwestern Quebec. Accessible from Highway 101, the village occupies 70 ha of land adjacent to Blueberry Lake. The reserve population was listed as 115 people in 2006. The total registered population was 295 in June 2012 (AANDC, 2012).

Flying Post First Nation

The Flying Post FN, formerly an independent FN in the Nishnawbe-Aski Nation territory, joined the Wabun Tribal Council in 2007 to become a member FN to be represented by the organization. The reserve is located 40 km southwest of Smooth Rock Falls and occupies an area of 5957.1 ha. The July 2012 registered population for Flying Post FN is 204, all living off reserve. Most of the First Nation members are located near Nipigon but others live in different parts of the country (AANDC, 2012).

Mattagami First Nation

Mattagami FN is a small Oji-Cree community 70 km south of Timmins, Ontario and 113 km south west of Kirkland Lake. The community is built on the northwest side of Mattagami Lake. The FN reserve occupies an area of 5261 ha. The registered population as of July 2012 is 507 members. In 2006, on reserve membership was listed at 190 (AANDC, 2012).

2.12.2 Spiritual, Ceremonial, Cultural and Burial Grounds

All waterways are viewed in traditional Aboriginal culture as the 'veins or lifeblood of Mother Earth'. Water quality and water ecosystem health and function are typically mentioned as concerns by Aboriginal people in relation to natural resource management and development projects.

Xeneca has engaged with Aboriginal communities from the onset of the project and continues to do so. Xeneca's work in engagement continues and is considered very important in the planning process.

Information on the engagement of members of the Aboriginal communities during the project development is provided in Section 4.5.

To date no environmental information specific to lands and water has been provided by individual Aboriginal community members.

2.13 SOCIAL AND ECONOMIC ENVIRONMENT

The purpose of compiling an economic and a socio-demographic profile is to develop an understanding of the trends, issues and dynamics of the local communities in proximity to Xeneca's projects. The profile also enables Xeneca to identify a sustainable balance between economic growth facilitated by hydropower and socio environmental objectives. This information can be used to create a socioeconomic baseline against which potential project impacts can be compared.

Information used to characterize the socioeconomic environment has been obtained from various sources including government and local documents and websites (e.g. Statistics Canada, Ontario Provincial Park, Forest Management Plan, and CLUPA), agency correspondence, stakeholder input, literature review and field observations. Information obtained at the Public Information Centre (PICs) sessions, held on March 24, 2011 and June 26, 2012, were also incorporated into this section.

2.13.1 Municipal Structure, Background and Community Profile

The proposed project is situated on provincial Crown land, at Frederick House River, in the geographical Township of Mann. There are no incorporated municipal governments in or surrounding the project location.

The closest municipalities to the site are the Town of Iroquois Falls, occupying a total area of 600 km² and located about 26 km southeast of the site, and the Town of Cochrane, which occupies about 540 km² and is located 22 km north of the site (Figure 1).

Town of Iroquois Falls

The Town of Iroquois Falls is situated amidst the wilderness of Northern Ontario on the resource frontier. Located within the Cochrane District, the Town is accessed via Highway 67 off the Trans-Canada Highway (Highway 11). The Villages of Monteith and Porquis Junction are contained within the boundaries of the Town.

The Town of Iroquois Falls has a population of 4,595 people according to the 2011 Census. This represents a 2.83% population decline from 2006 levels and an 11.92% decrease since 2001. Approximately 38% people are fluent in English while 2% can only communicate in French. Approximately 60% of the population are bilingual.

Table 5: Outline of the Community Profile for Iroquois Falls as per the Statistics Canada Census 2001, 2006 and 2011

Canada census – Town of Iroquois Falls (Ontario) Community Profile			
	<u>2011</u>	<u>2006</u>	<u>2001</u>
Population:	4,595	4,729	5,217
Percentage difference	-2.8%	-9.4%	-8.7%
Land area:	599.92 km ²	599.43 km ²	599.42 km ²
Population density:	7.7 persons/km ²	7.9 persons/km ²	8.7persons/km ²

Historically, the site of Iroquois Falls was inhabited by the Aboriginal communities who were attracted to its abundant natural resources and extensive water routes. The Europeans moved to this part of Ontario in the 1600's to acquire and establish trading of furs with the First Nation communities. Recognizing its potential for paper manufacturing in the early 1900s, Iroquois Falls was built as a company town, by Frank Anson, a Montreal businessman and owner of the Abitibi Power and Paper Company Ltd. The extension of the Temiskaming and Northern Ontario Railway (now Ontario Northland Railway) further supported the economic development and rapid growth of the area. Soon after being incorporated as a Town in 1915, the Great Fire of 1916 destroyed a large portion of the region. The community was able to rebuild amidst Anson's beautification program, initiated in 1920, which remain evident to this day.

Presently, the Town of Iroquois Falls is experiencing low to moderate economic growth in the area. In terms of forestry, Resolute Forest Products (formerly Abitibi-Consolidated Inc.) operates a large mill producing newsprint and commercial printing papers in Iroquois Falls, and is one of the Town's key industries. It also operates other divisions including woodlands and hydroelectric power generation.

Similarly the mining industry, led by Glencore Xstrata, is providing a significant employment opportunities for the local community with many mining projects developing in the north. Retail and family oriented businesses are opening in the region; in addition, the Town also owns and operates a year-round airport, and has recently received provincial government support to enhance long – term operations and facilities (MNDM 2006). The Iroquois Falls Community Development Team and politicians in the region have initiated economic development plans to help promote employment opportunities and stabilize growth.

Lists of the top public and private sector employers in and around the Town of Iroquois Falls are provided below:

Top Public Sector Employers:

- Ministry of Correctional Services (Monteith)
- Anson General Hospital
- District School Board Ontario North East
- Town of Iroquois Falls
- South Centennial Manor
- Conseil Scolaire Catholique

Top Private Sector Employers:

- Resolute Forest Products (formerly Abitibi-Consolidated Inc.)
- Iroquois Falls Valu-Mart
- Association for Community Living
- Iroquois Falls Foodland
- Iroquois Falls Power Corp.

As illustrated in Figure 13, manufacturing forms the dominant industry for Iroquois Falls, employing 23% of the labour force, with forestry services (20%), health care and social services (12%), educational services (10%) and agriculture and resource based industries (10%) making up the other major industries (Statistics Canada, 2007). The Town has an employment rate of 48.2%.

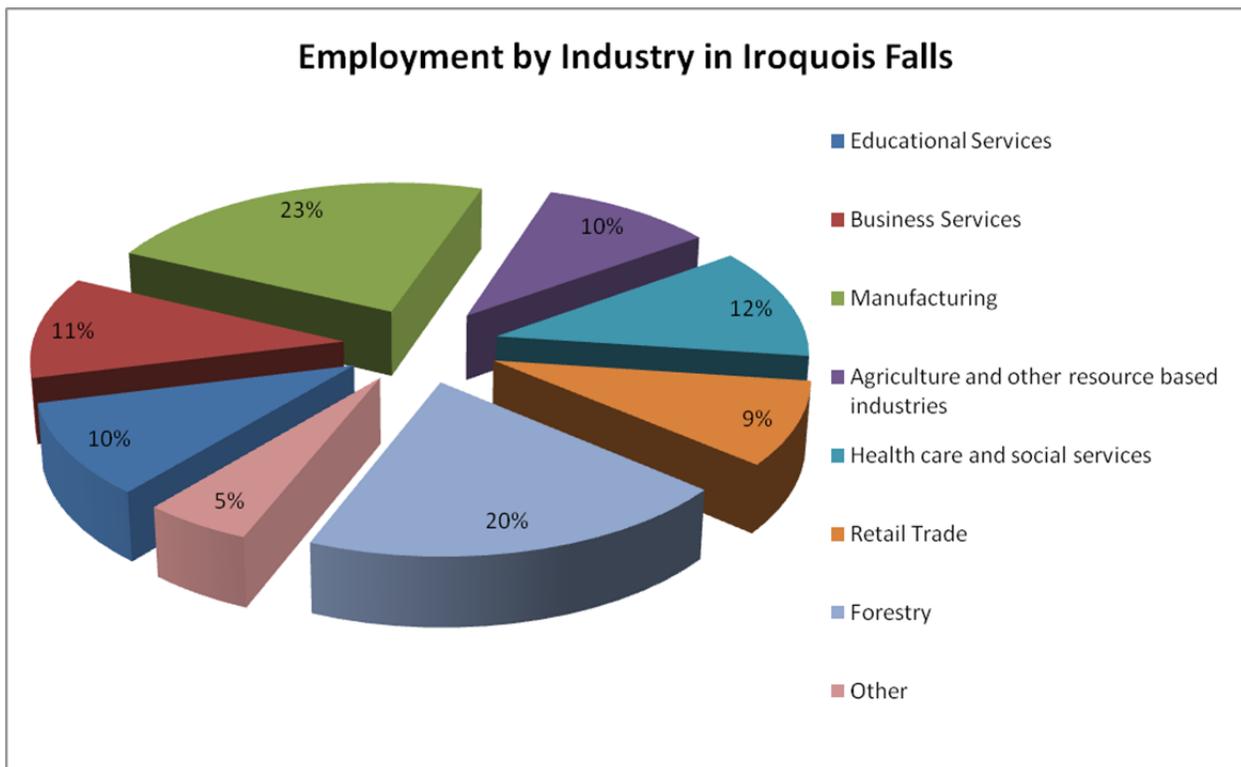


Figure 13: Employment Breakdown by Industry in the Town of Iroquois Falls [Source: Statistics Canada and Town of Iroquois Falls website]

Cochrane

The Town of Cochrane is located just north of the 49th parallel, in the heart of the Great Claybelt of Northeastern Ontario. By road, it is located 375 km northwest of North Bay and 105 km north of the City of Timmins.

The Statistics Canada 2011 Population Census lists the population of the Town of Cochrane as 5340 people. This represents a 2.75% decrease in the population from 2006 levels and a 6.55% decrease since 2001. Approximately 51% of the population is English speaking, while 44% report their mother tongue as French. The remainder are bilingual.

Table 6: Employment Breakdown by Industry in the Town of Cochrane (Statistics Canada and Town of Cochrane website)

Canada census – Town of Cochrane (Ontario) Community Profile			
	2011	2006	2001
Population:	5,340	5,487	5,690
Percentage difference	-2.7%	-3.6%	-4.5%
Land area:	599.92 km ²	599.43 km ²	599.42 km ²
Population density:	7.7 persons/km ²	7.9 persons/km ²	8.7 persons/km ²

Named after the Honourable Francis Cochrane, the Town of Cochrane was established in 1908 at the point where the Temiskaming and Northern Ontario Railway (now Ontario Northland) intersected with the National Transcontinental Railway. Though it was destroyed three times by fire in 1910, 1911 and 1916, this rail town slowly grew to become one of the major railway centers for both passenger and freight services. In fact, over time, it became a vital centre for construction, forestry, trade and transportation in Northern Ontario (Cochrane, 2013). However, the last few decades saw low ridership and a decline in the rail industry leading to major downsizing of the rail yards with much of the operations moving south (Gingras, 2013).

Presently, the Town of Cochrane, which amalgamated with the surrounding townships of Glackmeyer and Lamarchein in 2000, functions as a service center for a wide regional geographic area. The town has a labour force participation rate of 62.3%, with an unemployment rate of 8.7%.

The Town of Cochrane is the base for most of the region's provincial government ministries and the District Provincial Court. The Ministry of Transportation, Ministry of Natural Resources, and Northern Development and Mines among other agencies have offices here, providing employment for about 14% of the labour force (Gingras, 2013). Forestry services (18%), agriculture and other resource based industries (13%), retail trade (13%) and health services (12%) form the other major industries in the Town of Cochrane (Statistics Canada, 2007).

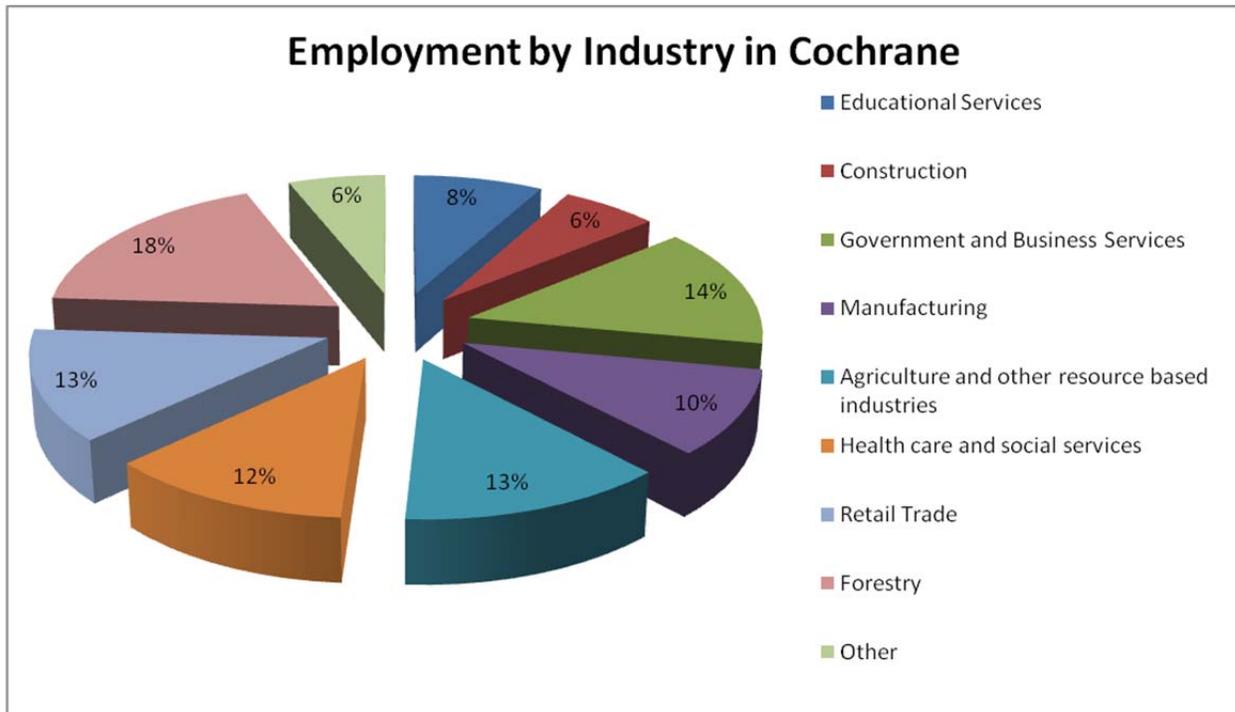


Figure 14: Employment Breakdown by Industry in the Town of Cochrane (Statistics Canada and Town of Cochrane website)

Some of the largest private employers in Cochrane are Detour Gold Corporation, the Tembec sawmill, and the True North Hardwood Plywood veneer mill (formerly Norbord Industries Inc.).

In July 2011, Detour Gold Corporation began construction of its new regional office in Cochrane as part of a large mine development project. This mine is a new major player in the Cochrane economy. Provision of foods and other services to the isolated Detour Lake site (which is a three hour drive east and north of Cochrane) provides an economic boost to the town).

Lists of the top public and private sector employers in and around the Town of Cochrane are provided below:

Top Public Sector Employers:

- Lady Minto Hospital
- District School Board Ontario North East
- Town of Cochrane
- Ontario Northland Transportation Commission
- Conseil scolaire catholique du district des Grandes Rivières
- Ministry of Natural Resources

Top Private Sector Employers:

- Detour Gold Corporation
- Tembec Inc.
- Villeneuve Construction
- Genier Brothers Trucking Ltd.

The mining and forestry industries in combination with public sector employers are expected to have a significant impact on both the Town of Cochrane and of the broader region of Northeastern Ontario by providing a reasonably stable economic base.

Any new required water crossings will require a work permit from MNR. Impact and mitigations associated with power lines (e.g. impacts to wetlands) are to be addressed through a screening process that will take part outside of the Waterpower Class EA planning process.

3. DESCRIPTION OF PROPOSED PROJECT

As noted in the earlier sections of this ER, the proposed Wanatango Falls GS project incorporates the use of a dam/weir. An open intake channel situated on the west shore of the river will conduct flows from the river to an intake before directing them through one or more turbines with a combined name plate capacity rating of 3.7 MW.

The proponent necessarily reserves the right to variances between the conceptual design presented herein and the final detailed engineering design, provided that such variances do not materially and negatively impact the environment beyond the scope of the impacts described herein. The proponent recognizes that any changes to the project where it is determined that there is a potential for new negative effect(s) to the environment will require the application of the addendum provisions for the ER as per Section 8.8 of the Class EA for Waterpower Projects (January 2014), and as summarized in Section 1.3.1 of this ER. An addendum to a Final ER will also be subject to mandatory regulatory and public review. The Wanatango Falls GS site is located on the Frederick House River, approximately 21 km south of Cochrane, Ontario. Details are provided in Section 3 below.

Possible variances from conceptual to final design include:

1. Detailed design may incorporate changes that are specifically meant to address and/or accommodate stakeholder issues agreed to during the consultation process.
2. Construction materials may vary from those shown on conceptual drawings. Earth material may be interchanged with concrete or steel material as required in the final engineering design. Where alternative material is specified, volumes and footprints may be adjusted to reflect safe engineering design requirements.
3. Physical sizes and orientation of structures.
4. Physical size of construction site areas may be adjusted where it is required for safe site management.
5. Specifications of mechanical and electrical equipment may vary, including the physical size, number of units, and total rating.
6. Design specifications for protection of fish, such as inflow velocities and inlet spacing of trash racks.

7. The powerhouse angle and alignment may be adjusted. The location of spillway and powerhouse structures may be adjusted along the dam axis to optimize engineering design and safety.
8. Road and power line routes may be refined.

As stated previously, if any changes to the project are determined to have the potential for a new negative effect(s), they may be subject to the addendum provisions of the Waterpower Class EA.

3.1 DESIGN OPTIONS AND RATIONALE

Originally, two design alternatives were considered for the Wanatango Falls facility, a “low dam option” and a “high dam option”. The locations of the built structures (powerhouse, spillway, fish passage, etc.) are identical in both options, the only difference being the height of the water control structures and the resulting headpond. The high dam option is the proponent’s preferred option for overall power production, although the implementation of this option requires agreements with upstream riparian landowners whose properties overlap with the proposed headpond. At the time of writing of this report, Xeneca was in the process of negotiating the last outstanding agreement with an upstream riparian landowner.

Under the high dam option, the Wanatango Falls GS will have a gross head of 9.0 m at a normal operating level of 259.0 masl, and a headpond extending 8.6 km upstream. In contrast, the low dam option has a gross head of 7.5 m and a normal operating level of 257.5 masl, with a headpond extending 0.5 km upstream.

Additionally, during much of the EA planning process, the provision of a fish passage structure was planned for the Wanatango Falls GS. Extensive discussions were held with Taykwa Tagamou Nation (TTN), who emphasized their preference that Xeneca focus resources and efforts on constructing compensatory habitat downstream of the Wanatango Falls GS, rather than creating a fishway that would be difficult for lake sturgeon to navigate safely. As a result, on April 25, 2014, Xeneca formally committed to adopt TTN’s preferred strategy, and the “no fish passage option” is presented here as the preferred option for the Wanatango Falls GS. The alternative option discussed in this ER is to incorporate a fishway at the project site.

Unless indicated otherwise, all descriptions of the Wanatango Falls GS and (in the later sections of this ER) the associated potential impacts apply to the high dam option. Similarly, the descriptions of the GS are the same for both the “fish passage” and “no fish passage” option, unless clearly stated otherwise in the subsections below.

3.2 GENERATING STATION COMPONENTS

The following is a description of the generating station components. The reader is referred to Annex II for conceptual engineering drawings in support of the information detailed below.

It should be noted that final engineering drawings for the components of the proposed undertaking must be submitted for applicable regulatory review at the permitting and approvals stage to secure permission to initiate construction. Detailed habitat information, a fish habitat compensation plan (if applicable) and an operation plan must also be supplied to DFO so that a determination under the *Fisheries Act* can be made. It may be noted that, ultimately, the decision on fish passage at the site is legislatively assigned to DFO under their *Fisheries Act* mandate. Continued discussions between DFO, the proponent and TTN will be required during the regulatory permitting process. The details presented below are based on conceptual engineering design calculations and subject to some modification at the final design stage.

Artistic renderings of the preferred option for the proposed facility (High Dam Option) are included as Figures 15 to 17 below. The renderings show the proposed headworks structure, powerhouse and substation under varying flow conditions (Figure 15: Summer Time Mid-Flow, Figure 16: Fall Low Flow, Figure 17: Spring High Flow).



Figure 15: Artist's Rendering of the Wanatango Falls GS – Summer Time Mid-Flow



Figure 16: Artist's Rendering of the Wanatango Falls GS – Fall Low Flow



Figure 17: Artist's Rendering of the Wanatango Falls GS – Spring High Flow

3.2.1 Installed Capacity and Annual Energy Output

The approximate installed capacity of this project will be 3.7 MW and will provide approximately 19,180 MWh of renewable energy annually. The production of 19,180 MWh of renewable energy represents the equivalent of:

- The displacement of 13,226 metric tons of carbon dioxide equivalent; or
- The annual greenhouse gas emissions from 2,593 passenger vehicles; or
- The sequestering of carbon from nearly 1141 hectares of pine or fir forests.

3.2.2 Headworks Structure

The proposed headworks structures will be constructed across the watercourse and will consist of a combination of spillways topped with Obermeyer gates and embankment dams. Two embankment dams, approximately 40 m and 50 m long, will abut the powerhouse to ensure that water is directed into the powerhouse's intake rather than spilling around either side. Two spillways controlling flow releases into the bypass reach will be constructed on the north and south channel of the island at the project site. A single 170-m long embankment dyke will be constructed across the island between the two spillways. If constructed, the upstream end of the fishway will pass over the 170-m long embankment dam and down the island, where it will join the south channel of the island.

3.2.3 Intake Channel

Water would be directed from the Frederick House River to the facility's intake through an open approach channel. The majority of the channel would be excavated to an elevation of 254 metres above sea level (masl). However, approximately 50 m upstream of the powerhouse the channel would begin to slope down to reach an approximate bottom elevation of 243 masl at the base of the powerhouse intake. The intake channel would have an approximate footprint of 1,500 m².

3.2.4 Powerhouse

The proposed powerhouse will have a footprint of approximately 400 m². The powerhouse will be constructed with reinforced concrete floors and walls to a level above the historical flood level and existing ground levels. Construction above this defined line can be reinforced concrete, insulated steel panels or a combination of the two based on existing physical needs and constraints. A coffer dam will be required to make initial excavations of the powerhouse, draft tube and flow transition features, as these are below the tailrace water level. The water passage within the powerhouse will be constructed from a combination of concrete and steel conduits.

3.2.5 Turbines

Turbine selection is based on the project site head, flow and economics. In instances of low head and intermediate to large flows, Kaplan, Propeller or Cross Flow (Banki-Ossberger) type turbines are deemed most efficient. For very low heads, a horizontal Kaplan is the preferred option as it requires less excavation than the vertical turbine and can maximize turbine efficiency over a wide range of flows. Regarding additional economics of the turbine selection, cost varies directly with the maximum operating flow, but because a large component of cost is fixed for a development regardless of the flow, an optimum size results through balancing the cost versus the revenue generated from turbines of various sizes (diameters).

Two options, involving the installation of one or two Kaplan turbines, are currently being considered for the Wanatango Falls GS. Turbine specifications for the two options are summarized in Table 7 below.

Table 7: Turbine Specifications for the Wanatango Falls GS

	Option 1	Option 2
Type	Kaplan	Kaplan
No. of turbines	1	2
Diameter (mm)	2,600	2,000
RPM	200	228
No. of blades	4	5
Trash rack gap (mm)	48	48
Entrance velocity (m/s)	0.75	0.75

3.2.6 Tailrace

The facility's tailrace will have an overall area of 500 m² and extend approximately 30 m downstream of the powerhouse. The excavation of the tailrace will be to an elevation of approximately 243.72 metres above sea level (masl) at the powerhouse outlet and will taper upwards until it meets the elevation of the existing river bed (approximately 248 masl). To address concerns about the potential for scour at the opposite bank, the tailrace will be angled downstream to minimize the erosion potential of outflows emerging from the powerhouse.

3.2.7 Fishway

As noted in Section 3.1, the preferred design for the Wanatango Falls GS does not incorporate a fishway. The following section is therefore *only* applicable for the alternate design option, in which a fishway would be constructed on the island at the project site.

As the fishway is proposed as a mitigation to an identified impact (barrier to fish movement), it is discussed in greater detail in Section 7 alongside other proposed mitigation measures for the project. Being a key feature of the alternate design option for the project, as well as being visible

in some of the preceding site maps and figures in this ER, it is briefly introduced here for the convenience of the reader.

The proposed fishway, if constructed, will connect the headpond to the upstream end of the bypass reach (immediately below the south spillway) via an approximately 150 m long open channel running roughly parallel to the embankment dam on the island. The embankment dam would be designed with an opening 1.2 m by 1.0 m high, and will convey flows of 0.6 to 3.1 m³/s under the range of normal operations. The fishway would be designed to accommodate both upstream and downstream passage for fish of all sizes, including large fish (eg. mature Sturgeon), and will occupy a footprint of 2,400 m².

The construction of the fishway, if pursued, will also be accompanied by the installation of a fish slide (a 30-cm diameter pipe) near the powerhouse intake, in order to provide an alternate route downstream for fish that are drawn to the intake area.

3.3 ACCESS ROADS AND POWER LINES

Originally, three options were presented by the proponent for the power line routing. Based on issues with respect to drafting agreements for access to the corresponding connection points, two of the options were ultimately dropped. Presented below is the description of the proposed line route which generally follows existing roadways.

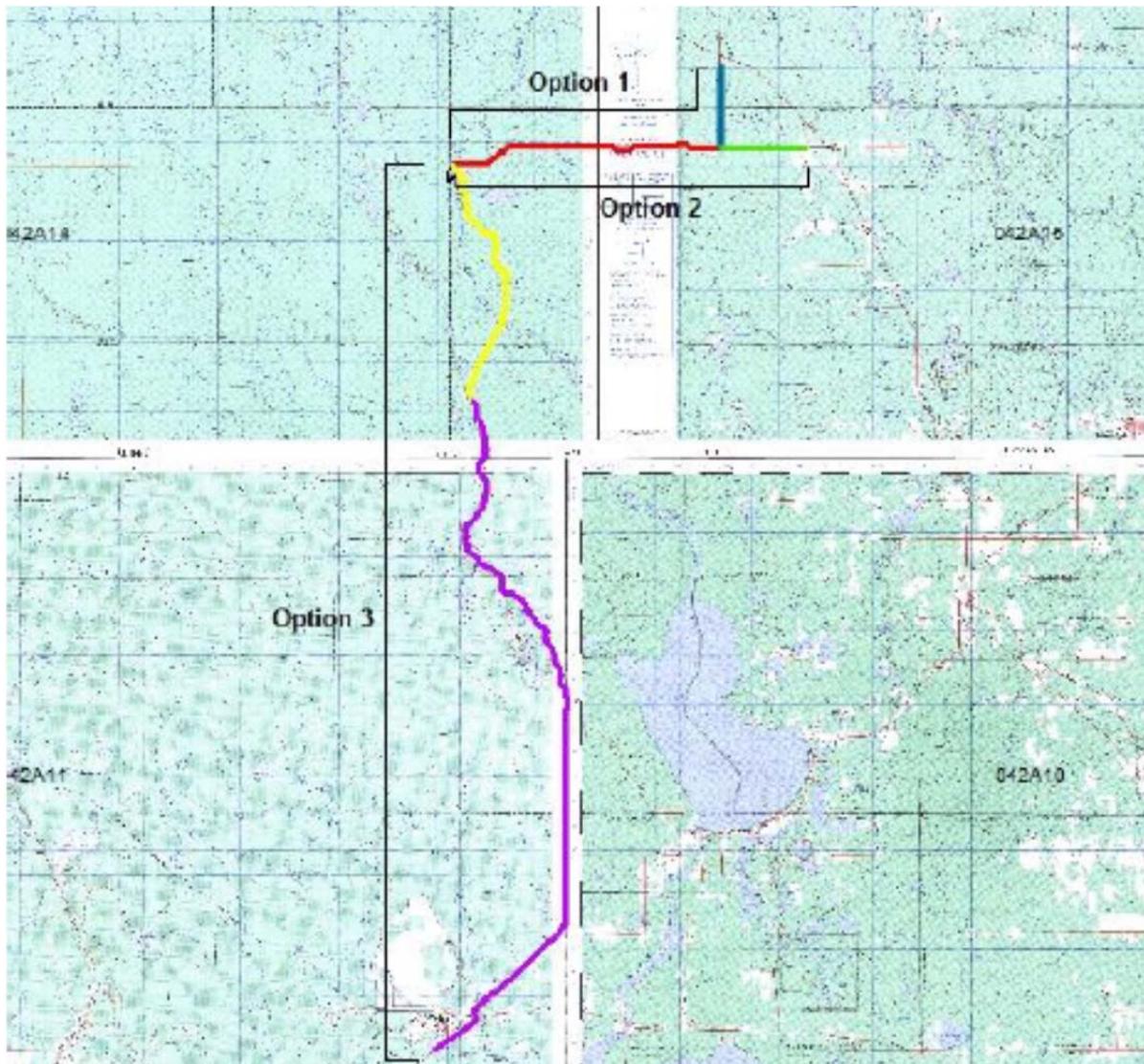


Figure 18: Options for Power Line Placement

Line Route

The preferred lines route travels south from the GS on the east side of the river for approximately 7 kms and then crosses the river heading south-west to link up with Ice Chest Road near Little Lake. It then runs south along the road to the rail crossing at Dugwal. Upon reaching the crossing at Dugwal the proposed line will run southwest along the road easement to Hoyle and the Hoyle Distribution Station. (Annex IV).

The total line distance of the preferred line from the GS to the point of common coupling is 43.6 km. The preferred route is illustrated in Figure 18 as 'Option 3'; details on lengths, land tenure and water crossings associated with this route can be found in Annex VI.

Of the total 43.6 km of line length, 35.2 km will be located adjacent to existing roads. The 8.4 km of new corridor will be located primarily on Crown land within undisturbed mixedwood habitat and will require skirting a wetland crossing (Wetland 7 as presented in Annex III).

Under the Waterpower Class EA process the assessment of power lines under 115 kV is not required. The conceptual line route described below is provided for the reviewer's information. The final line route selected for the project may vary and will be reviewed and approved by the MNR under the *Public Lands Act*.

Road Route

The general project area will be accessed from the east via the Newmarket Concession Road 5 and 6, which is located 29 km south of the Town of Cochrane, off Highway 17. (It is also known as the Reaume Esker Road). The road extends west from Highway 11 and crosses the Frederick House River immediately downstream of the Wanatango Falls. This road is a secondary road accessible three seasons of the year, as it is not currently ploughed in winter and exists in part as a snowmobile trail. The road will require some minor upgrades to water crossings.

The Reaume Esker Road is a regularly used forest access road and is scheduled for maintenance in the 2011-2012 Annual Work Schedule. Xeneca will consult with the forest license holder to ensure that traffic flow on this road is not impeded for other users during the project construction period.

A permanent bridge structure spans the Frederick House River roughly 500 m north of the proposed dam site (see Figure 10). It spans 40 m (131.2 ft) and has a width of 3.35 m (11 ft.). The current condition of the bridge decking is good and the bridge is rated to a maximum weight capacity of 35 tons.

Access to the west side of the GS follows an old logging road. This road (approximately 25 plus years) is overgrown with vegetation and a water crossing has failed, with the site now occupied by a beaver dam. This route will require significant upgrading along its approximately 800 m (2600 ft) length including the installation of two water crossings to facilitate access to the dam site during the construction phase.

An extension to the road of 150 m (490 ft) is required to access the powerhouse on the west side of the river and 303.0 m of new temporary access road is required to provide access to the proposed dam and fishway on the island south of the powerhouse.

Access to the east side of the project will be from a well-used former logging road (off Newmarket Concession Rd. This logging road will require 950m of upgrading and the construction of an additional 150m of new temporary access road to reach the edge of the river.

Summary

The preferred power line route generally follows existing tertiary roads, with 8.4 kms of new corridor required. Access to the project area will be primarily along existing roads running east from Highway 17. Primary project access for construction and maintenance will along an old logging road on the west side of the site. The road will require clearing and upgrade, as well as a short section of new road to reach the site. Temporary construction access on the east side will be along an existing access road requiring maintenance and a new 150 m road. The proposed lines and roads routes as summarized above are the preferred approach. It is noted that this route will have minimal impact on the ecological function of the surrounding habitat as the route avoids significant natural features. The proposed route does skirt a portion of Wetland 7. With the use of best management practices, minimal disturbance is expected. Additional details are presented in the Annex III and Annex IV.

3.3.1 Power Line & Roads Route Selection and Assessment Methodology

In November, 2010, KBM conducted a desktop assessment of proposed power line routes for Xeneca's 18 north-eastern Ontario waterpower sites and provided a draft report.

A report was completed summarizing the road access data and information which had been compiled for each of the proposed hydroelectric projects. Included in this report is a detailed written description of the proposed access routes, a summary of feasible aggregate sources and requirements for road and water crossing upgrades. Detailed maps showing the proposed access routes for each site were also included.

Further revised reports for line and access routes were completed in November 2011 for inclusion in the EA for each site. The revised reports included detailed information and maps for the final line and access route options being proposed for each project. Road and line routes presented in the revised reports were designed to:

- avoid impacts on known values;
- reduce environmental impact (i.e. streams & wetland crossings);
- minimize landscape footprint and fragmentation;
- dovetail with existing road corridors; and
- reduce total line length.

Road access strategies for all sites focused on the use of existing SFL roads and trails for the majority of project access. Where required, small sections of new road were adjusted to avoid impacts, and were located using high resolution imagery and best available data, including current FMP information. Road and power line routes were reviewed during the ground truthing exercise in June and July 2013 by Northern Bioscience. A final summary report was submitted to Xeneca in April 2014 and is presented in Annex III.

This report noted that all twelve (12) wetlands assessed were predicted to be provincially significant. In total, 0.1 km of new road, 2.5 km of new transmission line (not along existing roads), and 21.2 km of new power line along existing roads are proposed within provincially significant wetlands. These wetlands were predominantly large wetland complexes consisting of Black Spruce swamps on organic soils.

Coarse Filter Assessment to Avoid Known District-Specific Values

Xeneca provided the MNR (Cochrane and Timmins District) with maps of the most recent preferred line and access road options prior to the completion of the detailed assessments for significant wildlife habitat in the fall of 2012. The MNR evaluated any conflicts with respect to existing district-specific values including:

- Moose Emphasis Areas
- Marten Core Areas (from Forest Management Plans)
- Quality Fishing Zones
- Moose Wintering Habitat
- Significant wetlands
- SAR observations
- Natural Lake Trout Lakes
- Tourism values (including remote operations)
- Locally known sensitive cultural heritage or archaeological values
- Current or historic landfill or waste disposal sites
- Any known natural hazard areas or other liabilities
- Any areas that are subject to land claim negotiations or other known Aboriginal interests
- Any areas subject to pending dispositions (aggregate permits, forestry roads, etc.)
- Areas covered by mining tenure under the *Mining Act*.
- Land use policy areas that restrict or influence such development (e.g. parks and conservation reserves)
- Private land
- Federal land
- Existing Crown tenure (leases, LUPs, easements)
- Aggregate license areas, including “greenfield” sites under a first right of refusal (MTO)
- Trap cabins
- Existing utility lines and communications towers
- OFSC snowmobile trail network

To ensure minimal impact, the final route was selected and subjected to a fine filter assessment to predict the presence of significant wildlife habitat.

As completed by an Ontario certified interpreter, an ELC classification was completed on a 600 m wide corridor around the center line of all the proposed power lines and new road access route options.

Xeneca will be responsible for repair of any damage to roads and water crossings that may be caused by the project.

The Reaume Esker Road is a regularly used forest access road and is scheduled for maintenance in the 2011-2012 Annual Work Schedule. Xeneca will consult with the forest license holder to ensure that traffic flow on this road is not impeded for other users during the project construction period.

3.3.2 Power Line Route

Under the Waterpower Class EA process the assessment of power lines under 115 kV is not required. The conceptual line route described below is provided for the reviewer's information. The final line route selected for the project may vary and will be reviewed and approved by the MNR.

Xeneca is proposing a single 27.6 kV power line traveling south from the powerhouse to the point of common coupling (see Figure 1 for the proposed route). The total line length is 43.6 km, of which 35.3 km will be along pre-existing roads, thus requiring the creation of 8.3 km of new corridor. The proposed line would require 16 water crossings at pre-existing points and 5 new water crossings on new line corridor sections. The proposed route would also skirt the edge of a single wetland.

The power line will consist of an indeterminate number of wood poles extending approximately 15-20 m above the ground surface. The construction of a 10-30 m (approximate) wide ROW is required for the power line.

Further details are provided in Annex IV.

3.4 ANCILLARY WORKS

The following describes the ancillary works proposed for the project.

3.4.1 Electrical Substation

A transformer substation will be required and located adjacent to the powerhouse at the site. It is expected that the transformer substation will have an approximate footprint of 600 m² and will be surrounded by security fencing.

4. CONSTRUCTION STRATEGY

The following is a summary of the construction activities and temporary works required during the construction of the project. A construction management plan, including conceptual drawings, has been prepared and is presented in Annex II. It should be noted that final engineering details for these temporary works will be submitted for applicable regulatory approval in advance of the construction stage of the undertaking. The details presented below are based on conceptual engineering design calculations and subject to some modification at the final design stage. Site preparation activity is planned for the fall of 2015. Construction of the proposed facility is scheduled to take place between 2015 and 2018, with commissioning of the facility anticipated by October 2018.

4.1 CONSTRUCTION SCHEDULE

Assuming the issuance of the Statement of Completion by September 2014, site preparation activity is planned for the fall of 2015. Construction of the proposed facility is scheduled to take place between January 2016 and December 2017 with commissioning of the facility anticipated by March 2018. Under the terms of the FIT contract awarded to Xeneca, the facility must be commissioned no later than October 2018.

Tentative dates for the commencement and completion of various project components are presented in Table 8.

Table 8: Project Component Construction Schedule

Component	Dates	
	Roads and Bridges	Start
Finish		April 2016
Intake	Start	June 2016
	Finish	September 2016
Powerhouse	Start	March 2017
	Finish	March 2018
Control Structures	Start	June 2016
	Finish	June 2017
Connection Line and Associated Components	Start	January 2017
	Finish	June 2017

The following construction stages are proposed for the construction of the generating station and its appurtenant facilities:

- road upgrades and construction of new road access on both banks of the river; the western access will remain permanent;
- clearing and grubbing of the site, including work area and laydown areas;

- clearing and grubbing of the island at the embankment dam and (if fish passage is to be provided) the fishway;
- installation of type A (phase 1) cofferdam downstream of proposed powerhouse;
- blast and excavate powerhouse area, tailrace channel and portion of intake channel (terrestrial);
- construction of intake including gate and embankment dams;
- construction of powerhouse;
- construction of substation and power line;
- install type B (phase 1) cofferdam upstream of north spillway and use for access to the island;
- construct the embankment dam and (if fish passage is to be provided) the fishway;
- construction of the north spillway;
- removal of phase 1 cofferdams;
- install type B (phase 2) cofferdam upstream of south spillway channel and use for access to island;
- construct south spillway and remaining portion of embankment dam;
- install type A cofferdam upstream of intake channel;
- complete blasting and excavation of intake channel;
- removal of remaining cofferdams;
- site rehabilitation/reclamation.

Construction will be initiated once all applicable regulatory approvals and authorizations have been issued. The construction program will be advanced to meet the requirements of relevant legislation, industry guidelines and best management practices aimed at ensuring the highest level of protection of the environment. Specific proposed mitigation measures that will be integrated into the site's construction strategies are presented in Section 7 and explained in further detail throughout the supporting Annexes of this report. In-water construction-related timing restrictions will be stipulated by the regulatory agencies during the permitting and approvals stage and adhered to for construction. There will be no overnight camp located at the site. General construction strategies are presented below. Additional details are presented in Annex II.

4.2 CONSTRUCTION ACTIVITIES

4.2.1 Clearing and Grubbing

Trees cut within the inundation area and along the ROW for the power line and access roads will have their roots left intact wherever possible. Efforts will be made to remove as much organic material and woody debris as possible from the area of inundation to reduce the potential effects of mercury methylation.

Right of first refusal for all merchantable timber will be offered to the SFL holder for all areas being cleared, including inundation zones and access road and connection line corridors.

4.2.2 Construction Materials and Laydown Areas

Granular material for the construction of roads, embankments, yards, cofferdams and concrete structure backfill will be sourced from re-used granular material excavated from the road alignment, if the material is suitable for this use. Earth borrow material may be excavated from the up-slope side of the access road on the north bank. The total volume of borrow materials required is not known at this time as it will depend on the final project design. Granular materials may require on-site processing to improve the engineering characteristics.

Sand and gravel may be rare or unavailable in the project area, so geotechnical materials may need to be trucked to the site. Possible construction resources and borrow pits have been identified in the surrounding area.

Any required aggregate permits will be secured through consultation with the MNR's Cochrane District Office as it holds the authority for Crown land aggregates in the area.

Two 1000 m² temporary laydown areas will be established. The first, located near the powerhouse, will be used for construction materials and equipment storage, construction offices, parking, etc. The second will be located near the adjustable gate spillway, and will be used for the same purposes as the first laydown area, except that it will not likely contain site offices or parking. The laydown area near the powerhouse can also be reduced following construction, with some of the area remaining for operation purposes. The other laydown area can be completely reclaimed. If needed, an additional stockpile area of up to 5000 m² may be used to stockpile topsoil, excavated soil material unsuitable for construction use and excess blast rock material. The overflow dam on the large island will be constructed using a combination of concrete and earthfill, the relative amounts of which will depend on the final project design. Earthfill will be sourced to the extent available on-site. The primary borrow locations will include the abutment areas of each spillway at each shoreline and the rock blasting excavations for the powerhouse and other structure foundations. Excess material from the access road construction and ditching operations will be used should additional borrow material be needed. Additional blast rock material can be obtained by extending the excavation area for the foundation or powerhouse. The required rock borrow areas are not expected to extend beyond the construction site area.

4.2.3 Cofferdams

Cofferdams will be required to allow for the construction of all components which are below existing or final water levels. Drawings 151 and 152 in the Construction Management Plan (Annex II) identifies the proposed cofferdam locations.

Two types of cofferdams will be used for the construction activities. Type A cofferdams will be constructed of cargo bags filled with clean, local granular material transported to site in trucks or trailers (see the Construction Management Plan in Annex II, Drawing 00-151). They are installed using an excavator and/or a crane to place the bags sequentially in the river. Type B cofferdams will consist of rockfill with an impermeable liner and will have 2H:1V side slopes and a top width as necessary for expected construction traffic. The type and precise length of these cofferdams will depend on the construction phase and their location within the construction site. The footprint of the cofferdams will depend on the height/elevation of the dam required to manage the 1:20 year flow rate and the depth to suitable substrate within the river.

4.2.4 Dewatering

Water that accumulates behind the cofferdams will be discharged in accordance with the *Environmental Protection Act*. Permits to Take Water and an Environmental Compliance Approval for Discharge of Sewage Waste Water to the environment will be required from the MOE prior to the initiation of in-water construction activities. Dewatering approvals will require the proponent to submit a Sediment and Erosion Control Plan and possibly, a surface water monitoring plan for regulatory review.

4.2.5 Excavation of Powerhouse and Tailrace Canal

Excavation for the powerhouse and tailrace will be completed using appropriate methods. Tailrace excavation at the intersection with the river will be completed within the in-stream work window. The excavation will be carried out from the powerhouse working towards the water course so that flowing water does not infiltrate the cut until the final phase of excavation.

4.2.6 Concrete Production

A concrete batch plant will not be required on-site. Concrete will instead be obtained from concrete suppliers in or near the Town of Cochrane.

4.2.7 Connection Line

Clearing of the power line ROW and the construction of the line will occur in the least impactful and most cost-effective way possible. Overland sections of power line ROW (i.e., where the power line is not constructed parallel to an access road) are planned to be cleared in winter with tracked vehicles working on snow-covered, frozen ground. Where the power line is parallel to the access road, the line work can occur in winter or summer with minor impact.

4.2.8 Management of Waste Materials During Construction

Solid nonhazardous construction waste (e.g. material packaging) generated during the construction process will be removed from the site to an approved disposal location. The proponent will make the appropriate arrangements prior to construction for all waste disposals. The following waste disposal services were identified in proximity to the site:

- Northern Environmental Services (Timmins, ON) – management of construction and demolition waste;
- Erocon Waste Management (Timmins, ON) – removal of construction waste to locally approved landfills;
- Roztek Environmental (Timmins, ON) – removal of sewage waste;
- Veolia (just outside Timmins, ON) – management and removal of any hazardous waste.

No gaseous wastes other than construction equipment emissions are anticipated. Industrial liquids such as paints, sealants, fuels and lubricating fluids will be stored in secure containment areas and disposed of in accordance with provincial and federal liquid waste disposal regulations (e.g. *Environmental Protection Act*, *O. Reg. 347*, and *Transportation of Dangerous Goods Act*).

4.2.9 Water Crossings

Access to the project area will be by existing roads and new roads; approximately 150 m of new road construction as well as road upgrades/repairs to 1,743 m of old logging roads will be required. Upgrades to access roads, including upgrades for drainage (culverts, ditches, etc.) may be required to allow for the increased volume of construction related traffic. Additional traffic may occur during the construction period. An agreement with the appropriate contacts for the maintenance of the roads and water crossings will be developed during the post-EA permitting phase.

As noted in Section 3.3.1, a preferred route for the power line has been identified. Much of the power line route will be constructed adjacent to an existing access road and will traverse 17 existing water crossings and 4 new water crossings along its length, and will skirt 1 wetland. The route was selected to avoid wetlands, and therefore no wetlands are expected to be impacted by the project.

The proposed routes for the power lines and the access roads are presented in maps in the Powerlines and Roads Summary Report (Annex VI).

Fisheries and Oceans Canada's Overhead Line Construction Operational Statement (v. 3.0, 2007) will be adhered to in order to minimise impacts to fish and fish habitat associated with construction or upgrades to all water crossings.

5. PROPOSED OPERATING PLAN

This section summarizes how the facility is proposed to be operated and how the operation will be adapted to maintain key seasonal functions such as aquatic life and recreational use. This includes seasonal considerations, proposed operating rules and target limits. The proponent's proposed operating plan for Wanatango Falls GS is presented in Annex I, and summarized below.

The proposed operations plan is based on the conceptual engineering design and was developed following the identification and analysis of potential net effects and the selection of appropriate mitigation measures. Environmental data was collected and analyzed through various studies, including:

- Lidar Survey: detailed topographic mapping of the upstream and downstream river reach;
- Conceptual Design: drawings of the structures as conceptually proposed for the project (see Annex II of this ER);
- Hydrology Study: an analysis of the natural river flows (Annex I);
- Bathymetric Study: a field study of water depths upstream and downstream of the project location and a spot measurement of flows required for hydraulic model calibration;
- Hydraulic Studies: detailed hydraulic engineering analyses to better understand the various hydraulic parameters relevant to assess operational and environmental matters. The work included one-dimensional steady-state HEC-RAS modeling upstream and downstream of the proposed development, as well as unsteady-state flow modeling in the downstream area affected by operation of the project (Annex I);
- Geomorphology Survey: a field study of river channel stability, erosion and sediment transport (Annex I);
- Environmental Field Studies: studies of environmental areas and aspects of interest as documents in other parts of this environmental assessment (Annex III).

As noted in Section 3.1, two design options are being considered for the provision of fish passage: the preferred option ("no fishway option") is to have no fishway incorporated into the design, while the alternate option ("fishway option") is to construct a fishway to allow for the upstream and downstream movement of fish. As will be explained in the next sections, the overall operating regime of the Wanatango Falls GS will be largely the same whether or not the fishway is constructed, with the only difference being in the method that downstream environmental flow targets will be met. The descriptions of operations in the next sections apply to both fish passage design options unless specifically stated otherwise.

5.1 HEADPOND INUNDATION

An important factor in modified run-of-river operation is the availability of water storage upstream of the facility. Based on the dynamic modeling (HEC-RAS) of the river channel completed to date for the preferred 'high dam' option, the Wanatango Falls GS may result in an inundation area extending up to 8.6 km upstream of the dam during long-term average flow conditions. With water levels in the headpond maintained at a normal operating level (NOL) of 259 masl, water levels immediately upstream of the proposed Wanatango Falls GS would be 2.7 to 5 m higher compared to pre-construction conditions. Along much of the remainder of the headpond, water levels would be approximately 0.8 m higher compared to pre-construction conditions.

Water levels upstream of the proposed Wanatango Falls GS are predicted to be lower during post-construction long-term average flow than they are during pre-construction 1:100 year flood events. The current and proposed inundation area under long-term average flow and 1:100 year flood conditions are illustrated on the headpond inundation maps in Annex I.

During modified run-of-river operations, headpond water levels will fluctuate from on-peak to off-peak hours. Water levels will rise during off-peak hours as outflow from the plant is reduced to below the natural rate of river inflow, whereas the opposite will occur during on-peak hours as production and plant outflows are increased above the natural rate of river inflow. The objective of the Operating Plan is to allow for some fluctuations in the headpond levels without having significant impact on shoreline erosion, aquatic habitat and/or civil structures and private property. For the proposed Wanatango Falls GS, the maximum daily fluctuation of water levels in the headpond is 1 m.

The operating plan aims to allow for a certain amount of fluctuation in headpond water levels without having a significant negative impact on shoreline erosion, aquatic habitat, and civil structures and private property. Due to the presence of private property upstream, the proposed operating parameters were carefully selected to ensure that property will not be impacted without the consent of the owners; agreement has been reached with two of three landowners for the preferred high dam option and negotiations are underway with the remaining landowner. At the time of writing of this report, efforts were underway to acquire necessary property rights. To mitigate any undesirable effects in the headpond, the operation plan establishes limits on the timing of water level fluctuations as well as the extent to which the facility can manipulate water levels upstream.

5.2 SITE OPERATING STRATEGY

The electricity generated from this project has been contracted to the OPA under a FIT Contract. The terms and conditions of the FIT Contract encourage the facility to generate electricity between the hours of **11 am and 7 pm (on-peak hours) from Monday to Friday**, when needed most in Ontario.

It is proposed that the Wanatango Falls GS will operate as a “*modified ROR*” generating facility. Effectively, the operations of the facility would vary between ROR and intermittent operation depending on the flows present in the river. This mode of operation takes into account the objective of building and operating the project in an environmentally sensible manner, while trying to achieve the socio-economic objective of generating power when it is most needed in the Province.

Run-of-river versus Modified run-of-river operations

Whether the Wanatango Falls GS operates in run-of-river or modified run-of-river mode at any given moment will depend in large part on the natural flows in the Frederick House River. The different operating scenarios are described below.

Run-of-River Operations

When natural flows exceed the maximum amount of water that can be passed through the turbine(s) (50 m³/s in the case of the Wanatango Falls GS), excess water would be diverted over the spillway structures. The combined flow of the water passed through the turbine(s) to generate electricity and the water bypassed over the spillways will be equal to the natural flow of the river. This situation occurs primarily during spring run-off (freshet) conditions and during/after significant precipitation events. The Wanatango Falls GS would therefore operate in run-of-river mode when inflows exceed the maximum turbine capacity (50 m³/s), plus the minimum environmental flow (2 m³/s for the proposed Wanatango Falls GS).

Run-of-river operations would also occur during normal, seasonal low flow periods when natural flows are so low that any available water must be released downstream to maintain ecological function of the waterway. Flows are also typically too low for the generation of electricity during such periods. All available water will be passed through/over the dam to maintain aquatic habitat downstream. This situation occurs primarily in late summer and late winter when natural flows are typically very low.

Modified Run-of-River Operations

At other times, the facility would be operated to “modify” the natural flow in the river by storing some of the natural river flow during off-peak hours for release to produce electricity during on-peak hours (i.e. intermittent operation) when the demand is greater. Modified run-of-river

operation would occur during moderate and lower flows when the natural flow in the river is below the maximum capacity of the turbine ($50 \text{ m}^3/\text{s}$), but above the minimum flow required to maintain the ecological health of the waterway ($2 \text{ m}^3/\text{s}$). During these flow conditions, some of the natural river can be saved during off-peak hours for use during on-peak hours.

When natural river flows are between the minimum and maximum turbine capacity ($15 \text{ m}^3/\text{s}$ and $50 \text{ m}^3/\text{s}$, respectively), the facility runs continuously, with some of the water stored during off-peak hours. This operation results in downstream flows that are smaller than natural river flows during off-peak hours and larger than natural river flows during on-peak hours. However, flow releases under this mode of operation would never fall below $15 \text{ m}^3/\text{s}$.

When natural river flows are below the minimum turbine capacity ($15 \text{ m}^3/\text{s}$), the facility will cease operating during some off-peak hours to store water until operation is again possible. The lower the natural river flow, the longer the period of stoppage will be. When the facility operates, it operates at a rate less than maximum turbine capacity ($50 \text{ m}^3/\text{s}$). To ensure that the river downstream of the facility maintains sufficient flow to preserve ecological function, an ecological flow (Q_{EA}) of at least $2 \text{ m}^3/\text{s}$ of water will be released downstream at all times.

Typically, the facility operation will be stopped at night to allow the headpond to fill in preparation for the following day (on-peak).

Figure 19 below illustrates the modes of operation that occurs depending on the amount of natural flow in the river. Note that Figure 19 is presented for illustrative purposes only to illustrate the different operating modes of a typical modified ROR facility, and was not specifically plotted based on the operating parameters of the proposed Wanatango Falls GS.

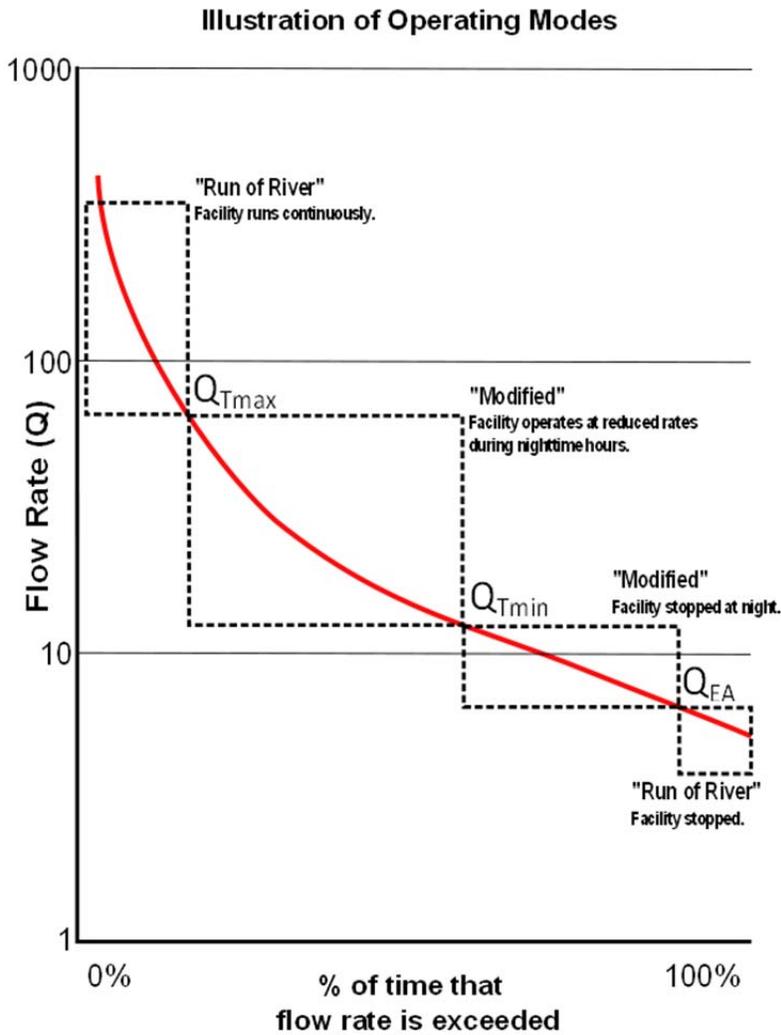


Figure 19: Modes of Operation

The proposed undertaking will have a limited ability to store water in the headpond, thus limiting the depth and area of inundation upstream, and by extension, the magnitude and spatial extent of the associated environmental impact. This, in addition to the limited amount of storage available for operation relative to the natural flow of the river, differentiates modified ROR projects from hydroelectric projects with large storage reservoirs capable of storing water for weeks or months and which have the ability to “peak” when seasonal periods of hot or cold weather raise the demand for electricity. Modified ROR projects typically have significantly less environmental impacts than peaking hydroelectric projects.

5.3 SPILLWAY FLOW ALLOCATION

Flows in the Frederick House River at the project site will be allocated between four or five structures (depending on whether or not the fishway is constructed):

- 1) Between 15 m³/s and 50 m³/s will be diverted towards the intake channel and into the powerhouse to generate electricity. After passing through the powerhouse, this flow will be immediately released back into the natural river channel at a point approximately 300 m downstream of the spillways;
- 2) Under the option with fish passage provisions, water from the headpond will be spilled into and down the fishway to facilitate upstream and downstream fish passage. The amount of flow spilling into the fishway at any given moment would depend on the water level in the headpond: a flow of 3.1 m³/s in the fishway would occur when the headpond is at the NOL of 259 masl; when the headpond level is at 258 masl, flows in the fishway are estimated to be 0.6 m³/s (see also Table 9 below, listing the estimated fishway flows at different headpond water levels);
- 3) A pipe through the south spillway will provide flows of up to 2 m³/s to ensure that the Q_{EA} of 2 m³/s can be met at all times. Under the fishway option, this pipe will be opened when flows passing through the fishway are less than 2 m³/s; outflows through the pipe will be adjusted to make up for the deficit. Under the “no fishway” option, the Q_{EA} flows will be provided entirely through this pipe;
- 4/5) Any flows in excess of the maximum turbine capacity (50 m³/s) and the Q_{EA} (2 m³/s - provided through the south spillway pipe and the fishway flow (if applicable)) will be spilled over the north spillway and the south spillway.

The proportion of flows going into each structure will depend on the amount of inflow into the project area and the operating status of the powerhouse. Under typical flow conditions, flows will be allocated among the different structures in the following manner:

- Flows in excess of the maximum turbine capacity + the Q_{EA} (> 52 m³/s): When natural inflows in the river exceed 52 m³/s, this excess flow is directed over the spillway structures;
- Flows between 17 m³/s (Q_{Tmin} + Q_{EA}) and 52 m³/s (Q_{Tmax} + Q_{EA}): in order to meet minimum flow requirements, 2 m³/s will automatically be provided to the bypass reach at all times via the fishway (if applicable) and/or the pipe through the south spillway. When the remaining flow is between the minimum turbine capacity and maximum turbine capacity (15 m³/s and 50 m³/s, respectively), all the remaining flow is passed through the powerhouse to generate electricity;
- Flows between 2 m³/s (Q_{EA}) and 17 m³/s (Q_{Tmin} + Q_{EA}): If the amount of flow in excess of 2 m³/s (the flow required for the bypass reach) is less than 15 m³/s, the turbines are not capable of operating, except intermittently, within the approved operating band of the headpond. The minimum environmental flow (Q_{EA} of 2 m³/s) is still being continuously released downstream through the fishway (if applicable) and/or the pipe through the south spillway;

- Flows less than 2 m³/s: During very low flows, inflow is insufficient for any type of operation, and all inflows are directed through the pipe in the south spillway, and the powerhouse is inactive.

The minimum downstream environmental flow target (Q_{EA}) (see Table 12 in Section 5.5) was selected to reflect the types of minimum flows that occur downstream of the Frederick House Lake Dam when the latter is shut in.

5.4 VARIABLE FLOW REACH

The Variable Flow Reach represents the length of the river downstream of the project site that will experience variation in water depth, flow velocity and wetted channel perimeter from on-peak to off-peak hours under modified ROR operations. The Variable Flow Reach for a given modified ROR facility is considered to end where the variability in flow is attenuated by the presence of a lake or a confluence with a significant tributary. Common concerns associated with modified ROR operations include potential impacts to aquatic habitat, navigation, public safety and civil structures, and ice scour. The proposed operating parameters of the proposed undertaking will ensure that ecological flow requirements are met, take into consideration any downstream navigation constraints and avoid significant negative impact on public safety and civil structures.

The magnitude of the daily fluctuations in flows in the Variable Flow Reach will depend on the operating mode of the facility and the natural flows in the river at that time. When the facility is running continuously, but at a reduced rate at night, daytime flows will typically be no more than four times greater than nighttime flows. When the facility is shut down at night, during which time only a flow equivalent to Q_{EA} is being released, daytime flows can be as much as 10 times larger than nighttime flows. Additionally, the lower the natural river flow, the longer the facility will cease operations and store water. Under purely ROR operations, the variation in flows (if any) from daytime to nighttime would be the same as they would be in the absence of the project.

To reduce the potential for impact within the Variable Flow Reach during intermittent operations, the following approach was employed when selecting operating parameters:

1. Timing of event: Special attention was given to the timing of aquatic habitat events and the relationship to the range of natural flows that could occur during these periods. The temperature ranges at which important life stage events for Walleye and Lake Sturgeon occur were identified, and appropriate operation strategies for such stages were developed. The proposed operating plan outlines a commitment to operational restrictions for key species, which are outlined in Appendix 2 of the proposed operating plan (Located in Annex I).

2. Controlled ramping of flows: To minimize the sudden release of water that occurs during start up, the increase or decrease in flows exiting the turbines will occur gradually over a span of 60 minutes. The maximum ramping rate under the proposed operating regime is 35 m³/s/hr, when outflows change from 15 m³/s to 50 m³/s (and vice versa) during continuous modified run-of-river operations.
3. Limiting maximum turbine flow (Q_{TL}): During intermittent operation, the turbine flow will be set to not exceed an upper limit of 20 m³/s to minimize the amount of flow variability that occurs on a daily basis.

The proposed operating parameters have been designed with the objective of avoiding significant impacts on the downstream habitat. It should be noted that operating parameters for turbine flows depend on the final design and equipment selected at construction. As such, some variation in the identified parameters may occur, however the objectives of the mitigation and ecological flows provided will remain as stated.

Bypass Reach

Upon the start of facility operations, the length of river between the spillways and the end of the tailrace at the Wanatango Falls GS will experience significantly reduced flows compared to pre-construction conditions, due to the diversion of up to 50 m³/s into the powerhouse to generate electricity. The Wanatango Falls GS will be designed and operated to ensure that the minimum environmental flow (Q_{EA}) of 2 m³/s can be met or exceeded at all times.

Should the preferred 'no fishway' design option be pursued, a constant outflow of 2 m³/s will be provided through a pipe installed through the south spillway. Any variation of flow in the bypass reach would only occur gradually in response to natural increases in flow conditions in the river; e.g. during increasingly higher flow events, the amount of water passing over the spillways and down the bypass reach would increase accordingly. However, flows in the bypass reach would not vary on a daily basis due to operations at the Wanatango Falls GS *should the preferred 'no fishway' design option be pursued.*

In contrast, the alternate option of including a fishway would introduce an additional pathway through which flows are supplied to the bypass reach. The amount of water passing into the fishway at any given moment will depend on the water level in the headpond; under modified run-of-river operations, when the water level in the headpond fluctuates by up to 1 m on a daily basis (from 258 masl to the Normal Operating Level of 259 masl), flows in the fishway will vary on a daily basis between 0.6 to 3.1 m³/s, as outlined in Table 9 below.

Table 9: Variation in Flow Passing through the Fishway under Different Headpond Water Levels (note: the information in this table applies only to the alternate option of incorporating a fishway into the project design. The preferred option would not include a fishway).

Headpond level (masl) *	Bottom of fishway entrance (masl)	Water depth at entrance (m)	Flow in fishway (m ³ /s)
261.0	257.5	3.5	5.57
260.5	257.5	3	4.91
260.0	257.5	2.5	4.46
259.5	257.5	2	3.57
259.0	257.5	1.5	3.12
258.5	257.5	1	1.54
258.0	257.5	0.5	0.61
257.5	257.5	0	0.00**

* Under modified run-of-river operations, headpond water levels would consistently fall within the range of 258.0 to 259.0 masl.

** With the low dam option, flows will not accommodate a fishway.

The minimum environmental flow target (Q_{EA}) of 2 m³/s for the bypass reach must be met regardless of whether or not a fishway is constructed. During run-of-river operations for the fishway option, when the headpond is maintained at a normal operating level of 259.0 masl, flow through the fishway will be 3.1 m³/s, which meets and exceeds the required Q_{EA} .

During modified run-of-river operations, when headpond water levels fluctuate between 258.0 and 259.0 masl on a daily basis, there will be periods when the flow in the fishway falls below 2 m³/s. During such periods, the pipe in the south spillway will provide up to 1.4 m³/s to account for the deficit. As such, for the fishway design option only, flows in the bypass reach during modified run-of-river operations may vary between 3.1 m³/s to 2 m³/s on a daily basis.

Variable Flow Reach Downstream of the Bypass Reach

Currently, flows on this reach of river are controlled by the OPG's Frederick House Lake Dam which is operated to provide seasonal storage and flow regulation for the operation of a GS further downstream on the Abitibi River. As a result, the Frederick House River, below the Frederick House Lake Dam, experiences highly variable flows and water levels over the course of any given year. The fluctuations in water levels that would result from operations of the Wanatango Falls GS were therefore compared against existing fluctuations in order to determine the length of the Variable Flow Reach.

Based on the results of unsteady-state hydraulic modelling, the largest daily fluctuations in flows and levels would occur when the Wanatango Falls GS is operating intermittently (see the CPL (2014) report, "HEC-RAS Unsteady Flow Modelling" in Annex I), i.e. when the facility is releasing flows during on-peak hours, but is shut down at night (releasing only the Q_{EA} of 2 m³/s). With a maximum turbine limit of 20 m³/s during intermittent operations (Q_{TL}), a

water level fluctuation of approximately 24 cm would be observed at a point 23.78 km downstream of the Wanatango Falls GS (see the CPL (2014) report, “Additional Peaking Scenarios – Hydraulic Modelling” in Annex I); this location is shortly upstream of Neeland’s Rapids, itself approximately 24 km downstream of the proposed Wanatango Falls GS.

In comparison, based on 15-minute interval level logger data (October 2010 to August 2011), the average 7-day fluctuation under *existing* conditions at the same location is 23 cm. Average daily fluctuations under existing conditions are 5 cm (see the CPL (2014) report, “Additional Peaking Scenarios – Hydraulic Modelling” in Annex I).

As water levels upstream of Neeland’s Rapids currently experience fluctuations of 23 cm on a regular basis, Xeneca therefore put forward Neeland’s Rapids as the end of the Variable Flow Reach (and the downstream zone of influence, as will be discussed in Section 7.1) in a rationale document presented to the MNR on April 16, 2013 (see the letter to Jennifer Telford, MNR, in Appendix C).

5.5 OPERATING PARAMETERS

In establishing the proposed operation parameters for the facility, the environmental aspects outlined in the previous sections were considered so as to provide a reasonable balance among operational constraints, environmental aspects and mitigation of possible impacts.

It should be noted that daily changes in upstream levels and downstream flows related to operation occur only when the facility is in modified ROR operations mode. While the facility is in ROR mode and subject to the amount of existing flow in the river, the upstream levels will be maintained at a constant level and downstream flows will equal the inflow into the headpond.

The proposed operating parameters and estimated water levels associated with the ‘high dam’ and ‘low dam’ options are listed in Table 10.

Table 10: Hydraulic Characteristics for the High Dam Option and Low Dam Option for the Proposed Wanatango Falls GS

	High Dam (preferred option)	Low Dam
Normal operating headwater level	259 masl	257.5 masl
Normal operating gross head	9 m	7.5 m
Length of inundation area	8.6 km	0.5 km
Maximum daily fluctuation	1.0 m	
Normal tailwater level downstream of powerhouse	250 masl	

Operation Parameters

The operating parameters that can be used to manage downstream flows/levels are:

- Upper Turbine Limit (Q_{TL}): During intermittent operation, daily fluctuations in flows can vary substantially, with night-time flow releases going as low as the minimum environmental flow ($Q_{EA} = 2 \text{ m}^3/\text{s}$). In order to minimize the difference between on-peak and off-peak flows, the maximum turbine flow during intermittent operations (Q_{TL}) will be limited to $20 \text{ m}^3/\text{s}$. As such, daily flow fluctuations will not exceed $18 \text{ m}^3/\text{s}$.
- Turbine Ramp Time: This parameter defines how quickly a turbine can shift from being stopped (i.e. not operating) to the desired operating flow. Turbine start up involves going from being stopped to the minimum turbine capacity in a very short period of time. Once the turbine is operating, the turbine capacity can then be increased gradually to the desired operating flow. By increasing the flow gradually, downstream impacts can be reduced. The turbine ramp time for the Wanatango Falls GS is proposed to be 60 minutes.
- Turbine Down Ramp Time: Essentially the reverse of Turbine Ramp Time. The time during which a turbine is taken down to minimum turbine capacity prior to shut down. By decreasing the flow gradually, downstream impacts can be reduced. For the Wanatango Falls GS, the proposed turbine down ramp time is 60 minutes.
- Environmental Flow (Q_{EA}): The amount of flow that is continuously provided to the bypass reach at all times. During intermittent operation when the turbine is stopped, the Q_{EA} constitutes the flow that is provided to the Variable Flow Reach as well. A Q_{EA} of $2 \text{ m}^3/\text{s}$ is proposed for the Wanatango Falls GS. It should be noted that the environmental flow provided through operations cannot be larger than the natural flow upstream in the river.

Potential operational impacts to environmental components vary significantly depending on the mode of operation and flow conditions which are in turn typically dependent on seasonal conditions. For the purposes of the operating plan, the operating seasons have been determined by reviewing a hydrograph of average annual flows and periods of special environmental significance (i.e. fish spawning). Further information with respect to fish spawning and operations constraints are presented in Appendix 2 of the Operating Plan (Annex I). Table 11 summarizes the start and end dates for each season as they relate to the operations of the proposed Wanatango Falls GS.

Table 11: Seasonal Hydrological Periods

Spring	April 16 th – June 1 st (46 days)
Summer	June 2 nd – September 1 st (92 days)
Fall	September 2 nd – November 1 st (61 days)
Winter	November 2 nd – April 15 th (166 Days)

Table 12 provides a summary of the flow hydrology information for the project site, and the proposed operating parameters which have been determined for the facility. It should be noted that the turbine flow parameters may be adjusted during the detailed engineering design and as commercially variable equipment options are selected. These adjustments will not materially or negatively impact the environment beyond the scope of the impacts described in this ER.

Table 12: Wanatango Falls Proposed GS Operating Parameters

Description	Acronym	Project & Streamflow Conditions (m ³ /s)			
		Spring	Summer	Fall	Winter
Streamflow Exceeded 99% of the time	Q ₉₉	0.2	0.1	0.1	0.2
Streamflow Exceeded 95% of the time	Q ₉₅	0.7	0.3	0.3	1.3
Streamflow Exceeded 80% of the time	Q ₈₀	2.6	2.7	1.9	17.0
Streamflow Exceeded 50% of the time	Q ₅₀	23.3	14.6	18.3	35.0
Streamflow Exceeded 20% of the time	Q ₂₀	81.3	40.6	45.2	50.2
Downstream environmental flow target	Q _{EA}	No Int. Op.	2.0	2.0	2.0
Maximum turbine flow capacity	Q _{TMAX}	50.0			
Minimum turbine flow capacity	Q _{TMIN}	15.0			
Limited turbine flow – Modified ROR	Q _{TL}	20			
Long term annual flow, average annual mean	LTAF	33.2			
Median streamflow value	Q _{MED}	27.0			
2 year return period 7-day-average-low flow	7Q2	0.43			
10 year return period 7-day-average-low flow	7Q10	0.14			
20 year return period 7-day-average-low flow	7Q20	0.11			
High streamflow event; occurrence of 1 in 2 yr	Q1:2	180			
High streamflow event; occurrence of 1 in 100 yr	Q1:100	467			
Turbine Ramp Up Time	N/A	60 min.			
Turbine Ramp Down Time	N/A	60 min.			

The frequency with which each type of operating mode is employed will vary seasonally. The proposed frequency of each mode of operation was determined using available hydrology, design parameters and operating restrictions.

Table 13: Operating Mode Occurrence by Season

Operating Mode	Inflow	Spring	Summer	Fall	Winter	Annual ¹	Annual ²
Run-of-River (Continuous Operation)	$>Q_{Tmax}$	33%	15%	16%	21%	20%	14%
Modified Run-of-River (Continuous Operation)	$>Q_{Tmin}$	67%	35%	38%	61%	51%	42%
Modified Run-of-River (Intermittent Operation)	$<Q_{Tmin}$	No int.	49%	45%	17%	28%	17%
Run-of-River (Facility Not Operating)	$<Q_{EA}$	No int.	1%	1%	1%	1%	27%
		100%	100%	100%	100%	100%	100%

¹ Estimated occurrence based on the period of record (1939 – 2010); see the Operating Plan in Annex I

² Estimated occurrence based on 1994 – 2011 flow data from OPG (see the April 16, 2013 letter to Jennifer Telford, MNR in Appendix C, and Section 7.1 below).

5.6 SPECIAL EVENT OPERATION

Operation during special events, such as floods, droughts and safety emergencies may need to deviate from the normal operating parameters to manage flows and mitigate impacts.

- **Normal Flood Operation:** Normal flood events are defined as flows that exceed the maximum capacity of the plant up to and including the one in two year flood event level. Flood events of this magnitude are normal occurrences in the river and present minimal concern for public safety or environmental impacts. During these periods, the facility is operated to manage water levels upstream below the maximum upstream operating water level where possible. This is achieved by allowing any water that is in excess of the maximum turbine capacity to bypass the facility through the spillway.
- **High Flood Operation:** High flood events are defined as events that exceed the one in two year flood event level but are within the safe design level of the facility. Flood events of this frequency are anticipated to occur only infrequently over the life of the facility. The objective of this type operation is to ensure public safety. This is typically achieved by allowing any water that is in excess of the maximum turbine capacity to bypass the facility through the spillway and by operating the spillway and the power generation facility in a manner that achieves this objective.
- **Extreme Flood Operation:** Extreme flood events are defined as events at which the facility cannot be attended safely by operators and where the risk of flooding of the generation equipment is possible. The emphasis on operation is on ensuring public and operator safety. Where advance warning is received that an extreme event may occur, the operation of the facility will be adjusted in advance of the flood peak to maximize its ability to pass water and provide minimal obstruction to the passing of flood waters.

The inundation map and operating curves provided in Annex I show the water depths and/or extents for various flood conditions. The objective of flood operation for the spillway, turbine and bypass is to ensure that the backwater inundation effect is minimized and kept within the projected distance limits.

5.7 COMPLIANCE CONSIDERATIONS

For compliance purposes, the Target Operating Zone will be the legal operating limits as provided in Section 7 of the Operating Plan (see Annex I of this ER) for the Wanatango Falls GS Project. The facility will be considered out of compliance with this Operating Plan if they go outside of the defined operating parameters. Xeneca will be required to submit an Incident Report following standard compliance procedures outlined by MNR whenever the headpond water levels or downstream flow targets deviate outside the Target Operating Zone.

During periods of drought or extreme flooding events equipment constraints may prevent water levels or flows from being maintained within the Target Operating Zone. Xeneca will not be required to submit an Incident Report whenever the operating parameters deviate outside the Target Operating Zone under these conditions. Xeneca will keep on record the occurrence of these events and resultant conditions.

In extreme flood conditions, both spillway gates will be completely lowered and Xeneca will have no ability to regulate the water level in the headpond. For compliance purposes, no Incident Report will be required if flows exceed the design capacity of the facility. However, when inflow rates decrease below the facilities design capacity, Xeneca will become subject to the Target Operating Zone Parameters as discussed above.

Flow through the fishway (if constructed) will depend on the headpond level as discussed in Appendix 3 of the operating plan (Annex I of this ER). At Normal Operation Level (NOL), flow through the fishway is estimated to be 3.1 m³/s. When the plant is operated in the intermittent mode and flow through the fishway is less than 2 m³/s, water will be provided through a pipe installed on the south spillway. Flow will be monitored just below the tailrace area for the minimum environmental flow (Q_{EA}) of 2 m³/s. The facility will be considered out of compliance if the Q_{EA} is less than 2 m³/s. Xeneca will be required to submit an Incident Report following standard compliance procedures outlined by MNR whenever downstream flow is less than 2 m³/s during the intermittent operation of the generating station.

Xeneca has also committed to limit the water level fluctuation to ± 10 cm at the end of the downstream zone of influence (DZOI), about 24 km downstream of the project site, just upstream of Neeland's Rapids. A water level meter will be installed at this location and this information will be closely monitored specifically the first couple of years of operation. After that water level information will be downloaded and provided to the agencies annually.

5.8 EFFECTIVENESS MONITORING PROGRAM

A post-construction environmental monitoring program is outlined in the Class Environmental Assessment for Waterpower Projects and includes assessment of the effectiveness of mitigation proposed, including effectiveness of the proposed operating plan in achieving the objectives outlined in Section 5.5.

5.9 COMPLIANCE MONITORING AND REPORTING PROGRAM

Xeneca will be required to report the following:

- one instantaneous discharge (flow) reading at 15-minute intervals at the project site;
- one instantaneous headpond water level reading at 15-minute intervals;
- one water level (flow) monitoring station just below tailrace area at 15-minute intervals for Q_{EA} compliance;
- one water level monitoring station will be installed at end of DZOI and water level information will be recorded at 15-minute intervals.

For total instantaneous discharge readings, this would be a combination of gauged/measured flows through the generation station and calculated discharge from the spillways and fish passage.

For the purposes of compliance monitoring, the headpond water level will be monitored from a water level gauge located on the upstream side of the powerhouse. The gauge will be connected via real-time Supervisory Control And Data Acquisition (SCADA) system so that compliance can be checked at real time and operation be adjusted accordingly if the facility is outside of the compliance bounds.

Water temperature in the headpond will also be monitored on an hourly basis and this data will be reported with the flow and water level reading data.

This information will be reported annually in a compliance monitoring report to MNR. The information will be provided in an electronic format that can be graphed as well as in a written format.

An out-of-operating zone situation will require the submission of an Incident Report as noted in the post-construction monitoring plan in Section 13.2.

5.10 PROVISIONS FOR PLAN REVIEWS, AMENDMENTS AND PLAN RENEWALS

An amendment to the Abitibi River WMP will be required to include the new facility and operator and to incorporate the approved operation plan for the facility/dam. Aside from consultation undertaken as part of the OWA Class EA process, additional stakeholder

consultation will be conducted at this stage. Once this is completed, Xeneca will adhere to any provisions for plan reviews, amendments and plan renewals required by the Abitibi River WMP.

6. FEDERAL, PROVINCIAL AND MUNICIPAL AGENCY AND STAKEHOLDER CONSULTATIONS

This section presents the methods and scope of stakeholder consultation conducted for this proposed development. For the reader's convenience, a summary of the issues identified during the regulatory agency and public consultation process is provided in tabular format as Table 30 (Identified Issues and Management Strategies), and includes the proposed resolutions to the issues. Additional measures potentially required at the permitting or operation stage are also outlined in Section 7 and 14 of this report.

6.1 CONSULTATION GUIDELINES

One of the main objectives of the Waterpower Class EA process is to coordinate and integrate the requirements of regulatory agencies under the provincial *EAA* and any applicable federal legislation. This involves gathering information from public, private and Aboriginal stakeholders to identify environmental concerns and to inform project decision makers. To meet this objective and to effectively engage with agencies and stakeholders, the Waterpower Class EA builds on the public notification requirements mandated under the *EAA*, and other EA processes (i.e. *LRIA*, *Public Lands Act*, etc.) which recommend that consultation and engagement planning be incorporated as an integral component of the planning process. Xeneca's consultation programs are designed to provide the outreach to identify potential stakeholders, engage stakeholders and provide the means and opportunity for participation in the development planning process. The goals of the consultation programs are to:

- Identify and notify potentially interested and affected stakeholders;
- Identify and assess the range of positive and negative environmental and socio-economic effects of the project;
- Address the concerns of adjacent property owners, local and regional interest groups, individual members of the public and Aboriginal communities that may be directly affected by the project.

To achieve these goals, the consultation programs strive to:

- Identify potentially affected stakeholders;
- Describe how the project may affect the natural and socio-economic environment;
- Provide notification to identified stakeholders as prescribed by the Waterpower Class EA;

- Inform the public, Aboriginal communities and regulatory agencies where, when and how they can engage in the process;
- Identify public and Aboriginal community benefits, concerns and issues related to the project;
- Address public, Aboriginal community and regulatory agency concerns and issues raised regarding the development and operation of the project;
- Document public, Aboriginal community and regulatory agency input and how concerns were addressed, issues avoided and mitigation measures put into place during project planning.

The records of government agency, public and aboriginal community consultation undertaken in the planning of this development proposal are provided in Appendices C, D and E, respectively.

6.2 CONSULTATION STRATEGIES

The consultation programs undertaken by Xeneca were intended to meet all mandatory consultation requirements as well as to assist in the identification and resolution of environmental concerns relating to the project. Xeneca is responsible for all procedural aspects of consultation, including but not limited to, notification, engagement, and consultation with FN and Aboriginal communities. All public consultation events, communications, and advertising with the public at large were coordinated and executed by Xeneca staff. Public and Aboriginal Community Consultation Plans for the proposed development were prepared by Xeneca and are presented in Appendices D and E, respectively. Key components of the consultation plans including the specific tools and approaches to consultation are described below.

6.2.1 General Print and Mailing

General mailing of reports, notices and letters through postal, courier and electronic methods were used. To promote environmental sustainability, the EA team did attempt to minimize printed media; however, hard copy print was used where electronic formats were not guaranteed to reach the intended target audience and where specifically requested.

6.2.2 Print Media

All print advertising in support of the undertaking was circulated in the Cochrane Times Post and Northern Times to ensure broad formal notification of key project milestones and key meeting dates to members of the public. PICs advertisements were circulated in advance of meeting dates. Advertisements were placed in the Cochrane Times Post in both English and French; copies of the advertisements issued in support of this undertaking are presented in the Appendix D.

6.2.3 Web Media

Throughout the planning process Xeneca has provided regular project status updates through emailing and through its website to complement the consultation and engagement program for the project. Key documents (i.e., Project Descriptions, etc.) and notifications were provided through emailing and Xeneca's website at www.Xeneca.com; preliminary distribution of Project Descriptions was through the former OEL-HydroSys Inc. website at www.wesa.ca. Xeneca personnel also employed other social media communication tools such as regular mass e-mails to stakeholders to gather and provide feedback to the public.

6.2.4 Meetings

Direct and/or teleconference meetings with various stakeholders such as municipalities, and public interest groups were a component of the consultation initiative intended to assist in the identification and resolution of environmental concerns. A summary of these events is presented in Section 6.3.3 and 6.4.

Meetings were held with identified Aboriginal communities as part of the business to business aboriginal consultation initiative. As part of these meetings, considerations to the concerns of FN and other Aboriginal communities located in the vicinity of, and/or having a potential interest in the project was afforded. To help facilitate these activities, Xeneca assisted interested Aboriginal communities in accessing government programs and funding.

FN and other Aboriginal communities located within or having traditionally used the project area were identified in the MNR SIP provided to the proponent and through dialogue with the Ministry. A copy of all notifications of the proposed undertaking provided by the proponent to FN and Aboriginal communities is provided in Appendix E. In addition, Xeneca solicited participation of Aboriginal communities in the Stage 2 archaeological studies for the site and requested their participation in project planning. Aboriginal consultation will be a requirement of the Stage 3 Archaeological Assessment which is slated to occur in the spring/summer of 2015.

6.2.5 Public Information Centres (PICs)

In addition to direct correspondence, two (2) PICs were held to collect information on concerns as well as to allow the EA team to inform members of the public and to provide direct and immediate feedback. These PICs were held on March 24, 2011 and June 26, 2012, at the Tim Horton Event Centre in Cochrane, Ontario.

The date and time for the PICs were advertised in local publications, and notification was sent either by electronic mail or regular mail to participating members of stakeholder groups and government agencies well in advance of the scheduled dates. Members of Xeneca staff as well as key experts from the EA team were on hand to answer public questions and to address concerns related to the development.

The PICs featured posters and maps with information about the project, copies of which are provided in Appendix D. Attendees of the meeting were asked to provide their name and contact information, to identify whether they wished to be provided with project updates, and to provide feedback on the project. A summary of these events is presented in Section 6.4.

6.3 GOVERNMENT AND AGENCY CONSULTATION

Xeneca issued a Notice of Commencement for the proposed undertaking on July 29, 2010. A revised Notice of Commencement was issued on November 11, 2010. A copy of each Notice of Commencement is provided in Appendix D. The Project Description document was provided to regulators on March 18, 2011. A complete record of contact and evidence of the provincial and federal government consultation effort is presented in Appendix C.

The EA team invited federal, provincial and municipal agency representations to an EA Coordination meeting on April 20, 2011. This meeting was conducted to introduce the project and collect feedback for regulatory approvals, permitting and requirements and project scoping. Both the municipalities of Iroquois Falls and Cochrane were invited to the meeting, but were unable to attend. Comments and issues raised by the individual agencies are summarized in their respective sections below.

A summary of the consultation events with government regulators and stakeholders is presented below. For the reader's convenience, a summary of the issues identified during the regulatory agency and public consultation process is provided in tabular format as Table 30 (Identified Issues and Management Strategies). The table also identifies whether and how proposed resolutions of the identified issues have been or may be addressed. Additional measures potentially required at the permitting or operation stage are also outlined in Section 14 of this report.

6.3.1 Federal

It is important to remind the reader that the proponent initially approached the EA planning process with a view to presenting one harmonized environmental assessment report document to meet the requirements of both provincial and federal planning processes. Since the enactment of the new *CEAA 2012*, a federal EA is no longer required for this project. Therefore, the information contained in the following section is based on the preliminary project approach and should therefore be considered in light of the regulatory setting it was undertaken in despite the current requirements for EA planning. There is merit in recounting the entire planning process accurately so the entire federal consultation record has been included in order to provide a comprehensive account of the planning process. Additional consultation with federal regulators may be required subsequent to the release of this document and prior to obtaining authorizations or approvals required under applicable federal legislation.

Canadian Environmental Assessment Agency (CEA Agency)

The CEA Agency was provided with an introductory letter and project overview by Xeneca in June 2010. In a July 12, 2010 response to Xeneca, the CEA Agency acknowledged receipt of the project overviews for several Xeneca proposed waterpower projects including the Wanatango Falls on the Frederick House River. The proponent was advised that the Agency would be acting as the Federal Environmental Assessment Coordinator (FEAC) for the proposed projects. The CEA Agency requested a detailed Project Description and clarification as to whether federal funding was being contemplated for the project. The proponent was advised that federal agencies to be contacted through the FEAC would include EC, DFO, Health Canada, AANDC, NRCan, and Transport Canada. Xeneca was informed that documents may be made available to the public, and that information related to the EA will be included in the Canadian Environmental Assessment Registry.

A copy of the project description was provided to the FEAC and each of the above referenced federal agencies on March 18, 2011. The baseline surface water quality investigation report was sent to CEA Agency on March 22, 2011. This report documented the results of the surface water monitoring program undertaken throughout the 2010 field season.

An EA coordination meeting was held on April 20, 2011 at Timmins District MNR but no representative from the CEA Agency was able to attend. In an April 20th email, the agency notified the proponent that triggers were identified under the *NWPA* and the *Fisheries Act* and that Transport Canada and DFO would be acting as the Responsible Authorities (RA) for the project. NRCan, EC and Health Canada would be providing expert advice and information as required.

The proponent was provided with the scoping document for the federal screening of the proposed project on June 29, 2011. The document established the scope of the project and the environmental components to be assessed in the screening report. The scoping document stated that the report must contain enough information to be understandable as a stand-alone document and which will constitute the basis for the RAs' decision under Section 20 of the *CEAA*. The Scoping Document for the Federal Screening of the Wanatango Falls GS on the Frederick House River is provided in Appendix C.

On June 30, 2011, the proponent provided the CEA Agency with an electronic copy of the Public Consultation Plan for Wanatango Falls.

In a letter dated July 12, 2012, after the *CEAA, 2012*, came into force, the proponent was informed that the proposed Wanatango Falls GS would no longer require a federal EA.

Fisheries and Oceans Canada (DFO)

A meeting was held on February 11, 2011, between Xeneca, NRSI, OEL (now BluMetric), DFO and the MNR, to discuss the necessary *Fisheries Act* authorizations for Xeneca's proposed projects (including the Wanatango Falls), potential impacts on fish habitat and habitat compensation.

DFO was provided with the baseline surface water quality investigation report on March 22, 2011.

DFO was in attendance during the April 20, 2011 EA coordination meeting via teleconference, during which its role as a RA under the *Fisheries Act* for the project was confirmed. The department representative stated that in order to obtain Authorizations under the *Fisheries Act*, the proponent would also be required to satisfy the MNRs' Fisheries Management Objectives.

On April 11, 2011, DFO provided an email confirming that the dam would result in the harmful alteration or disruption, or the destruction, of fish habitat (HADD) and that an authorization under subsection 35 (2), 32, 22(3) and 20 of the *Fisheries Act* would be required. These sections relate to the alteration of river flows, sufficient flow of water over the dam, the required flows required for the flooding of spawning beds, and the requirement for maintenance of fish passage. *[Note: amendments to the Fisheries Act came into effect on November 25, 2013. The amended Fisheries Act focuses on protecting the productivity of recreational, commercial and Aboriginal fisheries, and prohibits any work, undertaking or activity that results in serious harm to fish that are a part of, or support, such fisheries. It is anticipated that the proposed Wanatango Falls GS project will require an authorization under subsection 35(2b) of the current Fisheries Act.]*

The department participated in a meeting on April 28 to 29, 2011, to discuss the proposed operational strategies for multiple waterpower projects in the province proposed by Xeneca. For each project, the general layout of engineering, power line and access road routing methodologies and preliminary results, summary of hydrology assessments (including HEC-RAS modeling), environmental aspects (natural heritage) and consultation program summary was presented. Outcomes of this event identified the requirement to meet with DFO and MNR to discuss seasonal flow and water level requirements in order to establish the operating regime for the facility. Meeting minutes are provided in Appendix C.

On May 2, 2011 a teleconference meeting with DFO and the EA team took place to discuss scoping for 2011 field investigations. During the meeting, DFO commented on the importance of replacing critical fisheries habitat that could be lost or altered, acknowledging that it is not always possible to provide compensation on a 1:1 basis. Additionally, DFO cautioned that any compensatory habitat should not create opportunities for invasive species. No invasive species habitats were observed during field studies, and the fishway is not expected to create any potential habitats for invasive species. At the May 2, 2011 meeting, the scoping of future

fieldwork to be completed by NRSI was discussed. The study area was expanded upstream to include the base of the Frederick House Lake Dam because of the potential for dam automation being discussed with OPG, which could allow for management changes that could impact mitigation. The downstream study extent was expanded to include a tributary and large over-wintering pool used by sturgeon. Other topics of discussion included the fish community metrics being collected, tributary sampling, benthic invertebrate sampling, primary productivity studies, channel characteristics, fish habitats, power line and access road study requirements, and valued ecosystem components. The department had not yet completed its review of the federal scoping document when it was released on June 29, 2011, but it agreed to the release provided that any comments they may have at a later date be incorporated into a revised scoping document.

In a July 20, 2011 letter, DFO informed the proponent that the proposed project at Wanatango Falls GS would require one or more Authorizations under the *Fisheries Act*. The agency confirmed that Authorizations will be required under Sections 32 and 35 (prohibiting the destruction of fish by any means other than fishing, and the HADD of fish habitat, respectively). The proponent was also advised that project location and design elements and effective mitigation measures can be applied to satisfy the requirements of *Fisheries Act* habitat provisions under Sections 20(1), 22(1) and 22(3) which concern the obstruction of safe fish passage, the obstruction of downstream passage, and the effects to downstream flows, respectively.

On April 23, 2012 a meeting with DFO and EA team took place to discuss scoping for spring 2012 field investigations.

DFO participated in another teleconference held on April 23, 2012 where the recommendation for spring spawning fieldwork was discussed. DFO indicated it should be sent all updated reports, diagrams, information and drawings relating to the project. DFO supported the discussion regarding further field studies because it would assist with a more informed decision and a better mitigation strategy. DFO explained that FIT projects are placed in a high priority category and that habitat up to the Frederick House Dam should be quantified, especially nursery habitats above the dam site. DFO recommended that tributary habitats should be better defined to inform if fish could move into and out of the main flow.

In a letter dated July 12, 2012, after the *CEAA, 2012*, came into force, the proponent was informed that the proposed Wanatango Falls GS would no longer require a federal EA.

DFO was in attendance at a September 12, 2013 meeting between Xeneca, MNR, MOE and representatives of Taykwa Tagamou First Nation to discuss fish passage, bypass flows and the downstream ZOI. Xeneca noted during the meeting that they committed to the installation of a fish slide near the trash rack at the intake, to provide a means for fish to safely travel downstream past the Wanatango Falls GS. Fish would also be able to travel over the spillway during higher flows, when there is sufficient water passing over these structures, and down the fishway.

On May 16, 2014, DFO was notified of Xeneca's decision to include a no-fishway option in the Final ER.

Transport Canada (TC)

On September 28, 2010, TC provided comments to the CEA Agency on the draft Project Descriptions issued by the proponent. TC noted that where there is a proposal for new works including dams, booms, and water crossings, the *NWPA* will be triggered. TC requested that when required to confirm its role under *CEAA* prior to receiving a Request for Project Review under *NWPA* (from the proponent) it was that advised that navigability inquiry to the Navigable Waters Protection Office be submitted in advance of the issue of the Project Description. The agency could provide an opinion as to the navigability of the waterway and whether or not the *NWPA* will apply to the project. The proponent was advised to include the results of this navigability assessment in the Project Description if possible.

The baseline surface water quality investigation report for Wanatango Falls was provided to the agency on March 22, 2011. In an email dated April 19, 2011, TC noted that the project may cross or affect a potentially navigable waterway, and therefore TC would be acting as a RA. TC is responsible for the administration of the *NWPA* which prohibits the construction or placement of any "works" in, on, over, under, through or across navigable waters without first obtaining approval. TC added that Xeneca would have to submit a *NWPA* application.

In April 2014, the *Navigation Protection Act* came into force, replacing the *NWPA*. The Frederick House River is a non-scheduled navigable water under the new Act, and therefore the proposed project does not automatically require approval from Transport Canada under the *NPA*. Xeneca nonetheless has the option to submit an Opt-in Request to TC to review the associated works under the *NPA*. Xeneca may wish to do this in order to proceed with the added assurance that the work's interference with navigation is sanctioned under the *NPA*.

If Xeneca decides to submit an Opt-in Request and TC decides to accept this request, future consultation with TC will be required as the project moves forward in the development process. Detailed engineering drawings will be required by the Agency before it can proceed with their review under the *NPA*.

Environment Canada (EC)

EC received the baseline surface water quality investigation report for Wanatango Falls GS on March 22, 2011. EC was in attendance during the April 20, 2011 EA coordination meeting via teleconference, during which it was confirmed that it would be providing expert advice and information for the proposed undertaking as required.

On November 4, 2011, EC provided some preliminary comments on the first version of the ER, released in October 2011. EC commented on the proposed timing of site preparation and construction activities as they related to the core breeding bird season and noted that incidental take of migratory birds or their nests and impacts from blasting could disturb breeding birds and is prohibited under the *Migratory Birds Convention Act, 1994*. Additionally, EC identified that an Acid Rock Drainage (ARD) Management Plan be prepared as a mitigative measure, where ARD is determined to be an issue. EC advised that Xeneca determine the acid-generating potential of the bedrock prior to any excavation or blasting activities.

With regard to SAR, EC noted that the rationale for dropping the Rusty Blackbird as a potential SAR is unclear, and that a column for SARA status should be included Annex III. EC also recommended that in the section relating to Common Nighthawk and Olive-sided Flycatcher in Annex III, that the designations should be listed as Threatened nationally, listed on Schedule 1 of *SARA* and are therefore protected wherever they may occur, whether on federal, private or provincial land.

Natural Resources Canada (NRCan)

NRCan attended the April 20, 2011 EA coordination meeting via teleconference. It was noted during this meeting that NRCan will also provide expert advice and information as required.

Electronic correspondence was received from NRCan on August 13, 2012, confirming that the Agency is no longer involved in the undertaking as a result of the 2012 *CEAA*.

6.3.2 Provincial

Various provincial ministries were provided copies of an introductory letter, a Notice of Commencement, a revised Notice of Commencement, Project Description document and a copy of the Draft ER. A record of government agency consultation is provided in Appendix C.

The following is a synopsis of the consultation undertaken with provincial agencies.

Multiple Agency Consultation Meetings

Throughout the development of the Final ER, a number of meetings were held by Xeneca in collaboration with regulatory authorities, and these meetings often took place with multiple agencies participating in a single meeting. The following section describes the multiple agency meetings held in detail, and in the chronological order in which they occurred. Communications with individual agencies related to issues are covered under the individual Ministry headings below. All agency meeting minutes are included in Appendix C.

An EA coordination meeting was held on April 20, 2011 at the MNR Timmins District office. A number of topics were discussed at the meeting, a summary of which is provided below.

- A synopsis of the project site including a second development option which would extend the zone of inundation was discussed.
- Confirmation of a harmonized EA process to integrate federal and provincial EA planning requirements was given. It was agreed that the planning requirements under the MNR- RSFDP for the power line corridor could be harmonized under the Class EA for Waterpower Projects.
- It was noted that although there may be gaps in the data collected to date, the proponent was committed to completing any further studies prior to the permitting phase. MNR responded that there remained a public consultation requirement to present the findings of these investigations which could otherwise lead to a Part II Order request.
- The Ministry reminded the proponent of the FN rights to consultation, noting that the absence of a consultation record could lead to a Part II Order request, stating that the MNR did not recommend the proponent's present approach to Aboriginal consultation.
- MNR requested additional detail regarding the power line mapping, since the line crosses two Ministry districts, additional public consultation may be required.
- The MNR identified both Iroquois Falls and Cochrane as PIC locations, and noted that the proponent should seek to include additional project information in any future PICs. The MNR offered to facilitate public consultation through an internal stakeholder distribution list.
- Legislation, permits/approvals and field studies were also discussed during the coordination meeting.

On April 28th and April 29th 2011 a meeting to discuss the proposed operational strategy for the facility was held with district and regional level staff of the MNR, MOE and DFO. The proponent presented the conceptual engineering design for the site, and the proposed Operation Plan, which included maps of the upstream inundation zone of influence for the Wanatango Falls GS site. During the meeting, it was noted that two design options were being considered due to land ownership issues.

Xeneca advised that the headpond inundation area and reach were further evaluated with the additional bathymetry survey information collected after the EA was submitted. The updated HEC-RAS modeling results verified that the inundation area was within 8.6 km, which is consistent with the ecological study area present in the ER. Additional verification studies were also committed and executed.

On August 21, 2012, an inter-agency meeting was held in Timmins. The agenda for the meeting was to follow up on agency comments made, to discuss additional studies completed, and to discuss potential mitigations. Responding to agency comments on the downstream ZOI, additional aquatic and terrestrial habitat studies were completed to include fast-water sections of river as far as 32 km downstream of the project site. Xeneca developed an updated operating plan that provided detailed monitoring to illustrate the effect of operations on river flow and

potential environmental effects. Xeneca stated that they had completed ongoing dialogue and data exchange with OPG, owners of the Frederick house Dam upstream. Operation of this dam creates irregular flows. Xeneca acknowledges that during extreme low flow events, there may be periods where operations may need to be shut down when storage is limited. It was established through detailed study that Walleye, Sauger and Goldeye move through the site, and passage in both upstream and downstream directions establishes that the site is not a barrier to fish movement. Xeneca stated they had committed to a temperature-based operational regime that would constrain operations during sensitive fish spawning periods.

MNR stated that they required sufficient information and analysis to support making decisions with respect to dispositions associated with the power line. Xeneca stated that for power lines, they had planned future field verification for sensitive areas, to determine if SAR are present, and that they would work in accordance with SAR legal requirements. To aid in assessment, ecologically sensitive areas have been identified through information provided by MNR, and through aircraft reconnaissance, terrestrial assessment and wetland studies. Xeneca stated that regarding consultation efforts, Xeneca has held an additional Public Open House, and has liaised with Taykwa Tagamou Nation (TTN), Wahgoshig FN, and Wabun Tribal Council, the delegated authority for Flying Post, Mattagami and Matachewan FNs.

Additional habitat work was completed in 2011 and 2012, to fill data gaps that existed in the 2011 Draft Report. Special operating restrictions for walleye spawning in the spring were discussed as a mitigation measure.

On August 31st, 2012, an agency meeting was held in Timmins. The focus of the meeting was to address how agency and stakeholder concerns were addressed since the initial release of the ER in 2011. As a response to MNR's concern over the lack of accurate flow data, Xeneca provided detailed modelling to illustrate the effect on river flow, and potential environmental effects. Xeneca outlined that ongoing dialogue and data exchange with Ontario Power Generation had been occurring, and explained that with limited storage during extreme low flow events, there may be periods where operational shutdowns may occur. Field investigations concluded that three species of fish were able to pass upstream at the proposed GS site, and Xeneca stated that an option to provide fish passage at the GS was being investigated. Xeneca also outlined a temperature-based operating regime that would constrain operations during sensitive spawning periods. The analysis and evaluation of power lines was discussed; Xeneca's measures to evaluate the power line options have included evaluation and avoidance of ecologically sensitive areas, aircraft reconnaissance to aid in terrestrial assessment, and future field verification of sensitive areas that would aid in working with SAR legal requirements. Regarding concerns over adequate consultation, Xeneca explained they had conducted additional Public Information Centres and continues to advise and consult with First Nations involved in the process. Additional studies that had been conducted in 2011 and 2012 were outlined to include additional habitat studies, Stage 2

archaeology, revised operating plans, bathymetric and hydraulic modelling of downstream areas, operating scenario graphs, downstream features identification and water quality modelling.

On April 3, 2013, an inter-agency teleconference was held, to clarify the requirements for road assessment under the Class EA for Waterpower projects. Xeneca indicated that Northern Biosciences and KBM were working in collaboration to conduct a detailed desktop review of lines and roads, to be followed by spring field work in 2013, to identify areas of significant habitat and potential impacts. WHS would conduct on the ground Stage 1 and 2 assessments for the road and power line corridor (and possibly Stage 3 assessments as well). Three sites requiring Stage 3 assessment were identified for Wanatango Falls GS. For one of the sites, a mitigative approach would occur, but for the remaining two sites, Stage 3 and possibly Stage 4 assessment would be required. MOE indicated that the proposed approaches for road assessment appeared robust, and that MNR should also be kept apprised of approaches since they were unavailable for the call, but were the ultimate authority for the Crown Land dispositions required for the line and road components.

On April 17, 2013, at the all-agency meeting was held in Timmins. MNR mandated items up for discussion included the proposed operating plan, the downstream ZOI, minimum flows and fish passage, environmental characterization and modelling, temperature and sedimentation, roads and power line assessment, water management planning, First Nations consultation, archaeological studies, surface water quality modelling and consultations with riparian landowners. Xeneca proposed increasing ramping rate to 60 minutes. Active areas of erosion were discussed as they related to operations. The potential effect of pulsing and its impacts upon fish passage were discussed. Flow volumes and the minimum fish passage value of 2 m³/s was discussed. Xeneca committed to installing a monitoring station at Neeland's Rapids to ensure that minimum flow requirements were being met, and a minimum flow of 4 m³/s, as measured at Neeland's Rapids, was being met. MNR and MOE committed to review of the DZOI information provided and responding to any additional questions or concerns. An additional meeting and follow up call was scheduled to attempt to reach consensus on the required bypass flows for fish passage. One action item was to provide sedimentation and temperature reports to the regulatory agencies for review. Regarding archaeology, the amount of information to be included within the EA and the confidentiality of the site knowledge was discussed. The requirement for a construction camp and appropriate sewage disposal mechanisms were discussed. Xeneca committed to providing an updated operating plan prior to the release of the Final ER. MNR and MOE agreed to review the materials associated with the DZOI designation, and to get back to Xeneca if they had any additional questions or concerns to schedule a follow-up meeting. A follow-up meeting was planned to occur in the next several weeks. Temperature and sedimentation reports were to be sent to MNR and MOE representatives. Agency representatives would provide further clarity to the proponent regarding how archaeological sites would be reported in the Final ER. Land use permit holders and land owners were to be identified and this information was to be sent to the proponent, to determine future

required actions. Minimum flow requirements for fish passage were to be discussed in a future meeting planned with DFO. Land use permit holders were later identified in an email sent to Xeneca from MNR on July 10, 2013. They included four Land Use Permits held by Hydro One, and one Land Use Permit which was held by a private individual for a recreation camp.

On September 11, 2013, Xeneca hosted a site visit with the Abitibi WMP Standing Advisory Committee. Attendees from TTN, the MNR and NRSI participated. The field visit offered a good opportunity for all parties to go to the site and discuss specifics regarding fish passage, design and layout, and flows.

On September 12, 2013, Xeneca met with representatives from MNR, DFO, MOE, TTN and their respective consultants, and with representatives of the firms assisting with completion of the Final Environmental Assessment document. The focus of the meeting was to discuss fish passage and bypass flows that could be provided with respect to the economic constraints of the project. MNR clarified that the 6 m³/s being requested for the bypass would only occur at certain flows.

A design criteria table that outlined fish passage constraints based on flows was presented. Xeneca explained that fish larger than the trash rack grating would pass downstream through the fish slide. Fish may also pass downstream via the spillway and overflow weir. Key periods for passage were discussed and noted as including April 1st to June 30th and July 1st to November 30th. It was speculated that for walleye, the observed May/June passage events could be tied to spawning but that the later June/July/August passage movements could be a function of post-spawning foraging. It was noted that mortality for smaller fish is significantly reduced if they pass through the trashrack and through the turbine, and that fish can also pass over the overflow weir, and at times, fish may travel downstream over the spillway.

Xeneca committed to run-of-river during the critical spring period. Discussion ensued regarding whether habitat fragmentation would result, whether fragmentation would have unacceptable results, and what fish movements are critical/incidental. Xeneca stated that the upper stretch of the river is severely impacted by the Frederick House Lake Dam, and questioned the need to ensure fish could gain access to the upper 9 kilometers of river.

The differences between a permanent minimum flow of 2 m³/s versus 6 m³/s was discussed with regard to the impact on the economic viability of the project. Xeneca stated that by making modifications to the bypass channel, fish passage could be achieved at a flow of 2 cms, and that 6 cms could be provided at critical periods if necessary, if increasing flows are thought to be a trigger for fish movement.

According to Xeneca's studies, similar habitats occur both upstream and downstream of the proposed project site.

DFO stated that they accepted Xeneca's design for upstream fish passage, but that downstream fish passage was still questionable. Xeneca committed that a fish slide to provide downstream fish passage would be provided at the trash rack. In May of 2014 Xeneca changed their position with respect to fish passage based upon further discussion and consultation with TTN, and advised the regulatory agencies that a no fish passage option was the preferred option to be presented in the ER.

Prior to Xeneca's recent decision to incorporate a no-fish passage option into the Final ER based upon consultation with TTN, Xeneca had committed to development of a fish compensation plan, to be developed in conjunction with regulatory agencies and TTN through further discussions. The focus of fish passage at the Wanatango Fall GS initially was to maintain connectivity for Lake Sturgeon between the upstream and downstream habitats, and to maintain passage during critical spring flows, between April 1st and June 30th (this currently pertains only to the inclusion of a fish passage structure). With the no fish passage option, connectivity for downstream passage will be maintained through use of the fish slide only, in combination with the overflow weirs. Xeneca has committed to ROR operation during the critical spring period.

Fish studies conducted in 2012 provided evidence that two species of fish were able to pass through the project site (Lake Sturgeon and walleye), while seven species pass downstream at Zeverly's Bridge.

The 2012 data collected from telemetry studies showed that tagged fish traversed several sets of rapids and passed into the headpond area of the project.

The importance of incorporating Traditional Ecological Knowledge into adaptive management strategies in development of an appropriate compensation plan was discussed at the September 12th meeting. Xeneca committed to providing TTN consultants with all hydrology and flow variation information and to advise on other options open for consideration. Discussion regarding the location of suitable enhancement habitat took place, with some controversy about whether replacement habitat should be situated upstream or downstream of the dam. Upstream of the dam, appropriate sturgeon spawning habitat has been identified, and downstream, a major spawning habitat had been identified at Neeland's Rapids. Xeneca had committed to sending TTN's consultants information on the fish passage design and to advise on what other options had been considered.

At the conclusion of the September 12th, 2013 meeting, Xeneca committed to providing additional information on providing fish passage only a portion of time, when storing water, and to developing a model on channel optimization that provides depth, flow and velocity that was later added into the design table, along with adaptive management and post-development modelling, based on input from DFO. TTN stated they would develop a traditional knowledge questionnaire, in consultation with Xeneca and the agencies, and provide a traditional knowledge study quotation to Xeneca.

Xeneca was to provide to TTN officials a design of the fish slide along with provisions for downstream passage and mitigation plans to offset any loss of downstream passage, in addition to a monitoring program that would outline the effectiveness of fish passage and mortality. Contingency plans were also to be prepared to outline alternatives if fish passage methods are not effective and are found to be affecting fish productivity.

Xeneca committed to another meeting with TTN representatives to discuss the effects report, socio-economic impacts, and to discuss the monitoring and compensation plan details.

Xeneca committed to another meeting with the regulatory agencies including DFO, MNR and MOE to discuss the downstream ZOI (DZOI).

Xeneca also committed to installation of monitoring equipment at the Highway 11 Bridge to assess if water level fluctuations could impact burial sites downstream at the confluence of Abitibi River, and to prepare a flow rating curve for Neeland's Rapids.

Xeneca committed to consulting with the Abitibi Water Management Planning Standing Advisory Committee post-EA regarding safety provisions that could be put into place when the water flow increases from 2 to 15 m³/s. Following completion of the EA, these provisions could be incorporated into the Wanatango safety audit.

Later in the consultation process, based upon ongoing discussion with TTN, Xeneca decided to pursue a no fish passage preferred option for inclusion in the final ER. Further details of these consultations are described in Section 6.6. under TTN's Summary of Engagement (below) and in the Inter-agency Meetings section.

Ontario Ministry of Natural Resources (MNR)

The MNR, owing to its mandate to manage natural resources and to promote renewable energy in the province, has been engaged on the proposed project from an information request, baseline research permitting, and environmental assessment planning perspective.

Prior to the EA planning phase of the project, the MNR, Cochrane District office, provided instructions specific to site release issues Site 4MD02. The MNR provided field investigation scoping guidance to the EA team throughout 2010-2011 and detailed issues pertaining to the project that the ministry would like to see addressed through the environmental assessment of the proposed project. A summary of key ministry correspondences and communication is provided below:

- July 18, 2007, the proponent received confirmation of receipt of the Non-Competitive Site Release Application for Waterpower for the Wanatango Falls GS site.

- On January 22, 2010, Xeneca informed the MNR that they would initiate scoping of environmental issues in preparation for field studies scheduled in the spring of that year, and requested a Site Description Package for the proposed project site.
- Additional correspondence between the Ministry and the proponent regarding project status during February 2010.
- April 12, 2010, comments from MNR to EA regarding field study methodology in support of scientific collectors permit.
- April 28, 2010, correspondence from MNR noting that proponent should be in receipt of SIP, and a request for an update on FN consultation.
- September 24, 2010, teleconference call with the proponent and EA team members to discuss endangered species in the project area. Subsequent to the background review, 2010 field investigations and MNR SAR mapping that there were as yet no known or confirmed SAR in the study area, as such no permits under the *ESA* were presently required. However, the presence of Lake Sturgeon below Zeverly's Rapids and Wanatango Falls means that they must be included as a VEC for this project. MNR has conducted radio tagging monitoring of 90 Lake Sturgeon from this population to date. No studies have been conducted to confirm the limit of the upstream migration presently believed to be Zeverly's Rapids. Upstream migration of the Lake Sturgeon over the falls has been confirmed through telemetry studies. Further discussions ensued relating to migration and telemetry studies; meeting minutes are provided in Appendix C.
- January – February 2011, correspondence between members of the EA project team and the Ministry of Natural Resources (MNR) for natural heritage information requests and applications for Scientific Collectors Permits.
- May 11, 2011, clarification requested from MNR regarding proposed operational plan.
- June 15, 2011, operational discussions between the proponent, MNR, and the EA team.
- May 15, 2012 teleconference meeting with the Cochrane District of the MNR to discuss project updates and changes within the company.
- May 18, 2012 to discuss biological scoping and operating plans.
- August 21, 2012 meeting with MNR, MOE, DFO, and EA Team (see multiple agency consultation meetings for further details). The MNR was provided with a copy of the baseline surface water quality investigation on March 22, 2011.

The MNR met with members of the EA team for field studies on March 24, 2011, and advised that FN consultation in advance of any telemetry (radio tracking) studies is recommended. Ministry staff was in attendance at the March 24, 2011 PIC.

An EA coordination meeting was held on April 20, 2011 at the MNR Timmins District office. Details are provided in the Multiple Agency Consultation Meetings section (above).

On April 28th and April 29th 2011 additional multiple agency consultations took place.

At a June 15th, 2011 meeting, the ministry was presented with the updated operational strategy for the facility and preliminary results from the 2011 field season. The ministry was then engaged in discussions on what operational or design parameters could be modified in order to avoid or mitigate impacts to identified habitat features and what further work would be required to satisfy data collection requirements prior to the completion of the EA and permitting.

On June 30, 2011, MNR was provided with a copy of the Public Consultation Plan for Wanatango Falls GS. On September 6, 2011, the MNR received a copy of the Aboriginal Consultation Plan.

In October 2011, the first version of the ER for the proposed Wanatango Falls project was distributed for regulatory review. On November 4, 2011, the MNR provided proponent its review comments for the Environmental Report.

During the April 23, 2012 meeting, the MNR emphasized the need for additional field work to address gaps in biological data and information for the proposed project. The MNR also noted that Lake Sturgeon spawning needed to be investigated, as there have been reports of Lake Sturgeon presence in the river, but their distribution relative to the project site and the location of their spawning activities had not been confirmed. The MNR recommended that tributaries be studied as well, in order to determine whether they contain suitable aquatic habitat and whether fish can move into and out of the Frederick House River.

Three MNR staff members attended the June 26, 2012 PIC in Cochrane. Ministry representatives expressed concerns about the potential impacts of the Wanatango Falls GS on the river in light of the Frederick House Lake Dam operations. MNR staff also expressed concern that some of the rapids downstream could be further dewatered, resulting in fish being stranded and a reduction in benthic production. An MNR representative noted that he was unable to fully understand impacts to downstream features based on the information provided by the proponent through its hydraulic modeling exercises. It was suggested that river cross-sections showing the changes to wetted perimeter for each season would be helpful.

On August 31st, 2012 MNR participated in an inter-agency meeting (details are included in the Multiple Agency Meeting Section above).

In early 2013, MNR and Xeneca had extensive correspondence and discussion regarding the intention for fish passage and the criteria influencing passage. MNR indicated that the rationale for inclusion of fish passage in the project design was that the 9.4 km river segment upstream of the proposed facility represents 27% of the reach that sturgeon are known to use in the river, and contains 3 of the 9 fastwater features. Four fish species are known to pass through the site as evidenced by telemetry studies, but their exact reason for passage is unknown. MNR indicated they considered the provision of safe and successful fish passage necessary, to ensure the habitat does not become fragmented and connectivity lost.

On April 16, 2013, Xeneca provided written correspondence to MNR in response to MNR's concerns regarding existing flows at the Frederick House Lake Dam, the proposed low flow operations, and concerns regarding fish stranding at Neeland's Rapids as a result of operations. Xeneca stated that during intermittent operations, 2 m³/s would be released from the Wanatango Falls GS during the night; during this time, flows would not drop below 5-6 m³/s at Neeland's Rapids and thus remain greater than the Q80 baseflow of 4 m³/s at all times. Xeneca believes that the potential for fish stranding at Neeland's Rapids is very low, and Xeneca proposed to monitor this site during all intermittent operations during the first year of operation. In this correspondence, Xeneca also committed to run-of-river operations during spawning, and explained their reasoning behind the conclusion that the end of the ZOI is Neeland's Rapids. In response to MNR's concern that the ongoing flow fluctuations could impact shorelines or other habitats, Xeneca noted that fluctuations of 23 m³/s or more regularly occur on the river, and that operating within a band of +/- 10 cm compliance at Neeland's Rapids would be within the natural range of variation for this river, and would therefore not result in shoreline impacts.

On September 12, 2013, MNR participated in a multiple-agency meeting. Details are provided in the Multi-Agency Consultation Meetings section (above).

On April 17th 2014 MNR participate in an all-agency meeting. Details are provided in the Multiple Agency Consultation Meetings section (above).

On January 29th 2014, MNR responded to Xeneca's April 13, 2013 letter regarding resolution on the DZOI. MNR expressed their concern that the minimum and maximum proposed turbine flows, which are scheduled to range from 15-50 m³/s, would negatively impact upon fish and benthos production in the stretch of river ending at Neeland's Rapids. The Ministry expressed concern that the maximum and minimum proposed turbine flows of between 15 and 50 m³/s respectively could have the potential to negatively affect fish and benthos production due to water level changes at Neeland's Rapids. MNR disagreed that the ZOI ends at Neeland's Rapids and may stretch further down the river, therefore they requested to Xeneca to include a monitoring plan in the Final ER that would evaluate the actual variation in water levels downstream of Neeland's Rapids. MNR also stated that the distance between the Frederick House Lake Dam and the confluence of the Frederick House and Abitibi Rivers was incorrectly stated as being 100 km when in reality it is 75 km. MNR also clarified that the 2 m³/s flow from the Frederick House Dam did not represent the Q80 flow, and was approximate. MNR requested clarification about whether a 4 m³/s flow at Neeland's Rapids was an estimated flow, or whether it had actually been measured. MNR suggested that the final ER include a monitoring plan that would measure the actual variation in water levels downstream of Neeland's Rapids at maximum and minimum flow. They also stated that the leakage flow from the Frederick House Lake Dam would change as the reservoir level changes and that this flow should not be expected to remain a constant.

On March 10, 2014, Xeneca acknowledged and responded to the January 2014 letter. Xeneca committed to adding another water level monitoring station downstream of Neeland's Rapids and committed to the water level monitoring required to demonstrate compliance of low levels and fluctuations. Special operating restrictions have been agreed to during sensitive periods and Xeneca has committed to adaptive management based on monitoring results. Xeneca acknowledged the measurement error with respect to river distances. The Q80 value was referenced based upon a flow frequency exceedance table that was developed utilizing data from OPG. Xeneca concurred that flow at Wanatango would include all tributary flows below the FHLD, and would vary with weather conditions. Such flows would be beneficial but would not impact upon the analysis of flow at Neeland's Rapids since such flows would continue after project development. Water level monitoring data supplied was for the worst-case scenario. Xeneca confirmed that the flow value at Neeland's Rapids has not been measured and is not required. Low flow operation, fish stranding and spawning were not addressed in MNR's response, so Xeneca assumed that MNR had no outstanding concerns with these issues.

In response to comments forwarded by MNR on May 20, 2014, on the draft Operating Plan issued the previous month, Xeneca clarified the use of the term modified run-of-river to describe the proposed operations at the Wanatango Falls GS. Xeneca confirmed that the 'worst case scenario' for ramping up and ramping down at the proposed facility would be a change in downstream flows from 15 to 50 m³/s (and vice versa) over a period of 60 minutes, adding that these flows are well below the channel-forming flows that would pose a risk to channel stability. Xeneca noted that, after facility commissioning, water levels would be monitored at Neeland's Rapids to verify that the compliance limit of ± 10 cm is not exceeded, and that the operating profiles would be adjusted if required to stay within the limits.

On May 16 2014, Xeneca notified MNR that they would be including a preferred no fish passage option in the Final ER.

Ontario Ministry of the Environment (MOE)

The MOE was provided with an early information package from the proponent in June 2010. On August 12, 2010, the proponent received a letter from the Regional EA Coordinator of the Technical Support Section, Northern Region, in response to the information package. Within this correspondence, issues pertaining to the "managed" status of waterways, Notice of Commencement requirements and requested revisions, the coordination of planning meetings, suggested MOE contacts for the project, Aboriginal and public engagement and consultation, permitting, and issue resolution requirements were identified. The proponent subsequently replied to the correspondence via email on September 30, 2010, clarifying a number of issues, and as advised issued a Revised Notice of Commencement in November, 2010.

The baseline surface water quality investigation report was sent to MOE in March 2011. MOE was in attendance during the April 20, 2011 EA coordination meeting, during which they noted that the accelerated timeline for the EA required a minimal level of field investigations and evaluation in order to satisfy regulatory requirements. The Ministry commented that the proponent's approach to commit to the investigation of outstanding issues in the ER may not satisfy the requirements of the Class EA. MOE clarified that there remained a public consultation requirement to present the findings of investigations and that not doing so could lead to a Part II Order request. The MOE also suggested that the local landfill may not have sufficient capacity to accept construction waste that would be generated by the project, advising the proponent to investigate alternatives. Meeting minutes are provided in Appendix C.

On April 28th and 29th 2011, the MOE raised the issue of mercury levels in fish tissue and results from the 2011 tissue sampling investigation, recommending that data on mercury levels be made available for public use.

The Ministry was in attendance at the June 15, 2011 meeting and was presented with the updated operational strategy for the facility.

A copy of the Public Consultation Plan for Wanatango Falls was provided to the MOE on June 30, 2011.

The first Wanatango Falls ER was submitted to regulatory agencies in October of 2011. Following its release, in early November of 2011, MOE received several Part II Order requests under the Class EA for Waterpower Projects. These requests, otherwise known as bump-up requests, allow interested parties who are unsatisfied with a project's assessment and evaluation process to request that an individual EA be prepared for the Project. In November of 2011, the MOE received a Part II Order request from Taykwa Tagamou Nation. Similar requests were received from Wahgoshig FN, the Ontario Rivers Alliance and one other member of the public. Subsequent to these requests being received, on April 3, 2012, Xeneca elected to withdraw its Notice of Completion, in order allow for more work and further improvements before reissuing a revised ER and Notice of Completion.

On April 11, 2012, the MOE acknowledged receipt of the proponent's April 3rd letter of Notice of Completion withdrawal. The MOE informed the proponent that once the additional studies are completed and documented in accordance with the Class EA requirements, the proponent would need to re-issue a new Notice of Completion and a new 30-day review period of the ER would be required. The MOE also responded to Taykwa Tagamou Nation on April 11, 2012, indicating that Xeneca had decided to withdraw their Notice of Completion for the project in early April of 2012.

With the termination of the Class EA process, the MOE stated that a decision about the Part II Order requests would no longer be required.

MOE participated in meetings with Xeneca on June 15, 2011 and August 21, 2012. Topics of the August 21st meeting included discussion about the extent of the DZOI, the approval process for the power line (RSFD Screening as opposed to coverage within the EA), the Abitibi River WMP, habitat mapping and discussion regarding the flow data provided by OPG. The DZOI has been confirmed to be at the crest of Neeland's Rapids.

MOE participated in the inter-agency meeting held on **September 12, 2013**, as discussed under the inter-agency consultation meetings section (above).

On August 27, 2013, Xeneca wrote to the MOE, advising them of the receipt of a partial clearance letter from the MTCS, received on August 12, 2013. Xeneca stated their intention was to comply with the letter, noting that they planned to proceed with Stage 3 (and where appropriate) Stage 4 archeological work at Wanatango Falls GS in the spring of 2015. Xeneca advised MOE that they had recently met and consulted with a number of FN communities in proximity to Wanatango Falls GS in early August of 2013 at Cedar Meadows in Timmins, and indicated that a ceremony was planned for the fall of 2013 with these communities, and that the assistance of community members was being requested for the Stage 3/4 archaeological work to commence. The ceremony did not occur that fall but consultations regarding the archaeological work to commence in the spring/summer of 2014 are continuing.

On September 12, 2013, MOE representatives participated in an all-agency meeting. A description of these discussions is provided under the Multiple Agency meeting section.

Ontario Ministry for Municipal Affairs and Housing

In a December 3, 2010 email, the Ministry of Municipal Affairs and Housing stated that it did not need further notification in the EA planning process for the Wanatango Falls GS project.

Ontario Ministry of Northern Development and Mines (MNDM)

In correspondence dated July 8, 2010, the MNDM provided a response to the review of Xeneca's project proposals. Several mining claims were identified within the proposed project area; #1154612, #1154613, #1154614, #1190501, #1154618, #1154617, and #1154616) near the site location mainly claimed by one private owner with whom Xeneca has entered into information sharing and other discussions. Two mining claims, both south and north of site location, are being explored by Tres-Or Resources Ltd. for nickel, copper and platinum group elements (PGE). All mining claims are registered until at least 2014.

MNDM detailed the status of land tenure and mining-related hazards at the dam sites, whether past mineral exploration activity has been reported in the vicinity of the sites, and conditions in regards to various policies and acts. MNDM indicated that a similar review will be required for the connection corridors for all the projects as they range in length from 1.1 to 22 km.

Further, changes to the *Mining Act* in Ontario now recognizes waterpower and other resource development and provision exists for the claim holder to cede first right of refusal on surface rights to the developer of a renewable energy facility (note excerpts from the *Mining Act* and the attached letter from MNDM stating the terms of the Act as it applies to renewable energy development, Appendix C).

As of 2008, the surface rights of an area along the Wanatango Falls GS location were withdrawn from prospecting, staking out, sale or lease in accordance with the terms of Order No. W-P-04/08, under Section 35 of the *Mining Act*. The area was withdrawn from mining activities by the MNR as the proposed site for the Wanatango Falls waterpower project includes a dam and generating station. The site will be subject to long-term waterpower lease agreement via the *Public Lands Act*.

Ontario Ministry of Energy (ME)

A ministry representative was in attendance for the April 2011 EA coordination meeting, during which it was noted that, at that early stage in the process, the ministry's role in the undertaking was as an observer only. The ministry's responsibilities lie in the FIT contracts and ensuring that timelines are kept.

Ministry of Transportation

On March 15, 2011, Xeneca sent an email invitation to the Ministry of Transportation, inviting them to attend the PIC on Thursday March 24, 2011, in Cochrane, Ontario. On March 23, 2011, a representative responded regarding obtaining printed information. The representative attended this PIC. No comment form was received from the Ministry of Transportation at this PIC.

Ministry of Tourism, Culture and Sport (MTCS)

In October 2011, the first ER for the proposed undertaking was submitted for review. On November 4, 2011, the MTCS provided the proponent with its review comments on the proposed Wanatango Falls GS project with regards to cultural heritage resources, built heritage resources and archaeological resources (see Appendix C).

In May 2012, the report detailing the findings of the Stage 2 Archaeological Assessment was submitted to the MTCS as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. In a letter dated June 20, 2012, the MTCS confirmed that the fieldwork and reporting for the archaeological assessment were consistent with the Ministry's 2011 Standards and Guidelines for Consultant Archaeologists and the terms and conditions for archaeological licenses. The MTCS further confirmed that the Stage 2 report would be entered into the Ontario Public Register of Archaeological Reports (see Annex V for the Stage 2 report and MTCS correspondence).

In an August 12, 2013 letter, the MTCS granted a partial clearance for construction to Xeneca, following the submission of a Revised Stage 2 report on May 11, 2012. The ministry indicated that, because the construction site is greater than 300 m from the closest archaeological site, they concurred with the conclusion that construction activities can precede prior to a Stage 3 archaeological assessment without affecting the archaeological sites.

6.3.3 Municipal

The Notice of Commencement was provided to the Town of Iroquois Falls and the Town of Cochrane.

The proponent met with the mayor and council of the Town of Iroquois Falls on November 22, 2010 to present a briefing on the proposed project. Information presented in PowerPoint included:

- Background on Xeneca
- Xeneca's consulting team members
- Benefits of waterpower
- Overview of the Development Process
- Overview of the Class EA process
- Project design concept
- Economic impacts

The proponent met with Cochrane Town Council on March 23, 2011 to present a briefing on the proposed undertaking. The Council was provided with a copy of the Project Description in advance of the meeting. Xeneca presented a project briefing and overview entitled "Waterpower on the Frederick House Addressing Multiple Objectives". Members of council asked specific questions concerning revenue and potential impact throughout the process. On March 25, 2011, Cochrane Town Council provided Xeneca with minutes from the meeting including a resolution to support the project.

On August 2, 2011, the proponent sent a letter to the mayor proposing a meeting in order to brief the mayor and the council on the upcoming distribution of the Environmental Report and to discuss any relevant issues. A second meeting was held with the Cochrane Town Council on November 2, 2011 to provide an update on the progress of the project. Following up on one of the topics discussed during this meeting, on November 23, 2011, the proponent sent the mayor a package of materials related to the Gross Revenue Charges (GRC) applied to Waterpower sites. The proponent requested that they be copied on any correspondence with government agencies regarding GRC payments so that they may lobby more effectively on behalf of the Council.

6.4 PUBLIC CONSULTATION

Public consultation was undertaken by the proponent in the form of notifications distributed by mail and email; advertisements in printed media; updates on the proponent's website (www.Xeneca.com), and public meetings.

Two Public Information Centres (PICs) in Cochrane on March 24, 2011, and June 26, 2012. The PICs were advertised in local publications at least ten days prior to the event. Copies of the print advertising undertaken to support the PIC, as well as a record of consultation compiled by the proponent are provided in Appendix D. Private information of specific individuals (e.g. phone numbers and home addresses) were redacted from the correspondences for privacy reasons.

Landowners in proximity to the proposed project site issued were contacted via post on October 14, 2010, and provided with project details along with an invitation to contact Xeneca if they wished to set up a meeting. A letter dated October 15, 2010 was provided to the following recipients with information regarding a proposed PIC which was subsequently rescheduled.

Tourism and Municipal Government contacts included:

- City of Iroquois Falls
- City of Cochrane

Tourist Operators included:

- Cochrane Air Service
- Extreme Snowmobile Tours
- Polar Bear Fly-in Outfitters
- Coureurs de Bois Adventures
- Temiskaming Shores & Area Chamber of Commerce
- Temiskaming Shores Tourism Information Centre

Municipal Associations:

- Tri-Town & District Chamber of Commerce (Dymond)
- Iroquois Falls Community Development

Bear Management Operators:

- CC-30-0111, CC-30-0161, TI-30-0502, TI-29-0081

Riparian Landowners:

- Cottagers

Anglers & Hunters:

- Ontario Federation of Anglers and Hunters
- Kirkland Lake District Game & Fish Protective Association

Snowmobile and ATV Clubs:

- Jackpine Snowmobile Club (Iroquois Falls)
- Cochrane Polar Bear Snowmobile Club
- Timmins Snowmobile Club
- Ontario Federation of Snowmobiles Club
- Ontario Trails Council

Naturalists:

- Timmins Naturalists

Kayakers and Paddlers:

- Environmental Committee Paddle Canada
- Whitewater Ontario
- Ontario Recreational Canoeing and Kayaking Association

Environmental (NGO):

- Timmins Naturalists
- Mattagami Region Conservation Authority

Other public interest groups that were subsequently added to the contact list include:

- Cochrane Town Council
- Friends of High Falls
- Cochrane Board of Trade

A brief summary of Xeneca's public consultation initiative, and the concerns raised during the consultation process is presented below.

The proponent received inquiries from members of the public regarding water levels and proposed routes for power lines and roads. When requested, these were added to the proponent's list of stakeholders. A representative from the Iroquois Falls Community Development requested, via a November 4, 2010 phone message, that a PIC be held in the town of Iroquois Falls. The representative was informed that the proponent would be meeting with the Council on November 22, 2010, to provide a project briefing. An email was issued by the proponent to its stakeholder list on March 15, 2011 extending an invitation to the PIC on March 24, 2011.

A PIC was held at the Tim Horton Event Centre in Cochrane on March 24, 2011; approximately twenty-five individuals attended. During the PIC, an attendee identified a hiking trail along the east side of the river, travelling southward from Zeveryly's Road, and expressed concerns about the power line intersecting the trail. A local landowner requested advance notice of any aquatic studies requiring that fish be anesthetizing owing to possible effects to humans subsequent to consumption of fish tissue. An agricultural landowner downstream of the project site expressed concerns about impacts to property from water level fluctuations. Two trappers in attendance at the PIC noted that changes in upstream water levels would restrict boat access for beaver trapping, expressing concerns that higher water levels may push beavers into deeper parts of the river, or further inland to less accessible areas along the trap line, noting however that this was not viewed as a significant impact to their activities. A member of the Ontario River Alliance requested information about the Part II Order process, and was advised to bring project concerns to the proponent as soon as possible to facilitate the resolution of those concerns. One attendee expressed satisfaction about the information provided at the PIC, adding his support for the proposed development.

In an April 12, 2011 email, a representative from Friends of High Falls requested that the information presented at the March 24th PIC be posted on the company website. The proponent responded that the PIC featured both generic waterpower panels and project specific panels, and that only the latter were presently posted on the corporate website. All PIC panels were subsequently added to the website, and an electronic copy was sent to the representative.

In September 13, 2011 email, the president of the NLCA requested project information, specifically regarding any potential impacts of the undertaking on Nighthawk Lake, located upstream on the Frederick House River beyond the OPG Frederick House Lake Dam. Xeneca confirmed that Nighthawk Lake is outside the boundaries of the ZOI.

On September 30, 2011, hard copies of the first version of the ER for the proposed Wanatango Falls GS project were sent to the following locations for the 30-day public review period (October 6 – November 4, 2011):

- Cochrane Town Hall
- Cochrane Public Library

- Iroquois Falls Town Hall
- Timmins Public Library

On October 6, 2011, identified stakeholders were notified electronically that the ER was available for download at the proponent's website. Throughout the public review period, various comments were directed to the proponent. Comments or requests for clarification were submitted regarding the potential impacts of the power line routing on moose populations, potential impacts on sturgeon, and operating flows.

On November 3, 2011, the Ontario Rivers Alliance issued a detailed list of concerns regarding the proposed undertaking, involving issues such as cumulative effects, impacts on the ecosystem, increases in methyl mercury, changes to water temperature in the headpond, etc. On November 4, 2011, the Ontario Rivers Alliance submitted a Part II Order Request to the MOE, requesting that the undertaking be elevated to an Individual EA.

The MOE also received a Part II Order Request, dated November 28, 2011, from an additional member of the public. Both this individual and the Ontario Rivers Alliance were informed by the MOE on April 11, 2012, of the proponent's decision to withdraw its Notice of Completion.

A second PIC was held on June 26, 2012, in Cochrane; the event was advertised in the Cochrane Times Post and the Iroquois Falls Enterprise. Members of the project team were on hand to discuss the project and answer questions. Fourteen members of the public attended the PIC, including representatives from the Ontario Rivers Alliance, the Métis Nation of Ontario, the Northern Lights Métis Association, the Ontario Federation of Anglers and Hunters and Ontario Power Generation. The member of the Northern Lights Métis Association expressed opposition to the project, though he appeared to appreciate the level of investigation completed to date. The same individual noted that there was a private landowner whose property is located at the confluence of the Frederick House and Buskegau Rivers (approximately 11 km downstream of Neeland's Rapids, and 35 km downstream of the proposed Wanatango Falls GS).

A trapper expressed concern that the proposed undertaking may affect his traplines. Once informed of the project's area of influence, he expressed support for the project, noting that it could improve his trapping activities, particularly for beaver.

A representative from OPG questioned whether facility operations might affect the existing WMP. The representative was informed by an MNR representative in attendance that should the project gain approval; the facility's operating plan would be added as an amendment to WMP.

On July 4, 2012, Xeneca notified the public contact list by email that information provided on the panels at the PIC were available for review on the Xeneca website.

On July 11 and 17th 2012, an individual inquired regarding hydro line information and requested a copy of the area of the proposed development of the hydro line. Xeneca responded to the request for information on July 17th, 2012.

On October 24, 2012, Xeneca met with the Abitibi Water Management Planning Committee and provided a presentation at the general meeting.

On June 6, 2013, Xeneca was contacted by the Polar Bear Riders Snowmobile Club regarding power line routing on Reaume Esker Rd and other outstanding issues.

On June 25, 2013, Xeneca provided a letter to an additional stakeholder located adjacent to the downstream property providing additional opportunity for input.

Xeneca has recorded all public comments and concerns for the proposed Frederick House River projects over the course of the EA planning process and will continue to do so throughout the development process. A record of public participation compiled by Xeneca is provided in Appendix D.

A summary of the identified issues and concerns raised during the public consultation process is provided in Table 30.

Industry

OPG contacted the proponent electronically on June 1, 2011, to advise that the corporation owns and operates a control dam upstream of the proposed Wanatango Falls site (the Frederick House Lake Dam), in addition to several generating stations downstream of the project site. As requested, the proponent added OPG to the stakeholder list, along with a commitment to have a Xeneca engineering representative contact OPG. At the June 26, 2012 PIC, the OPG representative in attendance expressed interest in the project's proposed operating regime, noting that proposed minimum flows for the new facility did not match the Frederick House Lake Dam operating plan. The representative stated that OPG does not intend to provide minimum flows to support the Wanatango Falls GS. It was also indicated that OPG was seeking assurances that the headpond associated with the facility would not affect the control dam or its associated dam safety rating.

On January 3, 2013, Xeneca contacted H2O Power, to ensure that adequate information had been provided at the Abitibi Water Management Advisory Committee meeting held on October 24th, and to evaluate if there were any potential effects on their operations. On July 5, 2013, H2O Power notified Xeneca of an error in the Draft ER (October 2012) document, noting that the Island Falls GS (the next dam downstream on the Abitibi River) is in fact owned and operated by H2O Power rather than TransAlta Energy. H2O Power also noted that while the Wanatango Falls GS would not have any effect on the Island Falls GS' operations at a macro level, they believe some pulsing of inflows may be observable at a micro level at the dam.

6.5 ABORIGINAL CONSULTATION REQUIREMENTS

The Class EA for waterpower projects requires that aboriginal communities be consulted with regards to their rights within treaty and traditional lands and how their rights and interests may be impacted by project development and operation. This consultation and engagement is designed in part to help determine whether the Crown has a legal duty to consult under the Constitution Act of 1982, and is not intended to replace that duty. The Class EA requires that aboriginal engagement includes active engagement to determine if the project activities will impact aboriginal uses and values within the area.

What follows below is a description of the major highlights of engagement and consultation activities as they relate to the Class EA. A full description of all consultation activities, copies of major correspondence and a log of all correspondence can be found in Appendix E. A full description of all consultation activities for each community follows. It is expected that consultation activities will continue throughout final permitting, design and the lifecycle of the Project.

6.6 ABORIGINAL ENGAGEMENT

Xeneca's general approach to Aboriginal engagement and consultation follows:

- the Ontario Waterpower Association Class EA process and best practices adopted from the Ontario Power Authority (OPA) Consulting with First Nations and Métis Communities: Best Practices, Good Business (Ontario Power Authority, July 2008) document; and
- the Government of Canada's Aboriginal Consultation and Accommodation: Updated Guidelines for Federal Officials to Fulfill the Duty to Consult Guide (AAND 2011).

Using these documents, Xeneca developed an Aboriginal Consultation Plan that outlines a proposed approach to consultation with Aboriginal communities.

Xeneca has drafted an Aboriginal Consultation Plan which contains methods and goals for aboriginal consultations during the Class EA period. Highlights of these goals are defined below, a full text of the Aboriginal Consultation Plan can be found in Appendix E, Section 01.

General Consultation Protocol

Xeneca places great importance on its relationships with potentially affected Aboriginal communities and has created an Aboriginal Relations Liaison position within Xeneca to manage Aboriginal Relations Policy, Guiding Principles and ensure that the consultation requirements of the Class EA are satisfied.

To support the Crown's Duty to Consult to the best of its ability Xeneca proposes to:

- Provide project information to potentially affected communities and to be responsive to questions, concerns and input in a timely manner;
- Through the environmental assessment planning process provide all available information and accept from Aboriginal communities all information they wish to share regarding existing and traditional use for those resources and environmental components that might be impacted by the project;
- Ensure that any traditional knowledge shared by a Community is presented in an agreed upon manner to ensure that it remains the property of the Community;
- Afford consideration to any potential adverse impacts to treaty rights in the Class EA planning process;
- Clearly outline the EA Consultation and engagement process, and potential project related issues to the Communities;
- Maintain records of correspondence and engagement;
- Reflect on input questions and responses in the EA Report and subsequent processes accurately, respectfully and in a timely manner;
- Seek to have Aboriginal Communities obtain benefits from the projects where reasonably possible;
- Respect an Aboriginal Community's right not to engage; and
- Provide the Crown requested information concerning the proponent's Aboriginal consultation and engagement activities.

Xeneca is committed to carry out engagement with identified Aboriginal Communities & Métis Councils through written correspondence and direct telephone communications, including follow up on numerous occasions if communities are non-responsive. Upon appropriate direct contact, Xeneca has sought meetings with community leaders or designated lead person(s) in order to introduce Xeneca and the projects which may impact that particular community. Upon receiving an invitation from the host Aboriginal Community, Xeneca will conduct and sponsor community engagement sessions. Xeneca is also prepared, when requested, to provide access to its professional staff and consultants to answer technical questions. Finally, where a request is made, Xeneca is committed to providing necessary resources to support meaningful engagement including the retention of external consultants to peer review material presented to the communities.

By meeting these objectives and following the above-noted processes, Xeneca strives to foster and sustain a mutually respectful relationship with its aboriginal neighbours beyond the requirement to provide consultation support to the Crown.

The following is a list of methods of communication and engagement approaches employed throughout the EA Process in order to seek input from the Aboriginal communities involved with the Wanatango Project:

- Providing project information to potentially affected communities and being responsive to questions, concerns and formal engagement letters;
- Follow-up Email(s) and phone call(s);
- Formal invitations to participate in Public Information Centres (PICs);
- Offer to host information sessions in individual Communities;
- Extend invitations and offer financial assistance to participate in Stage II Archaeological field work program;
- Offer financial resources, technical staff and consultants to assist in the review of the Environmental Report and supporting documents; and
- Where Xeneca has received a protocol from the Aboriginal community that provides details on how the communities are to be consulted with, Xeneca has collaborated with the community to create a mutual understanding on a process to proceed.

6.6.1 Identified Communities

The identification of communities was completed through consultation with the District Office of the Ministry of Natural Resource (MNR) as part of the Crown Land Site Release (Site Release) process. A draft site release package was issued by the Cochrane District Office of the MNR in November 2011 which didn't identify any aboriginal communities at that time. Xeneca held conversations with the district MNR and decided to raise these discussions with the local First Nation and Aboriginal communities themselves surrounding the Wanatango project to ascertain their level of interest or participation as part of the Site Release process. These communities are listed below:

- Taykwa Tagamou Nation
- Matachewan First Nation
- Mattagami First Nation
- Flying Post First Nation
- Métis Nation of Ontario

- Northern Lights Métis Council
- Wahgoshig First Nation
- Conseil de la Première Nation Abitibiwinni (Pikogan)
- Wabun Tribal Council

Below is a table of each community identified above and their organizational structure.

Table 14: Community Organization

Community/Community Council	Tribal Council/Region	Grand Council/Nation
Taykwa Tagamou Nation	Mushkegowuk Tribal Council	Nishnawbe Aski Nation
Matachewan First Nation	Wabun Tribal Council	Nishnawbe Aski Nation
Flying Post First Nation	Wabun Tribal Council	Nishnawbe Aski Nation
Wahgoshig First Nation		Algonquin Anishinabeg Nation Tribal Council
Mattagami First Nation	Wabun Tribal Council	Nishnawbe Aski Nation
Northern Lights Métis Council	Region 3	Métis Nation of Ontario

6.6.2 Consultation through Site Release

The Aboriginal consultation and engagement process began as a component of the Crown Land Site Release Process, and has included components of the Waterpower Class EA (Class EA) planning process in parallel. An application was made for this site through the Crown Land Site Release process in 2007. The engagement process as required by the Site Release Process and the Consultation Process as required by the Class EA process, were connected and where possible, completed in parallel.

Due to the complex nature of Aboriginal consultation it may not always be possible or practical to harmonize multiple regulatory processes within the Class EA. In initial consultation, Xeneca was able to harmonize the process of the Class EA, Cultural Heritage, Site Release, and permitting and approvals. Relationship building continued with the Class EA and new technical and project economic information was shared. This advanced the requirements of the Site Release Process. Xeneca also harmonized the consultation efforts where possible, and continues to consult with Aboriginal communities in order to move forward into MNR's permitting and approvals phase. All of the materials in the Class EA meet or exceed the requirements of the OWA Class EA. The Site Release process and the Class EA process were completed in parallel where possible; however a separate report on Site Release will be issued independent of the Class EA. While some of this consultation overlaps with Waterpower Site Release and MNR permitting and approvals requirements it is understood that those processes require additional details, which may be confidential, and therefore not appropriate for public release in the Class EA format.

The ongoing engagement for Wanatango starting in 2010 through to the present has provided the communities involved with notification as well as relevant information along with the opportunity to provide input and feedback to Xeneca on environmental issues and conceptual planning for the project.

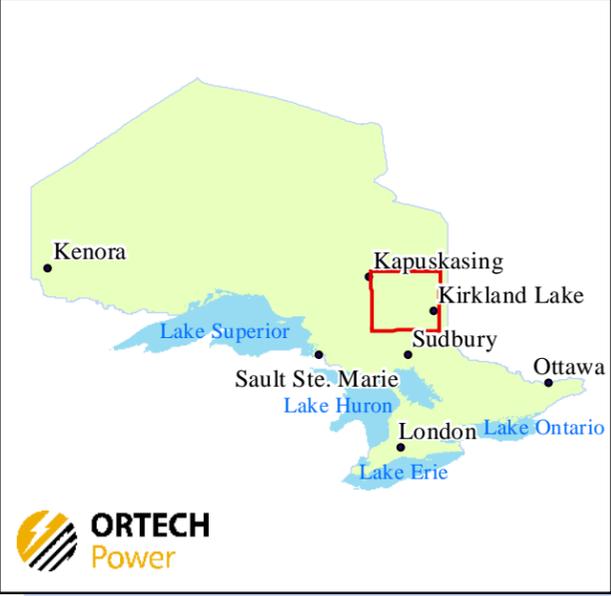
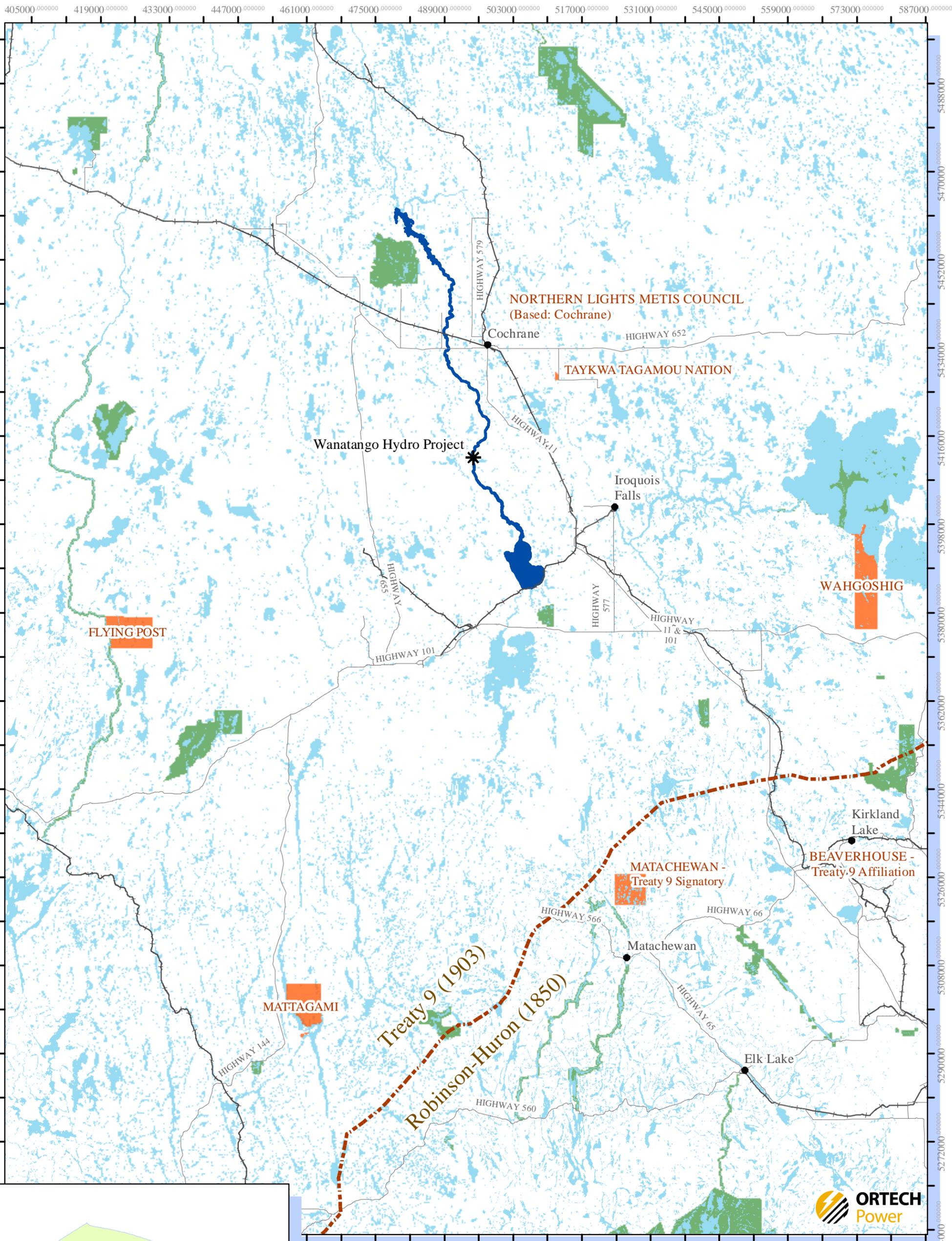
Xeneca will continue to meet with communities and groups after the EA process to advise them on progress with the construction and operation of the project. Xeneca is committed to adaptive management and establishing protocols within each community for addressing unidentified issues as they arise during the post construction phase and over the lifecycle of the Project. Xeneca has committed to continuing to work with each First Nation or Aboriginal community to review project information as they may require. Xeneca has also made available funding for necessary review of the environmental work that has been completed to date for a peer review, if it is determined to be necessary by each community.

6.6.3 Areas under Land Claim

There is presently a Comprehensive Land Claim Agreement in Principle on file between the Canadian Federal Government and the Nishnawbe Aski Nation which is the Grand Council of Treaty 9, and represents all those communities which are signatories to Treaty 9 (refer to Table 14). At this time a final agreement has not been negotiated (Aboriginal Affairs and Northern Development Canada, 2013).

At a meeting held with Flying Post First Nation, they identified they have submitted a land claim to the government; however no additional information on this claim has been presented. On April 30th, 2014, Flying Post First Nation submitted a letter stating that the project was not located within their traditional territory and that they had been adequately consulted on the project.

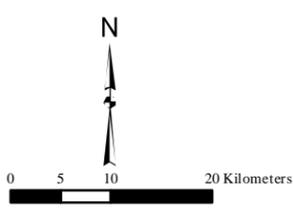
The Project location is not located within the boundaries of any First Nation reserve lands, or Treaty 9 (see Figure 20 on the next page). Communities may assert protections to activities and rights under this treaty which are not explicitly stated within the treaty text. Where those rights are asserted, they have been documented as impacts. The Project location is assumed to be within the traditional territories and current usage areas of the aboriginal communities engaged and consulted throughout the Class EA process.



Data MNR - UTM 17N - Produced by NC - Apr. 10, 2014 - Rev 4
 Xeneca does not have the Metis Nation of Ontario: Abitibi/Temiscamingue Harvesting Territorial Map

Wanatango Falls - First Nations

- Wanatango Dam
- Treaty Boundary
- First Nations
- Frederick House River / Lake
- Provincial Parks
- Highways
- Railway



6.6.4 Consultation Requirements

The Class EA for waterpower projects requires that aboriginal communities be consulted with regards to their rights within treaty and traditional lands and how their rights and interests may be impacted by project development and operation. This consultation and engagement is designed in part to help determine whether the Crown has a legal duty to consult under the Constitution Act of 1982, and is not intended to replace that duty. The Class EA requires that aboriginal engagement includes active engagement to determine if the project activities will impact aboriginal uses and values within the area.

What follows below is a description of the major highlights of engagement and consultation activities as they relate to the Class EA. A full description of all consultation activities, copies of major correspondence and a log of all correspondence can be found in Appendix E. A full description of all consultation activities for each community follows. It is expected that consultation activities will continue throughout final permitting, design and the lifecycle of the Project.

6.6.5 Taykwa Tagamou Nation

The Taykwa Tagamou Nation (formerly known as New Post) is a Cree nation based near Cochrane, Ontario, with two reserves. One is located 20 kilometers west of Cochrane, and one is located between Cochrane and Moosonee, approximately 14 kilometers west of the Abitibi River GS. The community's traditional area is within the Moose River Basin, along the Little Abitibi and Abitibi Rivers. The local economy relies upon the forestry, waterpower and mining industries, and the community is pursuing partnerships and new projects within its territory. The community is represented by the Mushkegowuk Tribal Council.

Historically the community was associated with a Hudson's Bay Company post located on the Abitibi River, at the mouth of New Post Creek where it flows into the Abitibi River.

The modern community has more than 400 registered members.

Summary of Engagement

The community was first notified of the project on July 6, 2009, when a letter from the MNR was provided to the community regarding the waterpower site release application on the Frederick House River.

Xeneca first notified the community of the project on June 24, 2010, when a letter was sent notifying the community of Xeneca's projects within their area, requesting ongoing communication re: concerns/requests, and providing contact information for Xeneca.

On July 8, 2010, the community received a posted letter, notifying them of the Class EA process, government funding processes, the intent for FN communications, and the potential for traditional knowledge studies.

On July 12, 2010, a first meeting was held with the community. This introductory meeting allowed Xeneca to provide TTN with a background on their company. The proposed development was discussed, and the potential for a possible business relationship and/or partnership was explored.

In a September 16, 2010 letter, Xeneca invited Identified, Local First Nation, and Northern Lights Metis Council to participate in archaeological studies that would be conducted in the project area.

On October 13, 2010, the community was sent a letter outlining upcoming Public Information Centre dates and locations with invitation for the community to participate.

On October 25, 2010, the community was notified of the need for a rescheduling of the Public Information Centre.

On November 21, 2010, Xeneca was advised by a Councillor of the community that a formal Protocol was required for proponents to initiate project within TTN Traditional lands and this document was provided to Xeneca. The protocol given provided details related to economic benefits, environmental considerations, capacity building and in general how resource development proponents are to engage with the community.

In early February 2011, TTN indicated that it would not support the project until the proponent enters into discussions and the development of an IBA as per the Protocol set out by the FN. Xeneca responded to the TTN that they would draft an MOU that aligns with the TTN Protocol.

On February 7, 2011, Xeneca advised the community that their protocol was under advisement, and provided a Draft MOU to the community for review.

On March 3, 2011, Xeneca contacted the community, advising them of the upcoming PIC to be held on March 24th, 2011, and requested a meeting with the community.

On March 24, 2011, a meeting was held in the community, during which business relationships, funding, economic benefits, environmental effects (including fish passage and, water levels), consultation protocols, and the project timeframe were discussed.

On April 14, 2011, Xeneca sent a posting to the community regarding the upcoming walleye and sauger study in the Frederick House River, requesting that the community post the notice.

On April 14, 2011, a meeting was held in the community.

On May 9, 2011, a Wanatango Project Description was provided by posted letter and attachments to the community for review.

A draft Aboriginal Consultation Plan was sent to all the Identified Aboriginal Communities on May 13, 2011.

On June 13, 2011, Xeneca provided the community with summary reports of the Stage 1 Archaeological Study via posted letter.

On June 20, 2011, Xeneca provided written invitations to the community to participate in the upcoming Stage 2 Archaeological Study.

On August 31, 2011, Xeneca provided written copies of Draft Aboriginal Consultation Plans for community review.

The Environmental Report was released to the public on October 6th, 2011.

On September 30, 2011, Xeneca provided hard copy of a cover letter notifying the community of the Wanatango Falls Environmental Report available for review on the website, and the 30 day review period.

On November 1, 2011, TTN advised Xeneca that they would not support the project, as a Non-Disclosure Agreement had not been signed, the TTN protocol had not been addressed, and no MOU had been signed.

On November 4, 2011, TTN's legal counsel forwarded a Part II Order Request to Xeneca and the MOE. The request outlined concerns related to the failure to meaningfully engage, the lack of time for a full review, the impact of the proposed project on the rights and interests of the Nation, and proposed mitigation measures.

On November 17, 2011, a meeting was held with TTN to discuss the Part II Order request.

On January 19, 2012, Xeneca contacted TTN regarding an estimate for peer review of Xeneca's environmental work, and to discuss the Draft MOU and NDA documentation.

On April 3, 2012, TTN was informed by the MOE that as a result of the Part II Order Request, the Notice of Completion was being withdrawn, which would allow Xeneca additional time for adequate consultation with affected First Nation communities.

On May 10, 2012, a teleconference was held to discuss TTN's Part 2 Order request in more detail. Xeneca explained the reasons for withdrawing the EA report and reiterated its willingness to engage with the community and importance of managing projects expenditures and itemizing TTN's budget request.

On May 14, 2012 Xeneca received correspondence describing TTN's dissatisfaction in Xeneca's approach and stating the lack of meaningful consultation and not properly addressing the budget and Protocol issues; a meeting was requested with Xeneca's CEO. On June 14, 2012, Xeneca provided notification and invitation to the community via posted letter to the Wanatango Falls PIC being held June 26th, 2012 in Cochrane.

A meeting was held on August 8, 2012 at TTN with Xeneca's CEO. The meeting included discussions on forming a working team that would develop a work plan and refine the budget for addressing issues and concerns (e.g. archaeology and environmental technical review), and one which aligns with a project development milestones timeline.

On August 16, 2012, an information session was held at TTN.

A follow up meeting was held on September 12, 2012 to provide an update on the project, advance the discussion on consultation protocols and budget, establish the working team and arrive at a decision on a process for moving forward. A Letter of Intent (LOI), Non Disclosure Agreement (NDA) and Memorandum of Understanding (MOU) were under discussion. A discussion about jurisdiction and overlapping territory also took place and the need for TTN leadership involvement to resolve potential territorial disputes. Xeneca has provided TTN with a Draft LOI, NDA and MOU for the team's review and input.

On October 10, 2012, a revised ER was submitted to regulators. On November 6, 2012, Xeneca provided hard copy of a cover letter notifying the community of the Wanatango Falls Environmental Report completion, at which time offers were made to the community to provide hard copies of all documents and an electronic CD of documents was provided to the community.

On January 24, 2013, Xeneca met with TTN to discuss the workplan, jurisdictional questions, and the MOU.

On January 30, 2013, Xeneca advised TTN via a posted letter that the Draft Environmental Report was available for review and comment.

On February 1, 2013, TTN's legal council provided Xeneca with a signed Non-Disclosure Agreement.

On February 2, 2013, a meeting was held with TTN. Points of discussion included obligations and economic interests in the project, and contracting opportunities.

On February 7, 2013, TTN received a report commissioned by them in co-operation with Xeneca from Dr. John Long. Dr. Long had completed a technical review of the Stage 1 and 2 Archaeological reports completed by Woodland Heritage Services on TTN's behalf. This report was provided to Xeneca. On February 8, 2013, Xeneca held a meeting with TTN primarily to discuss the archaeological report and the MOU.

On February 20, 2013, TTN contacted the Ministry of Tourism, Culture and Sport regarding their concerns with the Stage 2 Archaeological Report.

On March 27, 2013, a meeting was held with TTN representatives. The focus of the meeting was to discuss the archaeological program. The potential for erosion to affect burial sites was discussed. TTN advised that historical information needed to be incorporated into the archaeological reporting. TTN was invited to become involved in the Stage 3 and 4 fieldwork.

Issues with terminology of the MOU were discussed, with TTN requesting revisions to the Draft MOU. The Draft Operating plan was discussed with respect to Lake Sturgeon monitoring.

On July 19, 2013, Xeneca held a meeting with TTN. Topics of discussion included First Nations benefit and training, equity and division among the four communities, fish studies, shapefiles, and a community public information centre.

On July 17, 2013, Xeneca met with representatives from various communities including TTN in Timmins. The purpose of the meeting was to provide an update on the archaeology program, and to describe a process to move forward co-operatively to advance the Stage 3 and Stage 4 archaeological studies. Staff of Woodland Heritage Services was in attendance and advised that a Stage 4 archaeological survey would be required at three locations on the Frederick House River. Xeneca identified an interest to obtaining a common approach with all communities involved with respect to the Stage 3 and 4 archaeological studies. The tentative schedule for Stage 3 work was identified as fall 2015. The Stage 1 and 2 for roads and power lines was discussed. The economic model was discussed at the meeting. The impact of the project on each respective community and on the youth was discussed.

In mid-September of 2013, Xeneca obtained a letter from legal council representing TTN, requesting funding to complete traditional knowledge work for the area, and requesting that a MOU be signed to continue advancing discussions on the project. Xeneca committed to commissioning the Shared Value Solutions technical review.

TTN continued to express concerns with the undertaking, aquatic species investigations and project effects with respect to the projects impacts on fish migration. Xeneca extended an offer to subsidize a third party biologist to review the provisions for fish passage which are proposed for the site. The Shared Value Solutions Report (Draft) was submitted to Xeneca in March of 2013, under the premise that a site visit in the spring of 2013 along with further discussions with Xeneca would provide the basis for finalization of the report.

On September 12, 2013, Xeneca met with representatives from MNR, DFO, MOE, TTN and their respective consultants. The focus of the meeting was to discuss fish passage, if applicable, and bypass flows that could be provided with respect to the economic constraints of the project.

According to Xeneca's studies, similar habitats occur both upstream and downstream of the proposed project site. TTN (Peter Archibald) cited concern that where proper conditions have not been created in the development of other hydroelectric structures, fisheries have suffered, and by letting Lake Sturgeon up into the Wanatango headpond, they would be in less than suitable habitat. He contended that effort should be focused on enhancing downstream habitats for Lake Sturgeon. TTN added that an adaptive management strategy is also vitally important if the project causes unanticipated effects, and Xeneca and MNR/DFO should be considering downstream habitat compensation along with traditional knowledge.

At the conclusion of the meeting, Xeneca committed to providing further information on the fish slide, monitoring and compensation options to all parties for further discussion.

A final version of SVS draft ER review comments on the draft ER dated December 2, 2013 was provided to Xeneca on March 8, 2014. A technical review of the Stage 1 and 2 archaeological studies was completed by Shared Value Solutions and this work was received by Xeneca on March 8, 2014. Xeneca provided responses to their recommendations for the ER stage and Post EA permitting stage, respectively on April 23, 2014.

On April 25, 2014, Xeneca confirmed to TTN a commitment to include a “no fish passage option” in the ER, based upon concerns from TTN that Lake Sturgeon could be stranded in the headpond without adequate food and habitat. TTN observed that no fish passage structures have been proven to work perfectly for sturgeon and, as such, sturgeon could have difficulty negotiating the fish passage structure, and downstream fish passage could be negatively impacted. TTN noted that ample habitat for sturgeon and other fish species exists downstream of the Wanatango GS and it makes far more sense to undertake compensation measures in the much larger downstream reach that is not as heavily impacted by the OPG operated Frederickhouse Lake Dam. TTN also expressed concerns related to the cost of a fish passage structure as it related to business discussions that influenced upon an equity position for the First Nation. TTN advocated that the resources to be expended in the fish passage structure would be better redirected to downstream fish habitat compensation measures.

Table 15: Taykwa Tagamou Nation ER Milestone Dates Summary

Milestone	Delivery Date	Delivered To
Project Description	May 9, 2011	Chief Linda Job
Notice of Commencement	May 13, 2011	Chief Linda Job
Draft Environmental Report	September 30, 2011	Chief Linda Job
Part II Order Request received by Xeneca	November 4, 2011	Chief Linda Job
Shared Value Solutions Report submitted to Xeneca (Technical Peer Review)	March 8, 2014	Chief Linda Job
Xeneca committed to inclusion of a no fish passage option in the ER	April 25, 2014	Chief Dwight Sutherland

Current Status of Engagement

Throughout this period Xeneca has continued to engage Taykwa Tagamou Nation on an individual basis. To date the community has tabled some specific concerns as detailed in Table 16 below. Based on a general understanding of the community’s traditional and current use of the area, potential concerns for the community are listed in the impact and mitigation matrix in section 7. Xeneca is working towards the completion of the definitive legal agreements which are expected in short order. Consultation and engagement with this community will continue throughout the construction period, and into the lifecycle operations of the project.

Table 16: Issues and Concerns-Taykwa Tagamou

Issue / Concern Raised	Date Identified	Response on Record
TTN raised concern regarding fish passage at the site.	March 24, 2011	TTN was advised that the project biologist would provide additional information in an emailed response, however much information on fish passage was preliminary and would be clarified during the EA process.
TTN representative raised concern regarding initiation of the EA process prior to agreement with First Nations.	March 24, 2011	Xeneca explained the tight timelines involved in the process including an 18-24 month window for construction. Xeneca is committed to continue to work with the communities beyond the specified timeline.
TTN advised Xeneca that they would not support the project, as a Non-Disclosure Agreement had not been signed, the TTN protocol had not been addressed, and no MOU had been signed.	November 1, 2011	Subsequent to the Part II order request, meetings were held with TTN to further discussions around MOU development and signing, development of a Non-Disclosure Agreement and TTN protocols. Xeneca stated its policy to have ongoing and continuing dialogue throughout the development process and even after the construction of the site.
Part II Order Request received from TTN after submission of the Draft ER.	Nov 4, 2011	Subsequent to the Part II order request, meetings were held with TTN to further discussions around MOU development and signing, development of a Non-Disclosure Agreement and TTN protocols. Xeneca stated its policy to have ongoing and continuing dialogue throughout the development process and even after the construction of the site.
First Nations require a share of the resources and there is a cost of doing business with TTN.	March 24 2011	Xeneca's policy is that it will work with the communities that fall within the project area and will create an equity position, employment and training initiatives for the projects.
Safety concern near Zeveryly's bridge for fishermen	September 11, 2013	Xeneca is committed to implementing safety signage and limiting water level fluctuations. Xeneca has committed to limit water level fluctuations affected by operation of the plant to +/- 10 cm at the crest of the Neeland's Rapids, which is about 25 km downstream from the proposed project site. Xeneca has made all efforts to address the safety around and downstream of the proposed GS, including increasing the ramping time to one hour
Erosion near burial sites at confluence of Abitibi River, 60 kilometers downstream of the project.	September 11, 2013	The water level fluctuation further attenuates with the distance downstream. By the time it reaches the burial sites, (60 km downstream) the water level and flow variation will not be significant enough to cause the river bank erosion.
TTN requested capacity funding and meaningful opportunity to gather cultural, occupancy and traditional land use knowledge as input to the environmental impact assessment for this project.	March 8, 2014	Xeneca has provided preliminary funding for a scoped TEK review which will hopefully be incorporated into the final ER and is prepared to support other elements during the permitting and approval phase.

Issue / Concern Raised	Date Identified	Response on Record
TTN requested that a final version of the ER be provided for their comment prior to its submission to MOE with a tracking table identifying how issues raised have been addressed within the ER.	March 8, 2014	The issues responses table will be provided together with the final version of the ER.
TTN requested that upstream riparian vegetation mapping and detailed mapping of the inundation areas and areas affected by water level fluctuations at key sensitive features be provided.	March 8, 2014	Xeneca has completed vegetation mapping for all affected areas plus 120 m. Vegetation mapping was not completed within the downstream ZOI since no impacts were perceived to be possible in this area. In summer 2012 a reconnaissance survey was completed to the crest of Neeland's Rapids which included vegetation characterization and ELC of all hydrologically connected wetlands (Appendix III). Impact assessment to specific habitats was completed based on the Operating Plan and available HEC-RAS modelling.
TTN requested that information be provided on the extent and frequency of water level fluctuations and the potential impacts to wetlands.	March 8, 2014	Impacts to wetlands and tributary mouths were completed based on HEC-RAS water level fluctuations downstream and Lidar data upstream. The wetland in question is the result of a beaver dam which is at a higher elevation than the proposed water level fluctuation, and poses no effect to Xeneca's operations.
TTN requested additional information to clarify the effects of operational water level fluctuations on aquatic habitat as outlined in Appendix E.	March 8, 2014	The ZOI has been characterized through a variety of different surveys including RIN sampling, walleye and lake sturgeon spawning surveys at all suspected spawning habitats, benthic invertebrate surveys (completed at all fastwater habitats), habitat assessments and mapping and characterization of habitat utilized for spawning, rearing, foraging and refuge, and erosion and sedimentation studies. Lake sturgeon spawning was confirmed by MNR at Neeland's Rapids and preconstruction surveys have been recommended at this location to gain baseline data.
TTN should be made aware of how operation of the new facility will affect the duration of flooding (and drawdown), changes to depths and frequency due to management of peak flows, and the extent of impact to wetlands. Specific concern regarding wetland 2.	March 8, 2014	Impacts to wetlands and tributary mouths have been assessed based on the HEC-RAS water level fluctuations at cross-sections downstream and Lidar data upstream. Wetland 2 is the result of a beaver dam and this wetland is at a higher elevation than the proposed range of water level fluctuations. Beaver dams are ephemeral features. During ROR operations (flooding) the headpond will be maintained at NOL (259.0 MSL).
TTN requested a review of the fish passage conceptual design as part of the peer review completed by SVS. SVS identified issues with the proposed fishway design; (1) the	March 8, 2014	A nature-like fishway is normally built into an existing ravine or creek but this is not possible at the Wanatango site. The proposed fishway design and alignment was selected after considerable evaluation of possible options and is preferred over other engineered options by DFO and the government

Issue / Concern Raised	Date Identified	Response on Record
overall design of the fishway does not exhibit a thorough approach to nature-like design principles; (2) the permanence of the pool/riffle design is questionable; (3) the gate at the upstream end of the fishway will result in a water velocity that exceeds the burst fish swimming capability for fish; (4) a step-pool system at the fishway location may be more effective than the current design.		agencies. The fishway may require periodic maintenance and is not expected to function from December to March but flow will be provided continuously. Concern regarding fish burst swimming speed can be covered by increasing the intake size of the fishway in the detail design phase of the project. Minor changes of the fishway can be considered during the detail design phase but in general the proposed fishway presents the best option that could be built into this project.
TTN identified concern regarding downstream fish passage at the fish slide, specifically the velocity exceeding the ability for target species to survive the slide.	March 8, 2014	At NOL, flow through the 12" diameter pipe is 0.2 m ³ /s and velocity is 2.8 m/s) which would not lead to significant injury to fish escaping entrainment at the water intake.
TTN requested that Xeneca provide evidence that the fishway design can meet all design parameters for the indicator fish species listed in the fishway design parameter table	March 8, 2014	The fishway design parameter table provided by DFO in September 2013 does not include the burst swimming speed for different fish species. DFO has suggested on average the prolonged sustained speed to cover all species of fish, flow velocity should not exceed 0.75 m ³ /s. Based on the hydraulic modelling of the fishway, velocity will be higher than the recommended value in the riffle areas and lower than the recommended value in the pool areas but this can easily be achieved with minor adjustment in the fishway design in the detail design phases of the project. The key flow characteristics are available the majority of the time. Details of the fishway will be finalized in co-operation with government agencies in the post-EA stages.
TTN consultant identified that the nature-like fishway should be built to emulate the morphology of a stream with similar characteristics	March 8, 2014	Given the project site conditions and design criteria provided by DFO and MNR, the proposed fishway design and alignment is the best option that could be built in the Wanatango project.
TTN recommended that compensation efforts be focused on habitat creation and enhancing existing habitat downstream rather than implementing the existing fishway design	March 8, 2014	Xeneca has worked with regulatory agencies with respect to fish passage and habitat compensation/enhancement, and has consulted with First Nations, individuals and stakeholders with respect to project impacts and mitigation measures related to fish passage and habitat compensation. Regulatory agencies prefer prioritization of fish passage for Lake Sturgeon and sport fish. Xeneca's approach is to design a structure that allows upstream fish passage and may improve it under low flow conditions. Downstream passage has been carefully considered and through use of specific sized trash rack grating and a fish slide, entrainment

Issue / Concern Raised	Date Identified	Response on Record
		of fish will not occur near intakes and turbine mortality will be minimized through design and operational constraints. Through the use of bubblers, lights and other equipment, fish will be deterred from entering the intake area and redirected to the fish passageway entrance. It is recognized that fish passage will not occur all of the time and it is noteworthy that fish passage is, however, provided at critical life stages such as spawning. Xeneca seeks to work with TTN and its consultants to further enhance downstream habitat for sturgeon and other fish species. Monitoring will occur to determine the level of fish passage post construction and operation. Xeneca will continue to work with TTN and agency stakeholders to optimize both upstream and downstream fish passage.
TTN requested that they continue multiparty discussions related to the planning and design of downstream fish habitat compensation, and work to facilitate upstream and downstream fish passage.	March 8, 2014	Xeneca is happy to have discussions with TTN on these issues and will request that other responsible authorities participate in these discussions at the request of TTN.
TTN requested that they be engaged in a collaborative and meaningful way in developing the effectiveness monitoring and adaptive management or contingency plans, ensuring there is opportunity for TTN members to participate in monitoring activities.	March 8, 2014	A preliminary post-construction monitoring plan has been proposed and will be included in the ER. The monitoring plan can be sent to TTN for review shortly. Xeneca will be happy to consult and continue to obtain TTN's input and recommendations on these issues.
TTN requested that an ARD Management Plan including geochemical assessment of the blast and fill rock to be used in construction, or stored on the site be provided during the post-EA phase of the project.	March 8, 2014	ARD potential in rock can be readily tested by extracting and analyzing representative rock samples. A drilling and testing program of the rock material will be completed prior to construction to confirm if the rock mineralization and the potential for ARD exist at the site. Rock sampling and analysis for ARD will be completed by a qualified professional (P. Geo. or P. Eng.) in accordance with the methods and procedures from Mine Environmental Neutral Drainage (MEND) guidelines. The program will be carried out so that ARD testing result are available at an early enough stage to factor into final project design and permitting. Where the potential for ARD is confirmed, a management plan acceptable to the regulatory agencies will be prepared prior to commencing any rock excavation related to the project.

Issue / Concern Raised	Date Identified	Response on Record
TTN requested that the Blasting Plan include application of DFO guidelines, assessment of blasting impact to fish, eggs, habitat substrate, and development of mitigations and be provided to TTN during the post-EA phase of the project.	March 8, 2014	Blasting approval will be acquired from DFO for any in-water or near shore blasting activities during construction. Xeneca will consult with other regulatory agencies as well as TTN and other stakeholders in advance of blasting working to ensure understanding of environmental effects, safety and nature of the work being done. The impacts assessment and mitigation measures will be addressed in the application.
TTN requested that final plans to show the extent of riparian and terrestrial vegetation removal to effectively evaluate the extent of vegetation removal be provided to TTN during the post-EA phase of the project.	March 8, 2014	These final plans will be included in the Construction Progress reports produced quarterly, which will be provided to TTN through the construction stage.
TTN requested that Xeneca share their mitigation plan for construction including site reclamation for planting/seeding of native species during the post-EA phase of the project.	March 8, 2014	The opportunity will be provided for TTN for review of the site reclamation of native species and to propose preferred species.
Wood chips from clearing should be used to assist in soil stabilization as soon as possible after clearing and to augment salvaged soil/litter reserves.	March 8, 2014	Xeneca agrees.
Surveys for nesting species of conservation concern and/or Species at Risk should be undertaken prior to construction.	March 8, 2014	Vegetation clearing in complex habitats (forest) during bird breeding season and bat hibernate season will be avoided (May to August). If limited vegetation clearing in simple habitats has to occur during birds breeding season, then a bird nest survey prior to construction at the proposed vegetation clearing areas will be undertaken. Trees and vegetation containing active nests shall remain in place during the breeding season. Project work should avoid disturbance to the nest(s) with a designated buffer area of 30 m. If any sensitive or special species' nest is identified, an appropriate buffer area will be developed in consultation with MNR. If the clearing occurs during March and April, a nest survey for Bald Eagle will be undertaken to avoid its critical breeding period. A 400 m radius buffer zone around the nest will be provided, but can extend to 800 m if there is a direct sight line from the nest.
All communications with MNR regarding species at risk should be copied to TTN.	March 8, 2014	Xeneca will provide this information to TTN.

Issue / Concern Raised	Date Identified	Response on Record
<p>TTN requested mapping that delineates the fencing plan to minimize the footprint. The work site boundary should be fenced and efforts should be made to minimize the site construction footprint and to minimize terrestrial habitat impacts and wildlife disturbance.</p>	<p>March 8, 2014</p>	<p>Xeneca is prepared to work and discuss with TTN to achieve this outcome while maintain appropriate operational safety within the construction footprint.</p>
<p>The report makes reference to features not identified in the EA (Culturally Modified Trees, wildlife trees) and areas that may require clearing for temporary diversion works; staging areas for material storage and fueling/repair of machinery; storage of blast rock; locations of topsoil/overburden stockpiles and/or stockpiles of wood chip mulch for use in restoration. TTN should be provided with this information during the construction planning stage.</p>	<p>March 8, 2014</p>	<p>All information will be included in the Construction Progress reports and provided to TTN during the construction stage. Note that culturally modified trees were not found at this site during archeological assessment, nor has the community referenced the presence of CMTs on the site. CMT was included in Part A of the Construction Management Plan as a general consideration for all sites.</p>
<p>The <i>Migratory Birds Convention Act</i> should be added to the list of instruments that guide vegetation clearing operations</p>	<p>March 8, 2014</p>	<p>To minimize the risk of contravening the <i>Migratory Birds Convention Act</i>, the vegetation clearing window has been proposed to be from September 1st to April 30th to avoid the peak breeding season.</p>
<p>Final impact, mitigation and compensation plans for the dam site should be integrated and included in the Construction Management Plan.</p>	<p>March 8, 2014</p>	<p>A preliminary Offsetting Fish Habitat Plan for those impacted aquatic habitats has been discussed with MNR and included in the ER. The effectiveness of the offsetting habitats constructed will be monitored for the first five years of facility operation. This is committed to in the monitoring plan. The final plans will be included in the Construction Progress reports.</p>
<p>The biological consultant for Xeneca (NRSI) makes reference to appropriate documentation and mitigation of effects of blasting on fish and fish habitat, however details on blasting will be forthcoming during detailed design. NRSI lists bubble curtains as a behavioural barrier to exclude fish from areas potentially impacted by blasting. Behavioural barriers have limited effectiveness as a mitigation technique for some fish species such as Lake Sturgeon.</p>	<p>March 8, 2014</p>	<p>NRSI has recommended that any blasting activities follow the process outlined in the DFO publication entitled "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky 1998). As stated within the DFO blasting guidelines, possible mitigating measures to avoid/reduce impacts include the use of bubble curtains or blast mats to block shock waves and contain debris, isolation of the work area and removal of fish prior to blasting, and the use of smaller charges and staggering of blasts. If bubble curtains are ineffective at mitigating impacts to Lake Sturgeon, work site isolation and fish salvage will be considered. Prior to performing blasting activities, appropriate mitigation measures to exclude Lake Sturgeon from the blast area will be discussed with</p>

Issue / Concern Raised	Date Identified	Response on Record
		agencies and species experts. Mitigation planning will also be discussed with TTN as well as alternatives to equipment and procedures noted above.
Canada Warblers were documented during breeding bird surveys in specific ELC polygons. Those polygons are identified as Significant Wildlife Habitat (SWH). As a provincial species of SC they are not regulated by the <i>ESA</i> . A <i>SARA</i> permit may be required, although Environment Canada has not provided direction to date. Therefore, concerns regarding <i>SARA</i> remain. The extent of flooding of SWH is not well understood or quantified.	March 8, 2014	It is our understanding to date that a <i>SARA</i> permit will not be required. However, this will be confirmed with EC during the permitting stage of the project.
TTN indicated that they would launch a Part II order request if their desire for fish habitat compensation downstream of the proposed dam site was not considered.		On April 25, 2014, Xeneca confirmed to TTN a commitment to include a “no fish passage option” in the ER, based upon concerns from TTN regarding fish passage. DFO and MNR will be requested to participate in ongoing discussions to finalize these commitments.

6.6.6 Flying Post

Flying Post First Nation is a signatory to Treaty 9 and is a member of the Wabun Tribal Council. The band operates from an office in Nipigon and has a total registered population of 162. The reserve land is situated 40 kilometers southwest of Smooth Rock Falls. Flying Post was an original Hudson's Bay Company trading post located on the Groundhog River, a tributary of the Mattagami River. The post was approximately eighty miles downriver from Kukatush or Groundhog Lake, and one hundred miles upriver from the river's junction with the Mattagami. All community members currently live off-reserve.

Summary of Engagement

On April 14, 2011, Xeneca sent a posting to the community regarding the upcoming walleye and sauger study in the Frederick House River, requesting that the community post the notice.

On May 9, 2011, a Wanatango Project Description was provided by posted letter and attachments to the community for review.

On May 13, 2011, Xeneca sent a posted letter to Flying Post containing a Draft Aboriginal Consultation Plan, and a compilation of past written correspondences.

On June 13, 2011, Xeneca provided the community with an invitation to participate in future archaeological studies regarding Wanatango Falls.

On August 31, 2011, Xeneca again provided via written letter, a copy of the Draft Aboriginal Consultation Plan for review by Flying Post.

On September 30, 2011, Xeneca provided notice to Flying Post that the Draft Environmental Report was available for review and comment. The Environmental Report was released to the public on October 6th, 2011.

On June 14, 2012, Xeneca provided notification and invitation to the community via posted letter to the Wanatango Falls PIC being held June 26th, 2012 in Cochrane.

On October 10, 2012, a revised ER was submitted to regulators. On November 6, 2012, Xeneca provided hard copy of a cover letter notifying the community of the Wanatango Falls Environmental Report completion, at which time offers were made to the community to provide hard copies of all documents and an electronic CD of documents was provided to the community.

On April 11, 2013, Xeneca provided Flying Post with an outline of the future planned archaeological studies that would be taking place at Wanatango Falls.

On August 14, 2013, Xeneca provided copies of the third party review reports to Flying Post First Nation and the other communities involved in the peer review process.

On September 11, 2013, Xeneca advised Flying Post that a cultural ceremony was being planned in conjunction with the other communities to take place near the proposed site.

On March 5, 2014 a meeting was held with Flying Post representatives. The meeting included an overview of all projects within Flying Post's territory, and included discussion regarding archaeology and fish passage for the Wanatango site.

Table 17: Flying Post First Nation ER Milestone Dates Summary

Milestone	Delivery Date	Delivered To
Project Description	May 9, 2011	Chief Murray Ray
Notice of Commencement	May 9, 2011	Chief Murray Ray
Environmental Report	October 6, 2011	Chief Murray Ray
Revised Environmental Report	October 10, 2012	Chief Murray Ray

Current Status of Engagement

Throughout this period Xeneca has continued to engage Flying Post First Nation both individually, and through the Wabun Tribal Council. To date the community has tabled some specific concerns as detailed in Table 18 below. Based on a general understanding of the community's traditional and current use of the area, potential concerns for the community are

listed in the impact and mitigation matrix in section 7. In a letter dated April 30, 2014 from Flying Post to Xeneca, the community indicated that because the Wanatango Falls GS project was outside of their traditional territory, they would not need to be consulted further on the project.

Table 18: Issues and Concerns-Flying Post

Issue / Concern Raised	Date Identified	Response on Record
Land Claim	March 5, 2014	In a letter dated April 30 th , 2014, the community stated that Wanatango Falls was outside of their traditional territory, and that they would not need to be consulted any further on the project.
The community indicated its interest in contract opportunities and joint venturing (this general statement also applies to other Xeneca projects within the Flying Post traditional territory).	March 5, 2014	Flying Post indicated it would provide a list of their capacities to Xeneca and Xeneca agreed.

6.6.7 Matachewan First Nation

Matachewan First Nation is a member of Wabun Tribal Council and a signatory to Treaty 9. The community is situated approximately 60 km west of Kirkland Lake. The community has been working with resource development industries to establish “mutually beneficial agreements”, where they are able to work towards focusing on “protecting the environment and ecology” in their traditional territories.

Summary of Engagement

On June 24, 2010 a letter was sent to Matachewan FN, notifying the community of Xeneca’s projects within their area, requesting ongoing communication and providing contact information.

On July 8th 2010 the community was notified of the Class EA process, government funding processes, and the intent for FN communications and traditional knowledge studies.

On August 19th, 2010, an email was received from David Flood of Matachewan FN, requesting a meeting.

The first project meeting was held on September 23, 2010. On October 14, 2010 a meeting was held in Timmins with Wabun Tribal Council and 5 member communities, Matachewan, Mattagami, Flying Post, Chapleau Ojibwe, and Brunswick House FNs. Xeneca provided a presentation about the projects and described the FIT contract process and its FN engagement strategy. The dialogue included Wabun and member community’s approach to resource development and the requirement for a business agreement to be in place first and then following up with support towards environmental assessment consultations. With respect to the five communities, including Matachewan, Wabun Tribal Council (Jason Batise, Technical Advisor) would manage the consultation/negotiations and a protocol to only engage directly with Wabun was established.

In mid-October, 2010, the community was invited to the PIC but this invitation was later rescinded due to a PIC reschedule.

Xeneca was notified of a new Chief (Richard Wincikaby) in November of 2010.

An email correspondence from David Flood on February 16, 2011, informed Xeneca that the community wanted to establish meaningful joint consultation on the project and identify long term benefits. On February 16th Xeneca communicated via email to the FN that they wished to establish a MOU.

On December 20th, 2010, the community was sent a posted letter inviting them to attend the EA Coordination meeting for the project. A project description was mailed to the community on May 9, 2011. On May 13, 2011, the Notice of Commencement was provided to the community by mail, in addition to an information package providing information about the Class EA process, and eligibility for government funding.

In April of 2011, the community was provided a notice regarding walleye studies taking place on the Frederick House River.

On May 13th, 2011, an information package was sent to Matachewan FN containing hard copies of previous correspondence, copies of the Notice of Commencement and copies of the project description for the Wanatango Falls GS site.

On June 13, 2011, the community was sent a Summary Report for the Stage 1 Archaeological Report. On June 4, 2012, the Community was provided with a letter inviting them to attend PIC for the project held on June 26, 2012, at the Tim Horton Event Centre in Cochrane.

On July 5, 2011, the community was contacted regarding an invitation to participate in the future Stage 2 archaeological field studies in their area.

Matachewan FN was invited via email to attend the PIC in Englehart on August 23rd. They were also invited to meet with Xeneca representatives to discuss the MOU. They replied in an email that they would be unable to attend the meeting but looked forward to participating in upcoming fieldwork at the site.

On August 31, 2011 Chief Alex Batise was provided with an Aboriginal Consultation Plan for review. On September 30, 2011, notification was provided to the community that the Environmental Report would be available for a 30 day public review period. On October 6, 2011, a Draft Environmental Report was released to regulators and the public. On November 6, 2011, the Environmental Report was provided to the community for review.

On October 10, 2012, a revised ER was submitted to regulators. On November 6, 2012, Xeneca provided hard copy of a cover letter notifying the community of the Wanatango Falls Environmental Report completion, at which time offers were made to the community to provide hard copies of all documents and an electronic CD of documents was provided to the community.

On February 27, 2013, the community was provided with a letter notification of changes to the *Canadian Environmental Assessment Act* which outlined that the Federal screening process had been cancelled.

On April 11, 2013, the community was provided with copies of the Stage 2 Archaeological Report for review and comment, along with an explanation of the archaeological review process.

On July 9, 2013, an invitation was made to the community to attend a Stage 3 Archaeological orientation meeting to discuss archaeological and cultural heritage issues associated with the project.

On July 17, 2013, Xeneca met with representatives from various communities including Matachewan First Nation in Timmins. The purpose of the meeting was to provide an update on the archaeology program, and to describe a process to move forward co-operatively to advance the Stage 3 and Stage 4 archaeological studies.

On February 19, 2014 a meeting was held at Matachewan FN. The meeting was attended by community members and general project information was provided in a formal presentation. The meeting discussion focused on cultural heritage values, and the upcoming Stage 2 archaeological investigations.

Table 19: Matachewan First Nation ER Milestone Dates Summary

Milestone	Delivery Date	Delivered To
Project Description	May 9, 2011	Chief Alex Batisse
Notice of Commencement	May 13, 2011	Chief Alex Batisse
Draft Environmental Report	October 6, 2011	Chief Alex Batisse
Revised Draft Environmental Report	October 10, 2012	Chief Alex Batisse

Current Status of Engagement

Throughout this period Xeneca has continued to engage Matachewan First Nation both individually, and through the Wabun Tribal Council. To date the community has not individually tabled any specific concerns related to aboriginal treaty rights, traditional lands or specific community issues. Based on a general understanding of the community's traditional and current use of the area, potential concerns for the community are listed in the impact and mitigation matrix in section 7. Xeneca is working towards the completion of the definitive legal agreements

which are expected in short order. Consultation and engagement with this community will continue throughout the construction period, and into the lifecycle operations of the project.

Table 20: Issues and Concerns-Matachewan

Issue / Concern Raised	Date Identified	Response on Record
How will artifacts discovered during Stage 2 be transferred back to the communities and which community will they go to?	Feb 19, 2014	At the meeting, Dr. John Pollock indicated that the artifacts are in the hands of government. Woodland Heritage Services has created a form that can be used to apply to the government who currently holds the artifacts. One suggestion made was to transfer them to the Timmins museum.

6.6.8 Métis Nation of Ontario

The Métis Nation of Ontario (MNO) provides a host of services to all Métis individuals in Métis Nation communities and Regions in Ontario.

Xeneca is working with the MNO through their Lands, Resources and Consultation Branch collaboratively in order to establish a consultation protocol that will involve regional meetings and will include opportunities for review and input on project developments by representatives from the Northern Lights Métis Council, and any other interested Community Councils. The MNO has provided their consultation protocol to Xeneca with the intent that it be used as a model to develop a consultation process and aid in the implementation of an MOU that addresses capacity and accommodation requirements between the two parties.

As part of the consultation strategy, any written correspondence materials provided to Community Councils were also copied to the MNO for their information purposes.

Summary of Engagement

Discussions with the MNO began in July of 2009. At this time, Xeneca requested that the MNO identify any issues or concerns they had to prepare to consult with Xeneca. In a letter sent on June 10th, 2010, Xeneca provided information on projects within the area, requesting ongoing communication and information sharing. Melanie Paradis, Director of Lands, Resources and Consultation, was identified by MNO as the key contact in an email correspondence from MNR dated July 20, 2010. Xeneca sent MNO policies and procedures which would enable MNO to learn more about the MNR policy on aboriginal engagement and the required establishment of a business to business relationship.

On September 21, 2010, MNO indicated it was putting together an application for the Northern Partnership Fund and requested a letter of support from Xeneca.

On October 1, 2010, the Métis Nation of Ontario submitted a Letter of Support for Xeneca's decision to issue a Notice of Commencement for eighteen FIT projects across the province.

On October 13, 2010, the MNO received a written invitation to attend the PIC, which was later rescheduled. Xeneca indicated it would be pleased to participate in the MNO's Employment in Energy project in November of 2010.

In January of 2011 the MNO indicated to Xeneca it was looking for employers to enter the partnership agreement to submit to the Northern Training Partnership Fund, requesting Xeneca's support.

In February of 2011, the MNO's Lands, Resources and Consultation Branch requested that consultation meetings be set up between Xeneca and the affected Councils.

On May 13, 2011 Xeneca provided the Community a package of information containing copies of several important project specific documents. The package included copies of all of the Notice of Commencements, along with past communications, and a Project Description. A copy of Xeneca's draft Aboriginal Consultation Plan was also included.

On May 18, 2011, a meeting was held in Toronto with the MNO to discuss Xeneca's projects on a portfolio basis. Consultation protocols were discussed and a draft non-disclosure agreement (NDA) was distributed for review and consideration. The MNO's legal counsel later reviewed the NDA and did not identify any issues. In June of 2011, some changes were made to the NDA and Xeneca executed it. Further correspondence between the MNO and Xeneca explored the opportunity for an agreement that would cover all 18 sites.

On June 18, 2011, Xeneca provided the Community with a copy of the Stage I archaeological report, as well as notification of upcoming Stage II and III archaeological field studies. The Community was invited to participate in the field work.

On August 31, 2011, the Community was provided with a letter containing a download link for the Project Description. Aboriginal Consultation Plans were provided for review and comment.

A meeting took place on September 11, 2011 at the Métis office in Toronto. The focus of this meeting was on the EA consultation protocol, planning for three Regional meetings, provincial elections, and business opportunities. Commitments were made to plan three regional meetings, for MNO to provide Xeneca with a letter of support and to maintain ongoing communication and project updates.

On September 13, 2011, the community was provided with a Draft MOU for discussion purposes.

On September 20, 2011, the Community met with Xeneca to discuss the project, MNO consultation protocols, and the distribution of information. On October 10, 2012, a revised ER was submitted to regulators.

On October 26, 2011 an additional meeting was held with the MNO. Points of discussion included employment and procurement opportunities, discussion regarding the locations of the regional meetings, and planning related to participation, logistics and displays for meetings.

On March 9, 2012, a meeting was held with MNO representative Jason Madden. The meeting was to discuss investment opportunities and investment structures. MNO indicated they would debrief their Board on the Xeneca discussions.

In June 2012, the MNO had a change in their secretariat office with their Director of Lands, Resources and Consultation.

On September 20, 2012, Xeneca met with the new director. At that meeting, it was agreed that copies of Xeneca's environmental work would be tabled with the MNO, along with a workplan to set up regional meetings with the Timmins and Northern Lights Métis Councils.

On September 21, 2012, a meeting was held with MNO representatives Mark Bowler, James Wagar, and Beth Honsberger. Introductions were made to a new Director, Mark Bowler and his team. Discussion continued on planning for regional consultation committee meetings. The MNO explained time constraints and raised awareness about timing issues due to regional bi-elections. MNO consultation protocols and procedures were discussed. Xeneca acknowledges the tight time frames and agreed to work with their staff to begin planning the meetings at the regional consultation committee locations.

On November 6, 2012, the MNO was provided with an electronic copy of the Draft Environmental Report in an electronic CD format, to provide the community with the opportunity to review the information. An advisement was included that the Stage 2 Archaeological & Cultural Heritage Resources document had not been included as it has not yet received formal approval from Ontario Ministry of Tourism and Culture and Sport (MTCS). Panels from more recent PIC were included for review. Offer was made to provide hard copies of any of the documents enclosed upon request from community.

On November 19, 2012, upon request from the MNO, electronic versions of various reports and correspondences were provided to the MNO for review including reports that supported the Draft EA document. On December 18, 2012, similar items were provided upon request.

On January 23, 2013, a meeting was held with MNO representatives Marcel Lafrance, Lillian Ethier, David Hamilton, Urgil Courville, Alain Lefebvre, and Andy Lefebvre. Discussion focused on investors, investment opportunities and future potential of pumped storage facilities and the lack of policies regulating their development. EcoLogo Certification was discussed. The FIT Contract timeline and limitations were discussed, in addition to project specifics.

On February 21, 2013, a teleconference was held with MNO representative James Wagar. Discussions included a variety of topics including MOU development, sharing costs with Cliffs Resources (a Ring of Fire mining company), meeting costs, timelines, a TEK study, Xeneca

pressures to file the EA Report, the MNO letter of support, Region 4 and a formal reply regarding Serpent River projects, Riel Day and AGA sponsorship in Ottawa late August. Voyageur Fund opportunities and investment were also discussed. The Stage 3 Archaeological Report and mandatory consultation was also discussed and updates on other projects were provided.

On February 27, 2013, Xeneca provided the Community with a letter notifying them of changes to the *Canadian Environmental Assessment Act*, and that the project would no longer require federal environmental assessment. The letter confirmed Xeneca's intent to continue to work proactively with the Community.

On April 11, 2013, Xeneca provided the Community with a copy of the Stage II Archaeological report for the project.

Table 21: Métis Nation of Ontario ER Milestone Dates Summary

Milestone	Delivery Date	Delivered To
Project Description	May 13, 2011	Melanie Paradis
Notice of Commencement	May 13, 2011	Melanie Paradis
Draft Environmental Report	October 6, 2011	Melanie Paradis
Revised Environmental Report	October 10, 2012	Melanie Paradis

Current Status of Engagement

Throughout this period Xeneca has continued to engage MNO individually. To date this Community has tabled some specific concerns as detailed in Table 22 below. Based on a general understanding of the community's traditional and current use of the area, potential concerns for the community are listed in the impact and mitigation matrix in Section 7. Consultation and engagement with this community will continue throughout the construction period, and into the lifecycle operations of the project. Xeneca is progressing towards an MOU with the MNO and the Councils within Region 3 associated with the Project.

Table 22: Issues and Concerns-Métis Nation of Ontario

Issue / Concern Raised	Date Identified	Response on Record
MNO requests a letter of support to applications to the Northern Partnership Fund. MNO hopes Xeneca can fulfill the role of Industry Partner and employer.	9/23/2010	Xeneca provided the requested letter on September 23, 2010.
MNO sends letter of support for the Notice of Commencement indicating that they appreciate the effort made by Xeneca to work with the MNO by demonstrating a willingness to engage in a timely fashion.	10/1/2010	Noted
MNO reminds Xeneca that they should use terminology 'First Nations & Métis' in notices rather than just 'First Nations.'	10/18/2010	Noted. Xeneca will ensure they use the appropriate terminology in the future.
Consultation should take into account MNO policies and capacity. MNO has GIS and data transfer capabilities. MNO avoids independent technical review since principles and regulations in practice should build trust. A technical review should only be necessary if something controversial arises. MNO are concerned about the speed at which Xeneca needs to work. MNO indicated a concern about Xeneca leaving things to the last minute leaving insufficient time to address concerns.	9/21/2012	Xeneca developed an MOU that will support ongoing development of a Traditional Knowledge Database. Xeneca has provided draft reports in order to allow for review and to work within community consultation processes and offered compensation to support this review process.
What are Xeneca's 10 priority projects?	9/21/2012	Big Eddy, Marter Township, Wanatango, The Chute, Third Falls, Lapingam, Middle Township Buchan, Near North Boundary (Known as Kapuskasing), Wabagishik Rapids.
MNO inquired regarding Education, Training, and jobs opportunities.	9/21/2012	At the appropriate time when the FN communities are prepared to discuss economic benefits on this project, Xeneca is prepared to incorporate into its Term Sheets and definitive legal agreements opportunities to benefit both in terms of equity in the projects, as well as contracting, jobs and initiatives to enhance capacity within the FN communities.
MNO indicates which Regional Consultation Committee will have jurisdiction for each of Xeneca's projects.	10/31/2012	Noted
Are changes of the Canadian Environmental Assessment Agency	1/23/2013	Changes to <i>CEAA 2012</i> mean that there is no longer the requirement to complete a

Issue / Concern Raised	Date Identified	Response on Record
(CEAA) affecting the development process?		federal EA. Ongoing obligations exist where federal permits and approvals are required on projects, and projects would still be subject to <i>CEAA</i> . For example, if a project required a permit from Transport Canada or the Department of Fisheries and Oceans (DFO), then consultation is still required under <i>CEAA</i> .
How is Dundee wealth related to Dundee Reality?	1/23/2013	They are not related.
What is Ecologo certification?	1/23/2013	It is a fee based industry standard and auditing system. Xeneca is striving to achieve the Ecologo industry imposed standard.
Spirit of water is being changed when river is developed.	9/21/2012	During operation, there will be a minimum flow provided downstream at all times. This minimum flow value will vary monthly based upon base flow conditions and will range from 54m ³ /s during the spring freshet to a minimum of 2m ³ /s. During normal operations, the minimum flow provided downstream will be 3.1 m ³ /s. During the months that the Frederick House Dam (OPG) is holding back water, Xeneca will release all incoming flows up to a minimum of 2 m ³ /s. If the incoming flow is between 2 and 20 m ³ /s, Xeneca will release a minimum of 2 m ³ /s at all times as well as release all water within 24 hours).
Concern regarding the cumulative impacts of hydro development combined with other developments	1/23/2013	<p>The extent of the project zone of influence ends below the tailrace of the FHL D (approx 1.4 km downstream.) As such, Xeneca's project cannot have any impact on the FHL D or upstream areas, including Nighthawk Lake.</p> <p>Changes to water levels will be well within the existing conditions experienced within the project zone of influence. Although water level fluctuations may be more frequent, the fluctuations will be well within the range currently experienced as a result of operation of OPG's FHL D. Commitments are in place to ensure water levels are maintained in a manner that allows critical life stages to occur for aquatic species i.e. spawning. Extensive work on flows that avoid fish stranding and allow for fish passage has also been undertaken.</p>

Issue / Concern Raised	Date Identified	Response on Record
Concern that TEK studies have a regional focus	1/23/2013	Xeneca has provided funding for communities to conduct third party peer reviews of the archaeological reports. Xeneca has respected traditional ecological knowledge that has been shared for the purposes of active engagement.
Importance of Metis artifacts and all values be treated with respect	1/23/2013	Xeneca has engaged extensively with all communities with respect to the archaeological program and will continue to do so.

6.6.9 Northern Lights Métis Council

The Northern Lights Métis Council is located in Cochrane, Ontario. It is one of several Métis Councils operating at the community level under the umbrella of the Métis Nation of Ontario. The local Councils are an important communication hub for MNO and play a significant role in fostering community empowerment and development for Métis citizens living within the geographic territory of that council.

Community Councils operate in accordance with MNO Charter Agreements, which give councils the mandate to govern, while ensuring accountability, transparency, and consistency.

(www.metisnation.org)

Summary of Engagement

The Northern Lights Metis Council was first contacted on May 9, 2011, when Project Descriptions were supplied to the Council via posted letter.

On May 13, 2011, a correspondence package was sent containing hard copy of previous letters sent PIC media advertisements, all Notice of Commencements, and a CD containing electronic copies of the Project Descriptions.

On June 18, 2011, a summary report of the Stage 1 Archaeological Studies was provided.

On August 31, 2011, an Aboriginal Consultation Plan was provided for the Wanatango Falls development. Accompanying the documents was a cover letter with a description of its purpose and intention for review by the community.

On September 30, 2011 a posted letter was sent notifying the community of the Wanatango Falls Environmental Report available for review on the website.

On June 14, 2012 a notification and invitation was provided to the Council regarding the Wanatango Falls PIC being held June 26th in Cochrane.

On April 11, 2013, the Stage 2 Archaeological Report was provided to the Council for review and comment.

On October 10, 2012, a revised ER was submitted to regulators.

Current Status of Engagement

Throughout this period Xeneca has continued to engage the Northern Lights Métis Council individually in co-operation with the Métis Nation of Ontario (James Bay-Abitibi Temiskaming Consultation Protocol.) The Northern Lights Métis Council is represented by the James Bay Abitibi-Temiscamingue Consultation Committee, wherein the President of the Northern Lights Council is a member. To date this Community has not identified any specific concerns related to the Council's rights, traditional lands and specific community concerns. Based on a general understanding of the Council's traditional and current use of the area, potential concerns for the community are listed in the impact and mitigation matrix in Section 7. Consultation and engagement with this community will continue throughout the construction period, and into the lifecycle operations of the project. Xeneca is progressing towards an MOU with the MNO and the Councils within Region 3 associated with the Project territory. Xeneca is abiding by the Métis Nation of Ontario James Bay-Abitibi-Temiscamingue Consultation Protocol. No issues have been identified to Xeneca during the period of consultation.

6.6.10 Wabun Tribal Council

Wabun Tribal Council provides a host of services to its member communities including health, employment and technical services. They represent Mattagami First Nation. In addition they represent Beaverhouse First Nation and Matachewan First Nation, as well as, Brunswick House First Nation, Chapleau Objive First Nation, and Flying Post First Nation some of which are not within the engagement and consultation areas for this project and therefore were not included in consultations activities directly.

As part of the consultation strategy, any written correspondence materials provided to each represented community were also copied to Wabun Tribal Council for their informational purposes.

The proponent was informed by the Wabun Tribal Council in early 2011 that until a Memorandum of Understanding (MOU) between Xeneca and the Tribal Council is accepted by all parties, the consultation and engagement process could not begin.

Xeneca acknowledges the approach taken by Wabun Tribal Council as it relates to consultation on the Projects. This position was made clear during an initial teleconference call in 2010 with the member communities and Wabun Tribal Council, wherein the participating Chiefs and Councillors made it clear that they were delegating their authority to Wabun Tribal Council to negotiate an appropriate economic arrangement prior to moving forward on the consultation process. Notwithstanding their position, Xeneca has been sharing, and will continue to share, all of the relevant project information as required for the Class EA process.

A meeting was held with Wabun Tribal Council on October 14, 2010.

On June 24, 2010, Wabun was provided with a Letter from Xeneca indicating Xeneca's projects in their area and requesting ongoing communication regarding questions and concerns. This letter related to all of Xeneca's projects.

Xeneca met with Wabun Tribal Council on the following dates; April 1, 2010, September 2, 2010, October 14, 2010, January 26, 2011, February 17, 2011, March 24, 2011, June 22, 2011, August 22, 2011, November 30, 2011, April 2, 2012, June 26, 2012, August 8, 2012, July 30, 2013.

On October 14, 2010 Xeneca provided a presentation about the projects and described the FIT contract process and its First Nation strategy. The dialogue included Wabun and member community's approach to resource development and the requirement for an agreement to support environmental assessment and business relationships.

On April 27, 2011, a Project Description was provided to Wabun Tribal Council for the Wanatango project.

On July 12, 2011, a phone call with Wabun Tribal Council took place to discuss cultural heritage considerations.

On August 22, 2011, a teleconference was held with Wabun Tribal Council and the topics included project partnerships and financing.

On December 2, 2011, a Draft Non-disclosure agreement was sent to Wabun Tribal Council for review.

On April 2, 2012, a teleconference was held with Wabun Tribal Council. The meeting focused on financing and partnership opportunities.

On June 26, 2012, a meeting was held with the Wabun Tribal Council and a Xeneca representative. The discussion focused on how to move the process forward.

On October 10, 2012, a revised ER was submitted to regulators.

On December 11, 2012, Draft Reports were sent to the Wabun Tribal Council for review.

On April 23, 2013, a meeting was held with Wabun Tribal Council to discuss business to business items.

On June 4, 2013, a Draft Aboriginal Procurement Policy was sent to Wabun Tribal Council for review.

On July 12, 2013, a letter was sent from Xeneca to the Wabun Tribal Council, attaching information sent by the Ministry of the Environment regarding aboriginal consultation.

On September 15, 2013, a draft copy of a Draft Partnership Agreement was provided to the Wabun Tribal Council for review.

On September 16th and 17th, 2013, a meeting was held between the Wabun Tribal Council at Casino Rama. The purpose of the meeting was to update a number of communities on the Kapuskasing River, Ivanhoe River, Wanatango and Marter Twp. Projects. The Draft Letters of Intent and Term Sheets were discussed. Economic models, partnerships and opportunities were discussed.

On October 21, 2013, a Letter of Intent and Term Sheet was executed and sent to Wabun Tribal Council on behalf of several of its respective communities, including Matatchewan First Nation, Flying Post First Nation, Mattagami First Nation and Brunswick House First Nation.

Since that time, Xeneca has engaged directly with the affected communities, and continued business to business discussions with Wabun Tribal Council.

Table 23: Wabun Tribal Council ER Milestone Dates Summary

Milestone	Delivery Date	Delivered To
Project Description	April 27, 2011	Jason Batise
Meeting	August 22, 2011	Jason Batise
Meeting	August 8, 2012	Jason Batise

Current Status of Engagement

Recently Xeneca signed a series of Non-Binding Letters of Intent and Term Sheets with the Wabun communities including Matachewan for this project. Presently Xeneca is concluding negotiations with Wabun Tribal Council's legal and economic advisory team towards the final binding legal agreements. Wabun has indicated that it has not been delegated responsibility to discuss aboriginal treaty rights, traditional lands or specific community issues and as such have not listed such concerns as shown on Table 24.

Although Xeneca has engaged Wabun throughout this period, it has been adamant in its position that no consultation with them can occur in advance of an agreement being reached. Xeneca continues to work with Wabun and its representative communities towards finalizing the definitive agreements.

Table 24: Issues and Concerns – Wabun Tribal Council

Issue/Concern Raised	Date Identified	Response on Record
How/if Wabun will be involved in business relationship discussions on behalf of member nations	7/27/2010	Wabun First Nations will explore the option of entering into an agreement which will see any development in their territories with Xeneca pursued as a collective.
Wabun indicates at Feb 17, 2011 teleconference that they have been given band council resolutions from the Chiefs to move forward to discuss a potential partnership. There are other communities involved with the projects that are not part of Wabun	9/2/2010	Noted. Consultation process requires this.
There is concern with the MNR process used to identify First Nations involved in the projects. MNR uses tertiary watershed data and does not consider traditional territories. How/when MNR is involved in the discussions must be determined. Approach going forward with government agencies (MNR, MAA) with respect to business discussions need to be identified.	9/2/2010	Xeneca is in partnership with various Aboriginal communities and will defer to their processes and what they collectively agree to.
A description of the sites (vicinity and size) was requested.	9/2/2010	Project Descriptions were provided to Wabun Tribal Council.
A member of Mattagami First Nation indicated that they felt Xeneca was sidestepping the protocol of engagement by meeting with Matachewan First Nation on Oct. 23 2010.	10/5/2010	Xeneca meets with any community at request. There was no intent to bypass the agreed upon delegated process of Wabun Tribal Council.
What is ECT?	10/14/2010	ECT = Electrical Connection Test. FIT contract was not issued to the project due to lack of space on the distribution and power system. Xeneca is working on quantifying and resolving ECT issues.
What is the location of the projects?	10/14/2010	Xeneca has produced maps and are happy to share them. Wabun has landscape maps with project areas (see Tim Mutter, MNR Chapleau). The MNR can produce maps with the sites and include the First Nation community location for reference. Xeneca has provided positive feedback to the MNR and their maps.
What is the status on the Kamiskotia?	10/14/2010	This Project does not currently have a FIT Contract. There is potential for this Project to move forward at some point in the future under the new Competitive Procurement Program.
How much information is available for the sites?	10/14/2010	The site status, mapping, Project Descriptions, related Class EA information, MNR site

Issue/Concern Raised	Date Identified	Response on Record
		releases, Class EA drafts were made available to the Community. Archaeological field studies and Class EA project descriptions were released periodically to Wabun. This is detailed in Section 2.10.
How does Applicant of Record relate to permitting and establishing business relationship? Wabun can support the Applicant of Record at some point in the process.	10/14/2010	Applicant of Record is a policy which may allow proponents first access to crown sites after they have begun working towards business to business relationships with identified First Nation communities. It is an intermediate step which occurs prior to location approval being issued under the <i>LRIA</i>
Recommended that habitat study be completed by December; and that it examine endangered species.	10/14/2010	The habitat study was completed over several field seasons in accordance with the MNR guidelines. The report can be found in Annex III
Need to set-up a process for consultation with Wabun. There is urgency to create a formalized relationship, Wabun is progressive and experienced. Consultation is separate from business discussions but can inform the process and act as due diligence.	10/14/2010	Xeneca is open to an engagement at a comprehensive level with communities. Xeneca is comfortable with a conglomerate approach to projects.
Information sheet on projects was requested for the communities.	10/14/2010	Xeneca provided a Project Description on October 4, 2013
An activity report for the projects was requested.	10/14/2010	Wabun was kept updated on the Project status through email and phone call communications. Formal reporting was not completed.
An agenda on how to approach field work needs to be developed.	10/14/2010	The approach on field work could not be developed, as Wabun Tribal Council implemented their protocol on resource development which prevented Xeneca from engaging directly with individual Wabun communities and the Council on matters related to the EA. All field work was sent to Wabun for review as part of Draft ER
Wabun expressed concern about the commencement of 'consultation exercises' (public information centres and the release of project descriptions) prior to finalizing an agreement with Wabun. Wabun is also concerned with the time it has taken Xeneca to review the MOU they provided. Wabun also indicated that additional consultation beyond public open houses is required (i.e. separate engagement and consultations are necessary). Wabun will not participate in any PICs or consultation until an agreement has been reached.	1/7/2011	PICs and Project Descriptions must be planned in advance to meet government regulations and guidelines. Wabun is not the only First Nation organization or party Xeneca must satisfy, but Xeneca is not ignoring Wabun. First Nations are a priority. The information released illustrates that the projects are at the beginning of the planning stages and there is nothing binding or pin pointing beyond Xeneca's assertion to work with First Nations. Xeneca will work to establish an MOU in short order.

6.6.11 Wahgoshig First Nation

Wahgoshig First Nation is located near Matheson on Abitibi Lake, they are a member of Algonquin Anishinabeg Nation Tribal Council, and are signatories to Treaty 9. The reserve is home to two Communities, Wahgoshig First Nation in Ontario, and Pikogan in Quebec. Only the Wahgoshig branch of the Community has been engaged on this Project (Wahgoshig First Nation, 2013).

Summary of Engagement

The Community was first notified of the project on August 31, 2011, when the Community was provided with a letter containing a download link for the Project Description.

On August 12, 2010, the Community was sent a letter advising them of clarifications, updates and inquiries regarding aboriginal traditional knowledge.

On October 13, 2010, the Community was issued a written invitation to attend a Public Open House Information Centre to be held for the project in Cochrane on November 9, 2010.

On October 25, 2010, the Community was issued a written notice that the Public Open House session originally scheduled for November 9, 2010, would be rescheduled.

On December 20, 2010, the Community was issued a written letter advising them of start-up activities for the Wanatango project. Links for project descriptions were made available in this letter.

On August 11, 2011, Xeneca received a letter from Wahgoshig FN's legal counsel indicating the requirement to adequately consult the community.

On August 31, 2011 Wahgoshig FN was provided with a copy of the draft Aboriginal Consultation Plan for the Wanatango Falls GS project development.

On September 20, 2011 Xeneca received a letter from Wahgoshig FN stating failure to consult with, and accommodate the community, in addition to concerns about policy and process governing the project. A request was issued to meet with the community.

On September 30, 2011, the Community was notified by letter that the ER was available for review for 30 calendar days.

On November 4, 2011, Wahgoshig FN's legal counsel forwarded a Part II Order Request to Xeneca and the Minister of the Environment. The request identified concerns regarding archaeological work, resources to enable adequate consultation, and the MNR's site release policy.

On April 3, 2012, Wahgoshig FN was informed by the MOE that as a result of the Part II Order Request, the Notice of Completion was being withdrawn, which would allow Xeneca additional time for adequate consultation with affected First Nation communities.

On May 15, 2012, a meeting was held with Wahgoshig representatives. Wahgoshig First Nation requested funding to conduct an independent technical review of the Stage 2 Archaeology Report. Xeneca suggested that Wahgoshig work with the other communities to combine peer review efforts, but committed to providing funding for the review. Discussions took place regarding land use planning and traditional ecological knowledge studies and how these activities relate to the need to consult with the community on the archaeology program.

In July of 2012 a peer review of the archaeological Stage 1 and Stage 2 reports was performed by White Spruce Consultants on behalf of Wahgoshig First Nation, and this information was submitted to Xeneca. Table 30 includes some specific issues identified regarding the archaeological work completed to date, and the Xeneca response to these issues as discussed during the coordination meetings. (Where information is too specific in nature, and to ensure the privacy of the communities, some information may have been omitted from the summary table.)

A community meeting was held on September 11, 2012 in Wahgoshig FN to discuss the project in greater detail. Xeneca along with its environmental and archaeological consultants presented to members of council, staff, Wahgoshig FN's consultant archaeologist and legal representation. The discussion focused on the archaeological program and a strategy to work with Wahgoshig FN's archaeologist to integrate the FN's traditional land use study into the archaeological study. The environmental investigations conducted by the proponent's biological consultant were also discussed. Wahgoshig FN asserted its right to benefit financially from the project which prompted a discussion concerning overlapping territories and dispute resolution.

Xeneca hosted an information session at the community center later that afternoon.

On October 31, 2012, the Community was provided with an electronic copy of an executed Non-disclosure Agreement.

On March 27, 2013, a meeting was held with Irene Linklater representing Wahgoshig First Nation. Discussion took place regarding infrastructure availability and capacity to connect to the hydro grid and the costs associated with connection. A progress update on archaeology was provided and Wahgoshig identified they had an economic interest in the project. Xeneca's participation model was discussed along with operation and maintenance of sites.

On June 11, 2013, a meeting was held to seek clarification with the community regarding the Beacon Report, which was prepared at the request of Wahgoshig First Nation as a third-party technical review of the natural environment and aquatic components of the project. The conclusions of the Beacon Report were discussed in detail. Issues included the impacts associated with laydown areas, residual effects, TEK, sturgeon and compensation habitat, concern over the use of the fish passage structure by lake sturgeon, erosion, changes to federal legislation and issues related to the downstream zone of influence and compensatory flow. Xeneca committed to

sharing the Finalized EA with the community at the same time it is released to regulatory agencies.

On July 17, 2013, Xeneca met with representatives from various communities including Wahgoshig First Nation in Timmins. The purpose of the meeting was to provide an update on the archaeology program, and to describe a process to move forward co-operatively to advance the Stage 3 and Stage 4 archaeological studies.

On October 4, 2013, Xeneca provided the community with a copy of the Notice of Commencement. This notification also provided details on the EA Report delivery and review period.

Table 25: Wahgoshig First Nation ER Milestone Dates Summary

Milestone	Delivery Date	Delivered To
Project Description	December 20, 2010	Chief David Babin
Notice of Commencement	December 20, 2010	Chief David Babin
Draft Environmental Report	October 6, 2011	Chief David Babin
Revised Environmental Report	October 10, 2012	Chief David Babin

Current Status of Engagement

Throughout this period Xeneca has continued to engage Wahgoshig First Nation both individually, and through the Wabun Tribal Council. Based on a general understanding of the community's traditional and current use of the area, potential concerns for the community are listed in the impact and mitigation matrix in section 7. Xeneca is working towards the completion of the definitive legal agreements which are expected in short order. Consultation and engagement with this community will continue throughout the construction period, and into the lifecycle operations of the project.

Table 26: Issues and Concerns-Wahgoshig

Issue / Concern Raised	Date Identified	Response on Record
The study should be redone using the proposed 2 and 100 year flood elevations as the high water marker and that areas of archaeological potential corresponding to the 2 and 100-year flood event be evaluated.	September 11, 2012	Xeneca can follow-up on any archaeological-type sites such as old cabins (not spiritual or plant gathering sites etc) from the TK study that were outside our original high potential areas. The 100 year flood elevation has no meaning as far as the MTCS 'Standards and Guidelines' are concerned as it is not a physical shoreline.
Concern regarding local flooding and the cumulative impact of project development on reserve lands.	September 11, 2012	The Zone of Influence has been delineated by Xeneca as per the Waterpower Class EA. The headpond of the Wanatango Falls dam will extend 8.6 km to about 1.4 km downstream of the Frederick House Lake Dam. Xeneca will use whatever water is released from the dam. Xeneca has no authority or intentions to change the existing operation plan of the FHLD.

Issue / Concern Raised	Date Identified	Response on Record
		The proposed project will not have any effects on the operation and water level of the FHL. Flow alterations resulting from the operation of the project attenuate gradually with distance downstream, resulting in a downstream ZOI that ends at just upstream of the Neeland's Rapids. Xeneca has committed to restrict water level fluctuations at the Neeland's Rapids to be within +/-10 cm. Changes to water levels will be well within the existing conditions experienced within the project zone of influence. Although water level fluctuations may be more frequent, the fluctuations will be well within the range currently experienced as a result of operation of OPG's FHL. Commitments are in place to ensure water levels are maintained in a manner that allows critical life stages to occur for aquatic species i.e. spawning. Extensive work on flows that avoid fish stranding and allow for fish passage has also been undertaken.
What will happen if a burial ground is found during archaeological studies?	September 11, 2012	The Xeneca archaeologist advised that the <i>Cemeteries Act</i> takes over and consultation with the community is required. The site cannot be excavated and such a finding could impact upon the viability of a project.
What fish species were found at the Wanatango Falls?	September 11, 2012	NRSI has documented Walleye, Sauger, Northern Pike, and Lake Sturgeon in the project area in Natural Environment Characterization And Impact Assessment Report.
The Stage 1 and 2 Report did not include traditional land use information.	Archaeology Report Peer Review by White Spruce, July 2012	The TLU study was done after the Stage 1 and 2 reports. Xeneca has supported the White Spruce Technical Peer Review which provided Wahgoshig First Nation the opportunity to provide input into the archaeological program. Xeneca can follow-up on any archaeological-type sites such as old cabins (not spiritual or plant gathering sites etc.) from the TK study that were outside our original high potential areas.
It was not clear in the Stage 2 archaeological report how areas were classified as having high, low or no potential. Fieldwork focused on areas that would become inundated.	Archaeology Report Peer Review by White Spruce, July 2012	Areas of high archaeological potential were surveyed. WHS uses an implicit model to assess archaeological potential based on landscape features and experience. The identification of areas of potential is based on current landscape features (ie distance to water, slope drainage.) Dr. Pollock noted that they have waypoints and photographs of areas that were considered low archaeological potential.
A general conclusion of the technical review was that archaeological and First Nation's cultural and heritage values were not properly evaluated or protected as conducted by WHS. A Traditional Land Use	Archaeology Report Peer Review by White Spruce, July 2012	Xeneca has supported the White Spruce Technical Peer Review which provided Wahgoshig First Nation the opportunity to provide input into the archaeological program. During a conference call held on May 15, 2012, the technical review of the archaeological report was discussed. Xeneca would follow-up on any archaeological-type sites such as old

Issue / Concern Raised	Date Identified	Response on Record
Study was recommended by White Spruce.		cabins (not spiritual or plant gathering sites etc.) from the TK study that were outside our original high potential areas.
The technical review of the Stage 2 archaeological report indicated that a 20 meter protective zone and a 50 meter monitoring zone should be established around each of the sites. No activities should occur within these buffered areas until a full assessment is complete. Buffers should be established around potential burial locations and an elder should visit the site during excavation to monitor activities.	Archaeology Report Peer Review by White Spruce, July 2012	Xeneca has received a partial clearance letter from MTCs for construction activities prior to a full assessment of the archaeological site. There are no concerns for impacts to the archaeological sites from construction activities proposed on the construction sequence plans. The archaeological sites are greater than 300 m from the construction zone.
There is insufficient information in the Stage 2 report to develop a strategy for implementing the Stage 3 work	Archaeology Report Peer Review by White Spruce, July 2012	Strategies for implementing the Stage 3 work will be included in Stage 3 report.
Locations and plans for the infrastructure, roads and the power corridor had not been finalized at the time of the Stage 1 and 2 Archaeological Reports.	Archaeology Report Peer Review by White Spruce, July 2012	Additional report on infrastructure, roads and the power corridor will be included in the final ER.
Wahgoshig FN questioned how local knowledge was incorporated into the WHS reports. Criteria 10 "local knowledge" is indicated as "yes" however this is not addressed in the text of the Stage 1 report	Archaeology Report Peer Review by White Spruce, July 2012	(1) This is derived from Dr. Pollock's experience in the area and the historical information provided in the Stage 1 report. ii) Both the Stage 1 and 2 reports state that "The lands directly associated with the property in question current [sic] do not appear to be used for a particular purpose other than as a seasonal recreation area or canoe route"
No consideration of erosion was demonstrated. The Chert Beach site is already eroded.	Archaeology Report Peer Review by White Spruce, July 2012	It's impossible to predict locations where erosion will occur so it was not considered in the stage 2 work. The degree of erosion at the Chert Beach site will be documented during the Stage 3 work to be undertaken in future.
Wahgoshig First Nation had raised several questions regarding the locations of the areas surveyed in the archaeological report, and the level of archaeological potential of these areas.	Archaeology Report Peer Review by White Spruce, July 2012	Areas of high archaeological potential were surveyed. WHS uses an implicit model to assess archaeological potential based on landscape features and experience. The identification of areas of potential is based on current landscape features (i.e. distance to water, slope drainage.) Dr. Pollock noted that they have waypoints and photographs of areas that were considered low archaeological potential.

Issue / Concern Raised	Date Identified	Response on Record
In your experience where are historic and pre-contact burials typically located in northeastern Ontario? Was the potential for burials considered a possibility in the study area or at the Falls in particular?	Archaeology Report Peer Review by White Spruce, July 2012	Falls and rapids are documented in both the archaeological, historic and ethnographic literature as locations of pre-contact sacred sites that may contain burials (refer to Hamilton 1995). Dr. Pollock identifies these falls and rapids on Frederick House River as having archaeological potential. Stage 3 archaeological investigations will be undertaken on three pre-contact sites located in these areas during the Stage 2 work. The sites have been registered with the Province. There was no evidence of burials being present. However burials are not part of an archaeological licence project nor are Tk studies.
Were you able to find and/or record the historic portage on the east side of the river to Pickerel Lake?	Archaeology Report Peer Review by White Spruce, July 2012	There is no on-ground evidence of the former east side portage to Pickerel Lake or the former portage on the west side through the survey in fall 2013.
Wahgoshig First Nation had specific questions about how they would be consulted on the archaeological report if culturally sensitive archaeological sites are identified.	Archaeology Report Peer Review by White Spruce, July 2012	Stage 3 work will be undertaken for archaeological sites after consultations with First Nations and MNO.
Is any work or activity occurring now at the Wanatango Falls site that could impact the archaeological sites?	Archaeology Report Peer Review by White Spruce, July 2012	Xeneca has received a partial clearance letter from MTCs for construction activities prior to a full assessment of the archaeological site. There are no concerns for impacts to the archaeological sites from construction activities proposed on the construction sequence plans. The archaeological sites are greater than 300 m from the construction zone.

6.6.12 Mattagami First Nation

Mattagami First Nation is located 20 kilometers northeast of Gogama, and is road accessible via Highway 144. The village was originally located on the shores of Mattagami Lake. The community is a signatory to Treaty 9 and is represented by the Wabun Tribal Council. The traditional lands of the community extend to the Moose River headwaters on the James Bay Coast, and include the Mattagami River and Mattagami Lake areas.

Summary of Engagement

The community was first notified of the project on August 25, 2010, when a map of Xeneca's FIT contracts was provided to the community.

On April 14, 2011, Xeneca sent a posting to the community regarding the upcoming walleye and sauger study in the Frederick House River, requesting that the community post the notice.

On May 9, 2011, a Wanatango Project Description was provided by posted letter and attachments to the community for review.

On May 13, 2011, Xeneca sent a posted letter to Mattagami containing a Draft Aboriginal Consultation Plan, and a compilation of past written correspondences including PIC media advertisements, the Notice of Commencement, and a CD containing electronic copies of Project Descriptions.

On June 13, 2011, Xeneca provided the community with an invitation to participate in future archaeological studies regarding Wanatango Falls.

On August 31, 2011, Xeneca again provided via written letter, a copy of the Draft Aboriginal Consultation Plan for review by Mattagami First Nation.

On September 30, 2011, Xeneca provided notice to Mattagami First Nation that the Draft Environmental Report was available for review and comment.

On November 6, 2012, Xeneca provided hard copy of a cover letter notifying the community of the Wanatango Falls Environmental Report available for review on the website, and the 30 day review period.

On June 14, 2012, Xeneca provided notification and invitation to the community via posted letter to the Wanatango Falls PIC being held June 26th, 2012 in Cochrane.

On April 11, 2013, Xeneca provided Mattagami First Nation with an outline of the future planned Stage 2 archaeological studies that would be taking place at Wanatango Falls.

On July 17, 2013, Xeneca met with representatives from various communities including Mattagami First Nation in Timmins. The purpose of the meeting was to provide an update on the archaeology program, and to describe a process to move forward co-operatively to advance the Stage 3 and Stage 4 archaeological studies.

On September 11, 2013, Xeneca advised Mattagami that a cultural ceremony was being planned in conjunction with the other communities to take place near the proposed site.

On February 20, 2014 a meeting took place with Mattagami First Nation. A general overview of the Wanatango project was provided, including details of the development concept, the archaeological study findings, and the environmental impacts of the project.

Table 27: Mattagami First Nation ER Milestone Dates Summary

Milestone	Delivery Date	Delivered To
Project Description	May 9, 2011	Chief Walter Naveau
Notice of Commencement	May 13, 2011	Chief Walter Naveau
Draft Environmental Report	October 6, 2011	Chief Walter Naveau
Revised Environmental Report	October 10, 2012	Chief Walter Naveau

Current Status of Engagement

Throughout this period Xeneca has continued to engage Mattagami First Nation both individually, and through the Wabun Tribal Council. To date the community has identified specific concerns as detailed in Table 28. Based on a general understanding of the community's traditional and current use of the area, potential concerns for the community are listed in the impact and mitigation matrix in section 7. Xeneca is working towards the completion of the definitive legal agreements which are expected in short order. Consultation and engagement with this community will continue throughout the construction period, and into the lifecycle operations of the project.

Table 28: Issues and Concerns-Mattagami

Issue / Concern Raised	Date Identified	Response on Record
Concern regarding impacts upon spawning areas within the downstream zone of influence	February 20, 2014	Generating stations will be operated as run of river during the spawning season.
Three cultural heritage sites within the project footprint	February 20, 2014	Xeneca will continue to engage with Mattagami FN to ensure their participation in the Stage III archaeological studies.
Concern with the timing of the project	July 17, 2013	Xeneca is committed to continue to work with the communities beyond the specified timeline.
Concern related to the downstream zone of influence	July 17, 2013	<p>The extent of the project zone of influence ends below the tailrace of the FHLD (approx 1.4 km downstream.) As such, Xeneca's project cannot have any impact on the FHLD or upstream areas, including Nighthawk Lake.</p> <p>Changes to water levels will be well within the existing conditions experienced within the project zone of influence. Although water level fluctuations may be more frequent, the fluctuations will be well within the range currently experienced as a result of operation of OPG's FHLD. Commitments are in place to ensure water levels are maintained in a manner that allows critical life stages to occur for aquatic species i.e. spawning. Extensive work on flows that avoid fish stranding and allow for fish passage has also been undertaken.</p>

6.6.13 Conseil de la Première Nation Abitewinni (Pikogan)

The Conseil de la Première Nation Abitewinni (also known as Pikogan) are one of nine Algonquin communities within Quebec. This community traditionally occupied the Lake Abitibi area in Quebec. Lake Abitibi was a place of importance for the Pikogan, where they held important gatherings.

Summary of Engagement

On September 5, 2012, an introductory letter was sent to the community, outlining additional communities that were added to the consultation roster by the MNR. The letter included all relevant documentation sent to previously identified communities throughout the EA process.

On November 6, 2012, a posted letter with attachments was sent to the community and a CD copy of the Environmental Report was provided for the community's review.

On December 12, 2012, a phone call was made to the community. A message was left with the territorial office and a message was left for the key contact person.

On April 11, 2013, the Stage II Archaeological Report was provided for review and comment along with an explanation of the archaeological study process.

On July 9, 2013, a phone call was made to the community. We discussed the potential to come to the community to share information about the project and the community. Chief Kistabish indicated he would first contact Chris Sackaney of Wahgoshig, and discuss community relations and protocols between their communities, and advised he would then call Xeneca on a decision to meet.

On November 7, 2013, a posted letter was sent, containing a Notice of Commencement for projects on the Frederick House River, the Project Description for Wanatango Falls and the Draft Environmental report for Wanatango Falls.

Current Status of Engagement

Throughout this period Xeneca has continued to engage Conseil de la Premiere Nation Abitibiwinni. To date the community has not individually tabled any specific concerns related to aboriginal treaty rights, traditional lands or specific community issues. Based on a general understanding of the community's traditional and current use of the area, potential concerns for the community are listed in the impact and mitigation matrix in section 7. Consultation and engagement with this community will continue throughout the construction period, and into the lifecycle operations of the project.

7. EVALUATION OF POTENTIAL PROJECT EFFECTS

7.1 ZONE OF INFLUENCE

Agencies advised that a discussion and rationale be included in the Final ER to clarify the definition and delineation of the Zone of Influence (ZOI). The following sections outline the detailed rationale regarding ZOI.

Delineation of the extent of the watershed ZOI is important in determining where baseline and assessment studies must be carried out in accordance with the Waterpower Class EA process.

Since flow alterations attenuate gradually with distance, agencies have requested the proponent to rationalize the endpoint where the alteration is no longer deemed to have a direct effect that could result in serious harm to human health or the environment.

This section outlines how the watershed ZOI for the proposed Wanatango Falls GS Project was defined and assessed in relation to the flows and levels of the Frederick House River. The following sections outline:

- The regulatory context
- The existing conditions on the Frederick House River
- The proposed operation of the Project
- The methodology used to delineate the anticipated ZOI and/or the study area
- How the hydrologic flow, thermal conditions, sediment regimes, water quality aspects and biological components of the river were considered
- The determination of impacts to values, features and functions within MNR and MOE mandates
- How MNR/MOE requirements will be addressed in the permitting process.

A map of the ZOI for the proposed Wanatango Falls Project is shown in Figure 1. The upstream end of the proposed headpond begins a short distance (1.4 km) downstream of the existing Frederick House Lake Dam, ending at the proposed Wanatango dam site approximately 500 m upstream of Zeveryly Bridge on Newmarket Concession Road 5, and 10 km downstream of Frederick House Lake Dam. Flow alterations resulting from the operation of the project attenuate gradually with distance downstream, resulting in a downstream ZOI that ends at just upstream of the Neeland's Rapids (located approximately 24 km downstream of the proposed dam). No significant flow alteration due to project operation is expected to occur downstream of Neeland's Rapids.

7.1.1 ZOI & Regulatory Context

The Waterpower Class EA process, as put into place in 2009, introduced the topic of ZOI as a specific aspect of the EA process. The exact definition is as follows (see p. 85, "Class Environmental Assessment for Waterpower Projects", OWA, guidebook, second edition, March 2011):

- ***"Zone of Influence – immediate area beyond the site directly affected by the project."***

Extensive dialog with agencies has occurred since 2010 with respect to the proper interpretation of the ZOI on all Xeneca projects, including the proposed Project herein. On June 6, 2013, MNR provided the following advice on how to address this matter:

- *MNR respects the Zone of Influence (ZOI) definition contained in the OWA Class EA for Waterpower Projects (the Class EA). MNR encourages proponents to discuss with/seek clarification from OWA, if required, on how to apply the definition either generally or within the context of a particular project.*
- *MNR will continue to use this definition, the general guidance contained in Section 2.5 of the Class EA (“The Environment Affected and the Expected Range of Effects”) and MNR’s 2010 interim guidance for “Field Data Collection for Waterpower Projects” to inform our discussion with proponents on how to delineate for each waterpower project an appropriate ZOI to enable the proponent to adequately describe the environment affected and the range of effects for the purposes of the Class EA.*
- *MNR will continue to use the above guidance in conjunction with the broad purposes as set out in Section 2 of the Lakes and Rivers Improvement Act to ensure that in approving the location of the project/facility the operational requirements/constraints, flooding rights, mitigation to reduce impacts, compensation measures to address impacts and monitoring requirements have been adequately identified.*
- *MNR will continue to work collaboratively with proponents to meet the intent of Section 5.0 of the Class EA to identify opportunities to create a process that facilitates coordination with and integration of other legislative and regulatory requirements. In keeping with a coordinated approach, MNR recommends that all requirements of the LRIA, ESA and PLA be considered prior to and throughout the EA process.*
- *MNR recognizes that the Class EA is the primary planning and public engagement framework for waterpower proposals. Consistent with the Class EA, proponents are ultimately responsible for determining the required ecological data collection requirements with consideration being given to advice provided by MNR. It is the proponent’s responsibility to determine the potential ZOI (i.e. project scope) under the Class EA.*
- *If MNR and a proponent cannot come to a consensus on a final ZOI during the EA process, MNR would expect a proponent to clearly describe in the final Environmental Report (ER) the methodology used to delineate the ZOI boundary and, in situations where the ZOI does not cover the entire extent of hydrologic alteration resulting from the proposed development, rationalize why a stretch of river was not assessed or consulted on and how it came to its determination that the change to the hydrological regime does not cause an impact to any of the features or values of interest within MNR’s mandate. Inclusion of this rationale within the ER will help MNR make a determination as to whether or not sufficient information has been collected to allow MNR to make informed permitting decisions.*

The Ministry of Environment (MOE), Northern Region Director also referenced the above guidance by letter dated June 14, 2013.

The following sections outline how the ZOI for the proposed Project was determined and is consistent with the definition of the Waterpower Class EA process and the regulatory advice provided by MNR on June 6, 2013. Especially considered were influences on flows and levels in the Frederick House River upstream and downstream of the proposed Wanatango dam location.

7.1.2 ZOI & Existing Conditions

Definition of the ZOI requires an understanding of the existing flow conditions on the Frederick House River and the additional effect of flow alteration created by the proposed Project. Relevant aspects of the existing flow conditions are described in this section. Additional details about the hydrological flow under existing conditions are documented in Hydrology Review (Hatch, 2009) and Hydrology Memo (Hatch, 2011) reports in Annex I of this ER.

Under existing conditions, the flow on the Frederick House River is highly regulated by the Frederick House Lake Dam (FHLD), located approximately 10 km upstream of the proposed Wanatango Falls GS Project. The flow regulation dictates the prevailing flow conditions from FHLD to the confluence with the Abitibi River over 70 km downstream. Figure 21 shows a 2010/2011 excerpt of the hydrographic record (red line) illustrating the significant variability of flow released from FHLD throughout the year. It is important to note the extended periods (weeks) where zero flow is released, followed by extended periods where moderate to high flow is released (up to 90 m³/s in 2010/2011). Also noteworthy is the abrupt nature of the flow changes, which occur due to flow regulation several times during the year. The corresponding water levels changes (blue line) recorded at the Wanatango site vary by as much as 1.9 m under existing flow conditions.

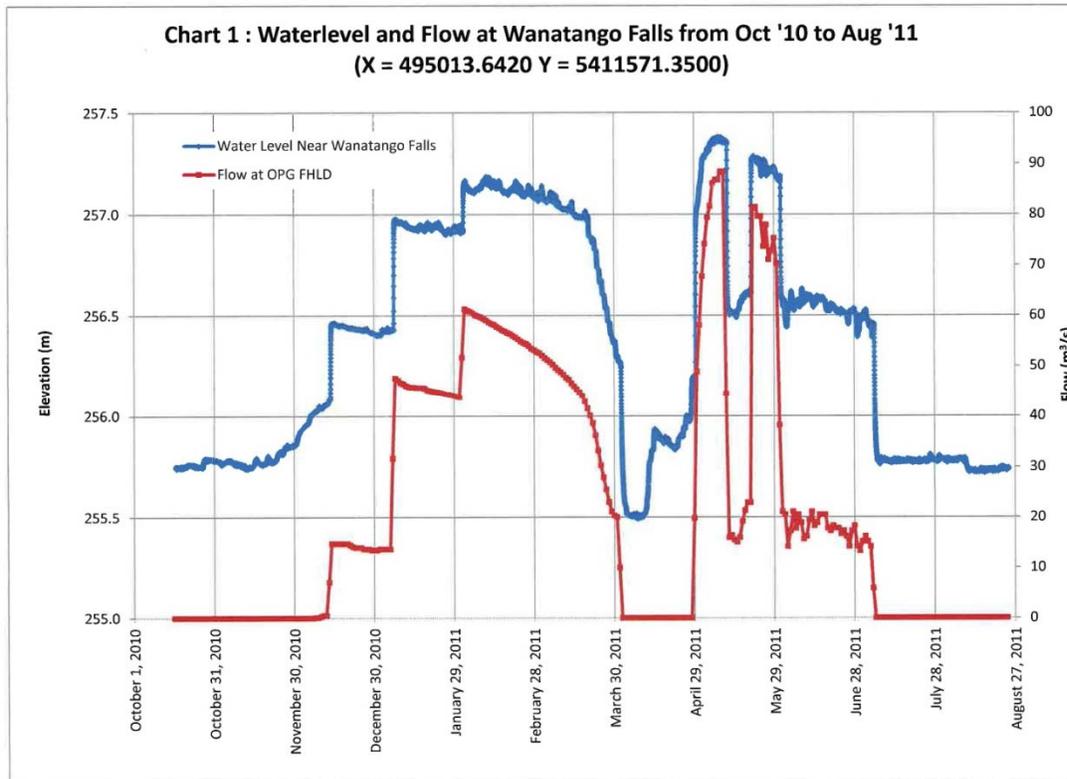


Figure 21: Hydrograph Excerpt

Hydrologic flow statistics as provided by OPG for FHLD for the period 1994 to 2011 are summarized in a technical letter dated April 16, 2013 (Letter from Xeneca to Cochrane District MNR, April 16, 2013, in Appendix C). The data shows that flows of near 0.0 m³/s are released from FHLD on average 27% of the time under existing conditions (i.e. approx. 100 days in a typical year). Figure 22 below illustrates the periods of zero flow for the years 2007 to 2012. The zero flow conditions occur primarily from the end of March to the end of September but vary significantly in duration from year to year. Due to the prolonged periods of low flow under existing conditions, the statistical Q80 annual base flow reference value at the outlet of FHLD is 0.0 m³/s. The Q95 annual base flow reference value is also 0.0 m³/s.

Monitoring at the Wanatango dam site location (10 km downstream of FHLD) indicates flows of 2.0 m³/s at times when the reported outflow at FHLD is 0.0 m³/s and under dry hydrological conditions in the tributaries. The additional flow is attributed to seepage and tributary flow occurring between the two locations (there are a total of 22 tributaries within the downstream ZOI). A flow of 4 m³/s or more is estimated to occur at Neeland's Rapids (~24 km downstream of the Wanatango dam site) under the above conditions due to further tributary inflow. The associated flow rate of 4 m³/s at Neeland's Rapids defines the approximate ecological base flow (i.e. approximate Q80 and Q95 reference conditions) under existing conditions for 100 days of the year at Neeland's Rapids when dry conditions prevail and releases from FHLD are 0.0 m³/s.

The flow rates of 2 m³/s at Wanatango Falls and 4 m³/s at Neeland’s Rapids provide a benchmark for planning minimum operational flows at the two locations. The water level fluctuations measured under existing conditions provide a useful comparison for level alterations resulting from the proposed facility operation.

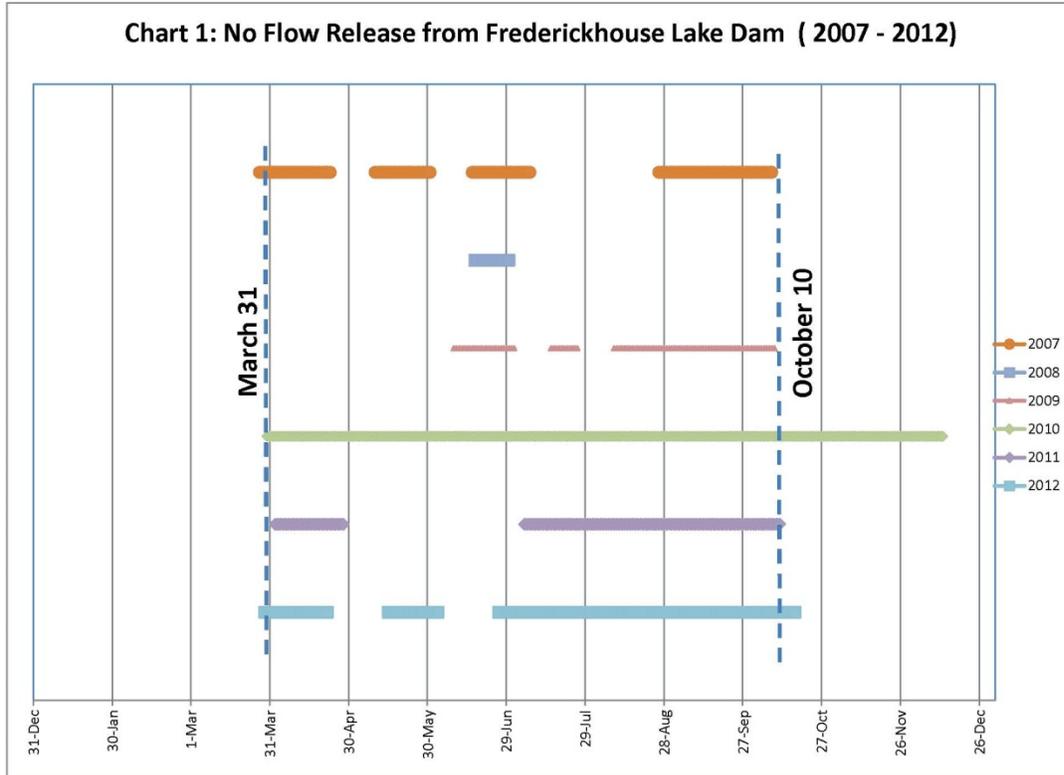


Figure 22: Periods of Zero Flow Release from the Frederick House Lake Dam from 2007 to 2012

7.1.3 ZOI & Dam Operation

The proposed Project will cause alteration to the existing river flows downstream and associated fluctuations in the headpond upstream (see the proposed Operating Plan in Annex I). This section outlines how the flow alterations were considered in determining the extent of the ZOI and how operating restrictions and compliance limits were used to mitigate potential environmental impacts.

During moderate and low inflow conditions, the proposed operation would shift some of the flow provided by FHLD from nighttime hours to daytime hours to better meet the needs of the provincial electricity grid. However, the total volume of water released from the Wanatango Falls GS each day would equal the volume of inflow into its headpond each day. The result is a daily variation in downstream flows and levels but with an average flow and level that is consistent with existing conditions. Upstream, the headpond level fluctuates during daily operation as water is stored at night (headpond rises) and used during the day (headpond falls).

The watershed ZOI is defined as the area that is directly affected by the fluctuations in flows and levels in the headpond upstream and the river downstream.

Hydraulic modeling has shown that daily flow alteration resulting from operations attenuates gradually with distance to a point where the residual flow alteration is no longer significant from an ecological perspective downstream (Frederick House River Site #12 – Wanatango Falls Additional Peaking Scenarios by CPL (2014) in Annex I). The models were used to assess the downstream attenuation of flow rates and levels resulting from daily operation and flow alteration.

7.1.4 Operation & Low Flows

A detailed analysis was carried out to assess low flow conditions related to operations and ensure that operations-related low flows are not inconsistent with low flows that occur under the existing conditions outlined above (i.e. 2 m³/s at Wanatango and 4 m³/s at Neeland’s Rapids).

Table 29 below provides a simplified summary of the proposed operation under typical inflow conditions and the resulting operating flow conditions at Wanatango and at Neeland’s Rapids. Of special ecological interest are night time low flow conditions that occur when the facility operation is in “Intermittent” operation or “Off.” As shown in the table, facility operation has been designed so that operating flows at night do not fall below the ecological base flow rates of 2 m³/s at Wanatango and 4 m³/s at Neeland’s Rapids. Note, additional information on the facility operation is provided in the Operating Plan document (Annex I).

Table 29: Operation and Projected Flows

Facility Operation	Time (%)	FHLd release	Proposed Site		Neeland’s Rapids	
			Day	Night	Day	Night
Spill Flow (Spawn /ROR)	14%	48+	50+	50+	52+	52+
Continuous (15-50 m ³ /s)	43%	33 *	50	25	45	30
Intermittent (1-14 m ³ /s)	16%	8.7*	20	2	16.3	5.8
Off (ROR)	27%	0	2	2	4	4

Note: Time % based on 1994-2011 OPG data. Low flow incl. 2 m³/s seepage between FHLd and Wanatango and another 2 m³/s between Wanatango and Neeland’s Rapids. *Projected flows based on a representative inflow condition of 8.7 m³/s (Intermittent) and 33 m³/s (Continuous), also see Operating Plan and technical analysis by Canadian Projects Limited, April 2, 2013.

Under the “Off” operating mode, the facility is in run-of-river (ROR) operation and no alteration of flow occurs. A ZOI discussion is not required for this operating mode. The “Off” mode occurs approximately 27% of the time. Similarly, no alteration of flow occurs under the “Spill Flow” mode (i.e. ROR). This mode occurs when flows exceed the facility capacity and typically coincides with spring spawning. The facility operates at full capacity and any excess water is

spilled. This mode occurs 14% of the time, primarily in spring when spawning also occurs. Combined, ROR operation with no flow alteration occurs 41% of the time.

Under the “Continuous” operation mode, the facility runs 24/7 and operates within the facility operating range (15-50 m³/s) at all times. In this mode, downstream flows vary from day to night, but never fall below 15 m³/s. Flows of 15 m³/s are substantially above the ecologically base flow rates. An exception exists during spring spawning when flows higher than ecological base flows are required. The Operating Plan (Annex I; see also Section 7.3.6 of this ER) includes special restrictions so that no daily alteration in flow occurs due to project operation during spawning.

The “Intermittent” operating mode occurs approximately 16% of the time (i.e. whenever natural inflows from upstream range from 2 m³/s to 15 m³/s). In this mode, the facility runs at limited capacity during the day (i.e. at 20 m³/s) and is shut in at night. A flow of 2 m³/s is released at all times when the facility is shut in to maintain an ecological base flow that is consistent with established ecological base flow rates. The intermittent operating mode has been studied in detail using hydraulic models and various inflow scenarios (see the report, “Unsteady Flow Modelling” by CPL (2014) in Annex I). The analysis shows that the daily flow variations attenuate with distance downstream. The attenuation results in night time flows at Neeland’s Rapids that are higher than 4 m³/s at all times, even when the release at the facility is only 2 m³/s.

7.1.5 Operation & Level Fluctuations

The extent of level fluctuations was considered in the delineation of the watershed ZOI. Operation related fluctuations result in water levels that are higher than normal levels during the day and lower than normal flow levels during the night. While fluctuation in flows and levels occurs naturally, flow alteration induced by operation differs in three aspects:

- The frequency of fluctuation is daily, instead of weather dependent/random.
- The degree of level fluctuation can be controlled operationally.
- The fluctuation attenuates naturally with distance downstream.

The Operating Plan (in Annex I) outlines specific operating profiles that restrict the operation to one cycle of operation per day (to avoid multiple fluctuations per day). Also restricted is the rate of change of flow to ensure that flow adjustments (a.k.a. “rampings”) occur gradually. The above features of the operating profiles are intended to mitigate potential environmental effects related to level fluctuations.

The Operating Plan also commits to limit water level fluctuations at Neeland’s Rapids. Hydraulic modeling (Frederick House River Site #12 – Wanatango Falls Additional Peaking Scenarios by CPL (2014) in Annex I) shows that the maximum level fluctuations occur during “Intermittent” operation when flows range from 2-20 m³/s and during “Continuous” operation when flows

range from 25.7-52 m³/s). The modeling predicts that daily level fluctuations can be limited to approximately ± 25 cm immediately downstream of the site and to ± 10 cm at Neeland's Rapids, 24 km downstream. Corresponding operating restrictions and monitoring commitments have been included in the Operating Plan and the Post-Construction Monitoring Plan (see Section 13.2 below).

An analysis was carried out to determine if the ± 10 cm fluctuation at Neeland's Rapids is statistically significant when compared to the level fluctuations that occur naturally on the river. Xeneca retained Canadian Projects Limited to prepare a report on the comparison of operational and natural fluctuations on the Frederick House River (see the October 12, 2012 report, "Water Level Fluctuation Analysis" in Annex I). The figure below taken from this report summarizes the results of the analysis.

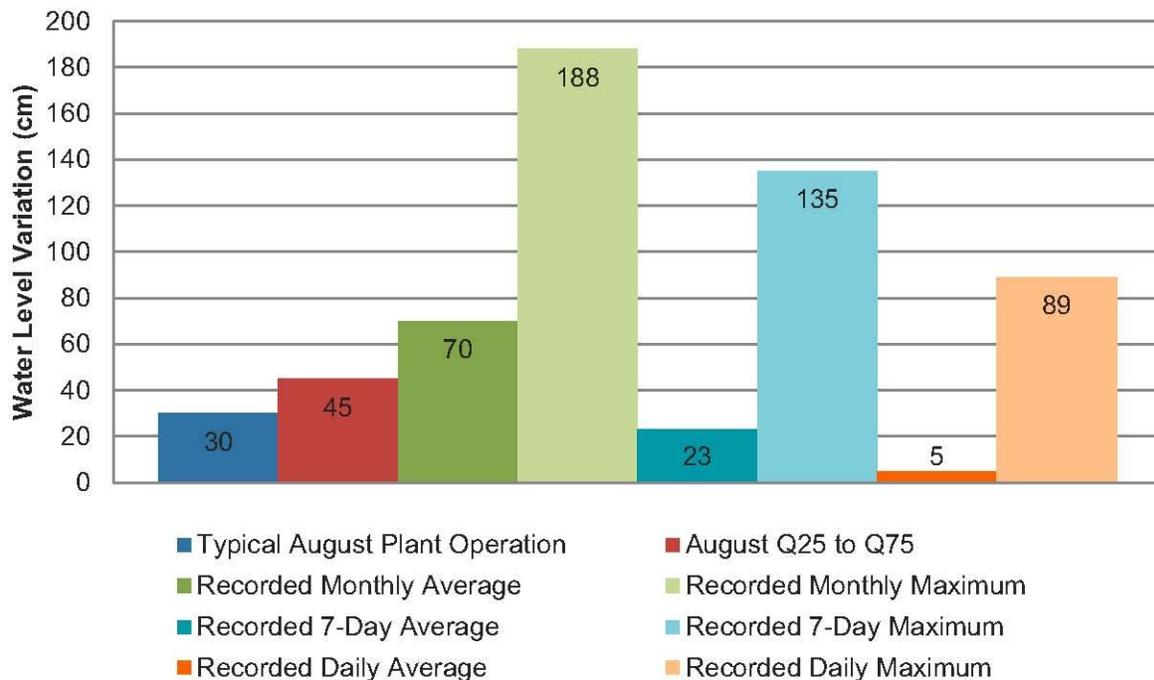


Figure 23: Water Level Fluctuation Analysis Summary at Neeland's Rapids

As this figure illustrates, at Neeland's Rapids large fluctuations of ± 94 cm (188 cm total) occur seasonally, consistent with the hydrograph excerpt from 2010/2011 shown in the previous section of this analysis. Moderate fluctuations of ± 35 cm (70 cm total) occur monthly under existing conditions. Small fluctuations of ± 3 cm (5 cm total) occur daily. The proposed daily operation of ± 10 cm at Neeland's Rapids is significantly smaller than the existing monthly fluctuation, but larger than the existing daily fluctuation (*Note: The figure shows ± 15 cm which was revised later in the consultation process to ± 10 cm to address agency concerns. The ± 10 cm was achieved by restricting the daily operating profile for "Intermittent" operation to a maximum of 20 m³/s during daytime hours, rather than 33 m³/s.*)

The statistical analysis suggests that the proposed operating fluctuations of ± 25 cm immediately downstream of the site are statistically significant while the residual fluctuations of ± 10 cm at Neeland's Rapids, 24 km downstream, are not statistically significant when compared to existing conditions. As a result, it was determined that flow fluctuations beyond Neeland's Rapids are not part of the ZOI as they are not inconsistent with the existing conditions.

7.1.6 Operation & Shoreline Erosion

Consideration was given to the increased daily fluctuation on shoreline erosion downstream of the proposed Project. Specifically, consideration was given to the increase in the existing statistical average daily fluctuation from ± 3 cm for the Frederick House River to daily operating fluctuations of ± 25 cm immediately downstream of the proposed dam. Secondly, consideration was given to the residual fluctuations from operations of ± 10 cm at Neeland's Rapids, 24 km downstream. The following factors were considered:

- The geomorphology study (Geomorphic Assessment report by Parish Geomorphic (2013) in Annex I) carried out indicates that the river is "in regime" and the channel profile is stable.
- The proposed operating fluctuations occur within the existing and developed stable channel profile.
- The flow rates associated with daily operation are not sufficient to cause channel alteration as they are significantly less than 'channel forming' flow rates (Q1:2 spring flood flow rate).
- The proposed level fluctuations downstream of Neeland's Rapids (i.e. less than ± 10 cm per day) are not significantly different from existing conditions.

Based on the above, it can be concluded that the proposed operation is not likely to impact downstream channel erosion. However, shoreline monitoring has been proposed in the geomorphic report and adopted in the Post-Construction Monitoring Plan in Section 13.2.

7.1.7 Operation & Fish stranding

MNR has questioned if the "intermittent" operation mode could cause fish stranding at either Zeverly's Rapids (immediately downstream of the proposed Project) or at Neeland's Rapids (24 km downstream). Both locations contain irregular bedrock outcrops and small pools at the channel bottom where fish stranding could occur if levels drop low enough during operation. The following consideration was given to this matter:

- Fish stranding is known to occur under existing conditions in a rock pool at Zeverly's Rapids and could occur more frequently under proposed operation unless mitigation is provided.
- No fish stranding has been documented at Neeland's Rapids under existing conditions.
- Photographs of Neeland's Rapids indicate no obvious locations where fish stranding would occur as a result of the committed constraint in water level fluctuations of ± 10 cm. However, visual monitoring has nonetheless been committed to for the first year of intermittent operation to determine whether or not isolated pools form during operations and if fish are in fact being stranded in these pools.
- If fish stranding occurs at Neeland's Rapids, it would be occurring several times per year under existing conditions, whenever flow drops to 4 m³/s (i.e. whenever FHL D is not discharging).
- Where fish stranding does occur under existing conditions, it is likely fatal due to long delay (days or weeks) before higher flow returns (see figure with hydrograph excerpt above).
- The likelihood of fish stranding due to rapid level changes is low. Hydraulic studies show that flow drops slowly at Neeland's Rapids during intermittent operation (CPL, October 12, 2012) thereby reducing the likelihood of stranding fish.
- The likelihood of fish stranding due to large level changes is low. Xeneca has committed to a ± 10 cm change in levels at Neeland's Rapids during intermittent operation, thereby reducing the potential for stranding. Level changes associated with the existing condition exceed 1 metre (albeit less frequent).
- The likelihood of fish stranding due to extreme low flows is limited. The minimum flow at Neeland's Rapids associated with intermittent operation (5-6 m³/s) is not as low as the baseflow under existing conditions (4 m³/s).
- The likelihood of fish mortality from intermittent operation is low. Normal flow is returned within 24 hours, thereby allowing stranded fish to escape.
- The frequency of conditions that could lead to fish stranding is low. Intermittent operation only occurs 17% of the time.

In summary, no fish stranding concern appears to exist at Neeland's Rapids due to the operating restrictions already implemented; however, monitoring is proposed as part of the Post-Construction Monitoring Plan (Section 13.2). Fish stranding already occurs at Zeverly's Rapids in one particular rock pool. Stranding could increase due to operation unless mitigation is

carried out. It is proposed to carry out a small channel improvement in the rock pool at Zeverly's Rapids to mitigate or eliminate the potential for fish stranding due to proposed operation. Future monitoring is proposed to verify the success of the mitigation effort.

7.1.8 Headpond Operation

The area impacted by the inundation of the proposed headpond forms the watershed ZOI upstream of the proposed dam.

The preferred option for the proposed Project involves the construction of a 3.9 meter high dam. The upstream ZOI is defined as the area immediately upstream of the dam affected directly by the proposed inundation of the headpond area. The proposed headpond will extend 8.6 km upstream from the dam to a location 1.4 km downstream of the existing Frederick House Lake Dam. The resulting headpond will directly affect the inundated terrestrial and aquatic habitat. The affected terrestrial habitat will be changed into aquatic habitat. The affected aquatic habitat will be altered by increased water depth and lower flow velocities. The methods used to define the upstream ZOI include:

- A LiDAR survey was carried out to obtain detailed topographic information throughout the proposed headpond area.
- A hydrology study and hydraulic modeling study were carried out to predict the inundation extent that will result from the proposed Project.
- Maps of pre-project and post-project inundation extent were prepared and used for public consultation and the ER document.

The inundation extent was defined for two conditions; normal flows (i.e. long term average flow) and maximum flood extent (1:100 year flood event). The inundation extent associated with normal flow was used to map the areas where terrestrial habitat is altered to aquatic habitat. The aquatic and terrestrial habitat in the proposed headpond area was assessed for existing baseline conditions and potential changes related to inundation. The work consisted of the following as documented in the ER document:

- Baseline habitat and baseline conditions were mapped with special emphasis on identifying *features and functions within MNR and MOE mandates* including species and habitats of special significance (e.g. sport fish, threatened species, spawning beds, etc.).
- The proposed change in water depth and flow velocity was evaluated using the hydraulic study results. Consideration was given to effects on habitat, impact mitigation, monitoring and adaptive management.

- The proposed effect of inundation of terrestrial habitat to aquatic habitat was considered with emphasis on identifying any special terrestrial habitat that might be lost. Consideration was given to the adaptation of terrestrial and shoreline species with respect to the proposed permanent alteration.
- The potential impact on locations with archaeological significance was considered.
- Other potential physical, biological and chemical changes were considered including water quality, temperature, erosion and sediment. Separate analyses were carried out for each topic including collection of baseline data and change assessment. Where a notable change was expected to occur, consideration was given to habitat impacts, impact mitigation, monitoring and, if applicable, adaptive management.

Also considered was the potential change in existing conditions for riparian and/or adjacent land use. Specifically considered were:

- Any potential change to the maximum flood extent (i.e. identification of any locations where the maximum flood extent would be greater or cover a larger area than under the existing condition).
- Any potential change to the location of the water's edge under normal flows, particularly where the water's edge line makes up a portion of the private property boundary as defined on the legal land title.
- Any potential change to the daily variability in levels of the headpond which could affect water access or navigability at the water's edge.

All private land owners affected by the creation of the headpond were contacted. The land owners were given special consideration in the consultation process. Detailed inundation mapping was provided to all riparian and adjacent land owners. In addition, land settlement negotiations were conducted with each affected land owner.

It should be noted that much of the extent of the proposed headpond is adjoined by private land. Land settlements are required with each affected land owner before the proposed Project can proceed. The settlement process is not specifically part of the Waterpower Class EA process. However, evidence of settlement is required as part of the MNR's Crown land disposition process which follows the Waterpower Class EA process. Public consultation, as well as one-on-one business negotiation was carried out with private land owners during the EA process (see Section 6.4 of this ER).

No Provincial Park or Conservation Reserve is affected by the upstream inundation. All other public and recreational uses related to the upstream ZOI were considered through the public consultation process outlined in the relevant sections of the ER documents.

7.1.9 ZOI Endpoint Definition

A small residual alteration of flow will persist beyond the defined ZOI endpoint at just upstream of Neeland's Rapids whenever daily operation occurs. The following rationale summarizes why the residual alteration of flow beyond Neeland's Rapids does not require further assessment and why just upstream of Neeland's Rapids was defined as the endpoint of the downstream ZOI:

- Flow alteration beyond Neeland's Rapids is largely attenuated to near background conditions.
- The residual level fluctuation is small (i.e. less than ± 10 cm and attenuating further with distance) in comparison to natural variability associated with existing conditions and attenuates entirely with further distance downstream.
- No concerns were raised during public stakeholder consultation regarding the proposed residual fluctuations beyond Neeland's Rapids.
- The First Nation burial site identified during consultation and located downstream of the ZOI will not be impacted. The residual flow alteration occurs within the range of normal water levels and does not add to flooding conditions. The Operating Plan commits to no daily operation under flood flow conditions.
- Navigation will not be affected. The maximum residual alteration in levels (i.e. ± 0.1 m from existing conditions) is not an appreciable reduction in navigation depth or dock water levels and is within existing conditions. Operating commitments have been made to ensure that minimum flows and levels are maintained that are consistent with existing conditions.
- Riparian rights are not affected. The location of the water's edge with respect to legal property boundaries remains unimpaired as the residual amplitude changes are amplitude changes related to defining water's edge.
- No changes to flood mapping are required. At no time will the proposed level fluctuations exceed the bank full condition or exceed the high water mark. The proposed fluctuations occur exclusively at moderate and low flow rates and never at high flow rates.
- No municipal water intakes or waste water discharges are known downstream of the ZOI that could be affected by variable flow conditions.

- No erosion and sediment impact exists. The residual alterations are orders of magnitude smaller than the channel-forming flows that impact erosion and sediment transport. As such, no impact on shoreline erosion (or accretion) is associated with residual flow alterations.
- The flow alterations are largely within the existing condition, except that they occur for additional days of the year.

Based on the above considerations, the environment values, features and functions within MNR and MOE mandates will not be directly affected beyond the downstream extent of the ZOI.

7.1.10 ZOI Summary

As advised by agencies, a detailed discussion and rationale on ZOI has been included to ensure that the Final ER is consistent with the definition of ZOI in the Waterpower Class EA and that aspects of importance to agency mandates have been considered.

Extensive analysis was carried out to define the extent of the watershed ZOI. It was determined that the ZOI extends from the upstream end of the proposed headpond to just upstream of Neeland's Rapids located approximately 24 km downstream of the proposed dam site. It was further determined that any residual flow alteration that may occur beyond Neeland's Rapids is no significant and does not require further baseline or effects assessment as it relates to the Waterpower Class EA process.

7.2 POTENTIAL EFFECTS TO THE ENVIRONMENT

In the Class EA for Waterpower Projects (January 2014), an effect is described as:

“Any change to the environment, positive or negative, that could occur as a result of a project”, and which can “include the impact or benefit that a project could potentially have, directly or indirectly, on the environment at any stage in the project life cycle.”

Under the *EAA*, “environment” means:

- a. air, land or water,
- b. plant and animal life, including human life,
- c. the social, economic and cultural conditions that influence the life of humans or a community,
- d. any building, structure, machine or other device or thing made by humans,
- e. any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities, or
- f. any part or combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario.

The purpose of an environmental assessment is to identify all those ecosystem components that are important to the environment (e.g., biological, social and economic) within the project area and to evaluate how the project would affect these valued ecosystem components. The EA team has adopted the conceptual hierarchy of avoidance, prevention and mitigation for this project. Where an impact cannot be avoided or prevented, mitigation measures were considered.

Mitigation measures include:

- Reducing the magnitude and duration of the impact;
- Repairing the situation post-impact to return to a pre-impact state;
- Offsetting the impact through other means.

Investigations undertaken in support of this project identified the anticipated effects of the project, at both the generating station site and ancillary components as presented in Sections 3.1 and 3.2, respectively. Once identified, the EA team worked collectively to apply its expertise to finding solutions to avoiding, mitigating or minimizing the identified effects.

Project effects and management strategies considered by the EA team during the preparation of conceptual site designs, construction plans and operation plans, and those identified through the consultation program, are presented in the following section.

The results of the project life-cycle potential impact analysis based on available data and information and recommended mitigative measures are presented and discussed within this report under Section 7.3 (for potential ecological effects) and Section 7.4 (for potential socioeconomic effects). All technical information completed by the EA team members is provided in the Annexes which accompany this document. A summary of the recommended mitigative measures is presented in tabular format for the reader's convenience in Table 30. Over the course of the assessment process, potential effects to the natural and socioeconomic environment within the project area were identified. For discussion purposes, these effects are grouped into categories, each of which is presented with a discussion of effects as they are derived from the inundation, operation strategy, and footprint of the proposed Wanatango Falls GS. In addition, the general mitigation strategies as they will be applied to these issues are presented. A discussion of Table 30 which indicates the effects identified and resolutions developed through the assessment is provided below in the following sections.

TABLE 30: Identified Issues and Management Strategies

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
General Natural Environment					
Air quality	Noise from operation of electrical generator and transformer at powerhouse	Operation	<ul style="list-style-type: none"> The facility is located in a remote area with an absence of human development Most equipment will be located inside the powerhouse which will minimise outside noise Use of electrical generator will be limited (typically only in emergency situations and/or power outages) 	While there will be noise associated with the operation of the facility there are no identified receptors within 1000 m. Modeling indicates that noise levels would meet applicable MOE noise criteria at both 500 m and 1000 m from the site. If noise impacts are detected during operation above modeled levels further mitigation will be implemented. In the case that an emergency generator is installed, an Environmental Compliance Approval (ECA) will be required	Yes
	Exhaust emissions from equipment and vehicles	Construction	<ul style="list-style-type: none"> Implement standard construction site best management practices Vehicles and equipment will be fitted with appropriate mufflers Reduce equipment and vehicle engine idling 	Low negative impacts are possible during construction - impacts will be mitigated or eliminated where ever possible.	Yes
	Odour	Construction	<ul style="list-style-type: none"> Utilize approved waste handling and disposal practices for VOC and organic waste management Organic/food waste will be collected daily and stored in closed, animal resistant containers until disposed of at an approved waste disposal site Full disposal containers will be removed to the appropriate waste disposal facility on a regular basis An attractant management policy to minimize the effect on wildlife from the storage, preparation and disposal of food products at the construction camp will be implemented 	No impacts anticipated - proper management policy implementation and handling of VOC/organic waste onsite and offsite disposal at an approved disposal location will mitigate potential impacts	No
	GHG Offsets	Operation	<ul style="list-style-type: none"> Waterpower can offset GHG emissions from coal fired generation. 	Positive effects due to GHG offsets by building a hydroelectric generating station to generate 19,180 MWh per year of renewable energy represents the displacement of 13,226 tons of carbon dioxide equivalent	Yes
	Dust emissions from construction activities and vehicles	Construction	<ul style="list-style-type: none"> Project personnel will control dust at work sites when it is warranted by the conditions Water spraying or alternate (non-chemical) methods will be used to suppress dust on all project roads and work areas when required as a result of dry or windy conditions Additional precautions (additional spraying, etc.) will be taken in windy conditions or prior to moving stockpiled material with the potential to generate dust Inactive stockpiles will be covered or surrounded by a wind barrier to minimize dust emissions Trucks will be required to use dust covers when traveling through populated areas Unpaved roads will be regularly maintained and speed limits established to minimize emissions 	Low negative impacts - impacts mitigated or eliminated wherever possible through implementation of mitigation measures	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Water Quality (surface and groundwater)	Surface water - general terrestrial and riparian construction activities along shoreline of waterway at facility and water crossings along power line route and access roads	Construction	<ul style="list-style-type: none"> • implement standard construction site best management practices • construction machinery should arrive on site in a clean condition • ensure a spill response and contingency plan is in place • maintain appropriate emergency response measures • implement wet weather restrictions • stabilize all waste materials above the high water mark • use mechanical means (not chemical) to clear and manage vegetation within ROW • project personnel will be made aware of safe concrete handling procedures. Concrete handling will employ watertight forms, spill contingencies, and designated truck clean out pits. • clearing will take place as close as practical prior to excavation and earthworks to minimize the length of time that soils are exposed • contain material when working near water bodies silt curtains, sediment traps and settling ponds • removal of riparian vegetation should be minimized and all areas to be cleared will be clearly demarcated by fencing or similar measures • no excavation or borrowing will be done without the appropriate plans, surveys, permits, and approvals in place • where practical, existing borrow sites and associated roads, trails or cut lines will be used instead of developing new sites • borrow sites for aggregate will be located in upland locations and separated from streams and lakes by a minimum 30 m wide buffer of undisturbed terrain in order to minimize potential for siltation • borrow area will be staked to prevent accidental over-extension of the affected area • where ever possible, vegetative buffers will be left between areas to be cleared and watercourses 	Low negative impacts possible. Impacts mitigated or eliminated wherever possible through implementation of mitigation measures. A sediment and erosion control plan will be developed for the project documenting detailed mitigation measures and best management practices to be adhered to.	Yes
	Surface water - In-water works construction and removal of the cofferdam: potential for excess sediment to be suspended and carried downstream by river flow	Construction	<ul style="list-style-type: none"> • Ensure that all materials placed into the river have been prewashed in order to minimize the introduction of fine sediment into the waterway. • Construct and remove the cofferdams during an appropriate low flow period. • Ensure that construction takes the least possible time by having all construction materials and necessary equipment available prior to construction or removal of the cofferdam. • Avoid construction and removal during the time typically associated with spawning and egg incubation times of warm water fish species (typically April 1 to July 15). Specific timing windows should be agreed to with the local MNR and DFO as part of the permitting process; • where conditions permit, implement further sediment control measures as required according to prepared sediment control plan 	Low negative impacts possible. A sediment and erosion control plan will be developed for the project documenting detailed mitigation measures and best management practices to be adhered to. Due to the velocities present in this section of river, it may not be possible to isolate the cofferdam construction from the channel using a silt curtain or equivalent, in this case site specific methodologies will be developed according to industry best management practices in order to avoid water quality impacts (e.g. the use of pre-washed aggregate for cofferdam construction, etc.)	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Water Quality (surface and groundwater)	Contamination from spills or leaks of hazardous substances	Construction	<ul style="list-style-type: none"> spill prevention and containment measures to be put in place throughout construction period ensure that workers are adequately trained in the implementation of a prepared spill response plan personnel will be trained in the requirements for the storage and transport of hazardous material ensure availability of spill control equipment and materials store hazardous materials at least 150 m away from water bodies provide impervious dikes and liners around oil, fuel and chemical storage areas avoid in-water works during periods of high precipitation refuel machinery on impermeable pads or pans designed to allow full containment of spills a minimum of 30 m from water bodies fuelling and maintenance activities should occur within an area where sediment and erosion control measures and all precautions have been made to prevent oil, grease, antifreeze or other materials from inadvertently entering the ground or the surface water flow monitor area for leakage; in the unlikely event of spillage the supervising engineer would halt all construction activities and corrective measures would be implemented; any spills would be immediately reported to the MOE Spills Action Centre (1.800.268.6060) All hydrocarbon fuels, oils, and lubricants will be stored in a secondary containment area Drip pans will be installed on equipment to intercept minor leaks Sumps will be installed including an oil trap to prevent contaminated water from being pumped into a water course All fuel or lubricant contaminated materials will be collected and trucked to an approved regional disposal facility, or will be treated with in situ bio-remediation techniques approved by the proponent and regulators 	Low negative effect - impacts possible in the event of accident/malfunction; impacts mitigated or eliminated wherever possible through implementation of mitigation measures	Yes
	Contamination from spills or leaks of hazardous substances	Operation	<ul style="list-style-type: none"> spill prevention and containment measures to be put in place throughout operational period ensure that workers are adequately trained in the implementation of a prepared spill response plan personnel will be trained in the requirements for the storage and transport of hazardous material fuel and other potentially deleterious substances which may be kept on site will be stored in appropriate containers/locations and will be monitored regularly to detect leakage 	No impacts anticipated - appropriate implementation of mitigation measures will contain effects and it is likely that only relatively small amounts of materials will be housed on site.	No
	Surface water - Inundation area at Wanatango Falls site may alter water quality (methyl-mercury) in reservoir	Operation	<ul style="list-style-type: none"> Woody debris will be removed from inundation area prior to headpond filing, preferably in the winter to minimize damage to soils Headpond created in association with the project will be relatively small when compared to other hydropower projects where mercury enrichment has occurred 	The proposed headpond for the Wanatango Falls GS is relatively small and involves a smaller proportion of new inundation compared to reservoirs in which mercury methylation is reported. Mercury concentrations in fish will continue to be monitored during the operational phase of development, and the results reported to the MOE. Consumption advisories will be published if mercury levels pose a problem.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Water Quality (surface and groundwater)	Surface water - impacts associated with acid rock drainage (ARD) and metal leaching	Construction	<ul style="list-style-type: none"> To date no significant amount of sulphide has been observed on rock outcrops or by megascopic analysis of any samples. 	<p>Xeneca commits to a drilling and testing program of the rock material prior to construction to confirm if the rock mineralization and the potential for ARD exist at the site. The program will be carried out so that ARD testing results are available prior to issuance of Plans & Specifications Approvals being sought from MNR.</p> <p>Where the potential for ARD exists, Xeneca will prepare a management plan acceptable to the regulatory agencies prior to commencing any rock excavation related to the project.</p>	No
	Surface water - lowering of dissolved oxygen levels	Operation	<ul style="list-style-type: none"> Dissolved oxygen will not be materially affected by the project due to the relatively small headpond; all flows passing through the Wanatango Falls GS in any given 24-hour period will be equivalent to the amount of flows that would pass through the site in the absence of the project. 	No impacts anticipated - proposed mitigation measures will continue monitoring for potential impacts. Water sampling indicates that dissolved oxygen levels are at or exceed saturation in the spring, summer and fall	No
	Surface water - increased phosphorous levels in the headpond	Operation	<ul style="list-style-type: none"> Phosphorous levels in surface water be monitored prior to construction and the initial operation period. 	Low negative impacts possible - impacts mitigated or eliminated where ever possible. Pre-construction water sampling indicates that phosphorus concentrations exceed PWQO standards for all sampling events except the spring.	Yes
Species at Risk (SAR) and Species of Conservation Concern (SCC)	Impact to habitats of identified terrestrial Species at Risk due to construction and operation of facility	Construction and Operation	<ul style="list-style-type: none"> a discovery protocol will be developed and in place should a SAR species be encountered a permit under Section 17(2)C of the <i>Endangered Species Act</i> will be required and an overall benefit to the species will be required/discussed. once operation commences an Agreement for Operation and monitoring protocols under the <i>Endangered Species Act</i> will be required/discussed with the MNR. Comparable habitat is commonly available in the surrounding landscape 	<p>Low negative impacts possible - impacts mitigated or eliminated where ever possible Permit/ Agreement required for construction/ operation. Effect on species and their habitat on a regional level is estimated to be negligible given the small size of the area of impact related to the amount of available habitat.</p> <p>Proponent will continue to monitor for the presence of SAR species which have the potential to be present within the project zone of influence and will contact the MNR to discuss requirements should individuals be identified</p>	Yes
	Potential impacts to Common Nighthawk (SCC)	Construction	<ul style="list-style-type: none"> Suitable habitat exists within the vicinity, and is abundant in the surrounding landscape. Open areas not found within the 120 m perimeter of the ZOI. Vegetation clearing will avoid bird breeding season (May 1 to July 31) 	No impacts anticipated.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Species at Risk (SAR) and Species of Conservation Concern (SCC)	Potential impacts to bird SAR and SCC known to occur in the general area: Peregrine Falcon (SAR), Chimney Swift (SAR), Bobolink (SAR), Short-eared owl (SCC), Rusty Blackbird (SCC), Barn Swallow (SAR), Black Tern (SCC) and Olive-Sided Flycatcher (SCC)	Construction	<ul style="list-style-type: none"> No suitable habitat for these species was identified in the area of impact. No individuals of these species were observed during field investigations. Vegetation clearing will avoid bird breeding season (May 1 to July 31) 	No impacts anticipated.	No
	Impacts to Canada Warbler (SCC) habitat as a result of vegetation clearing - species confirmed present in study area	Construction	<ul style="list-style-type: none"> area to be cleared is very small in relation to the abundance of similar habitat on the surrounding landscape the area of disturbance within the overall site boundaries will be kept to a minimum and clearing will only occur where necessitated by construction. Where possible, activities will be scheduled to avoid sensitive nesting, rearing, mating, or staging periods. Minimizing road corridor width to 20 m, revegetating temporary roads and construction areas after construction Vegetation clearing will avoid bird breeding season (May 1 to July 31) Modify driver behavior, reducing traffic through access controls, and restricting speed through access controls. 	Low negative impact possible - impacts mitigated or eliminated where ever possible. Permit/ Agreement required for construction/ operation. Effect on species and their habitat on a regional level is estimated to be negligible given the small size of the area of impact related to the amount of available habitat.	Yes
	Impacts to bald eagle (SCC) nesting and foraging habitat	Construction and Operation	<ul style="list-style-type: none"> Bald eagle nesting and foraging habitat is present approximately 8.3 km upstream of GS; habitat will not be affected by vegetation clearing. During operations, water level increase of up to 1 m above existing water levels will not affect nesting habitat, as the latter is located 30 m up an embankment from the shoreline. Water level increase will occur within existing channel and will not result in the loss of any perch trees along the shoreline in the vicinity of the nesting habitat. 	No impacts anticipated to Bald Eagle	No
	Impacts to Bank Swallow (SCC)	Construction and Operation	<ul style="list-style-type: none"> Small amount of suitable nesting habitat exists approximately 8 km upstream of the GS, set back approximately 30 m from the shoreline. Habitat will not be affected by either construction or operations. Bank swallow were not observed within the study area 	No impacts anticipated.	No
	Impacts on Eastern Wood-Pewee (SCC)	Construction	<ul style="list-style-type: none"> Not observed during field investigations, but occurs in the general area, and potential breeding habitat is present in the vicinity of the GS. Vegetation clearing will avoid bird breeding season (May 1 to July 31) 	No impacts anticipated with proper avoidance of breeding bird timing window	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Species at Risk (SAR) and Species of Conservation Concern (SCC)	Impacts to Lake Sturgeon due to construction and operation of facility (preferred "No Fishway" option)	Construction and Operation	<ul style="list-style-type: none"> • Facility will operate as a run-of-river facility during the spring when water temperatures are suitable for spawning, incubation and dispersal (starting when water temperatures reach 8°C until 32 days after 18°C is reached), followed by limited modified operation during larval drift (maximum daily range of 15 m³/s until 56 days after 18°C is reached or 39 days after 20°C is reached). • in order to prevent the isolation of Lake Sturgeon upstream of the facility and to prevent injuries due to downstream migration, sturgeon will be caught upstream and relocated downstream of the structure • Offsetting habitat will be created to provide appropriate spawning opportunities for Lake Sturgeon following the loss of approximately 1550 m² of habitat as a result of tailrace construction and inundation • The magnitude of daily fluctuations in water level will attenuate moving downstream of the dam, where the majority of important nursery habitat is located; fluctuations will attenuate down to a maximum daily range of ± 10 cm at the crest of Neeland's Rapids • Downstream foraging habitat suitability will remain largely unchanged post dam construction as it will remain restricted to the 2 m³/s channel where the majority of foraging currently occurs. 	Operations and mitigation measures will maintain the continued function of identified Lake sturgeon habitat downstream of the facility. The lack of fishway and relocation of fish out of the headpond will result in Lake Sturgeon no longer being present upstream of the facility. Impacts associated with the loss of this habitat to Lake Sturgeon will be offset by the creation of compensatory habitat downstream. Monitoring will be conducted in order to confirm Permit/ Agreement required for construction/ operation.	Yes
	Impact Lake Sturgeon due to construction and operation of facility (Fishway Option)	Construction and Operation	<ul style="list-style-type: none"> • Facility will operate as a run-of-river facility during the spring during periods where water temperatures are suitable for spawning, incubation and dispersal and limited operation during larval drift • fish passage will allow for the continued migration of Lake Sturgeon upstream and downstream • Two fast water features will continue to function between the Frederickhouse Lake Dam and the facility post-inundation • The decrease in flow velocities upstream of the GS site as a result of inundation is anticipated to improve the suitability of Lake Sturgeon foraging habitat • Offsetting habitat will be created to provide appropriate spawning opportunities for Lake Sturgeon following the loss of approximately 1550 m² of habitat as a result of tailrace construction and inundation • The magnitude of daily fluctuations in water level will attenuate moving downstream of the dam, where the majority of important nursery habitat is located; fluctuations will attenuate down to a maximum daily range of ± 10 cm at the crest of Neeland's Rapids • Downstream foraging habitat suitability will remain largely unchanged post dam construction as it will remain restricted to the 2 m³/s channel where the majority of foraging currently occurs. 	No impacts anticipated following the provision of offsetting habitat - proposed mitigation measures will maintain the continued function of identified Lake sturgeon habitat downstream of the facility. Permit/ Agreement required for construction/ operation.	Yes
	Impacts to Woodland Caribou	Construction	<ul style="list-style-type: none"> • No recent sightings of caribou and little to no suitable habitat in the project's area of impact. • Minimize density of linear features by using existing road corridors. • Minimize activities that increase mortality risk such as vehicle collisions and hunting. 	No impacts anticipated.	No
	Impacts to Northern/Little Brown Myotis (SAR) seasonal habitat	Construction	<ul style="list-style-type: none"> • Area to be cleared is small in relation to the abundance of similar habitat in the surrounding landscape • No known hibernacula within the study area • No removal of vegetation between May 1 and August 31 (peak bat activity season). • If tree removal must occur during the critical time period of May 1 - August 31, potential bat maternity roost habitat (cavity trees) will be identified and exit surveys will be conducted before removal occurs to confirm no active roosts are present. • Recommended that pre-construction cavity tree surveys be completed within the area to be cleared for construction and inundation. 	Low impacts associated with loss of potential breeding habitat within the area to be cleared. Forested habitats are considered potential SAR habitat for the 2 bat species. Pre-construction cavity surveys must be done to understand the potential. Based on the outcome of these surveys, acoustic monitoring may be required to determine presence/ absence.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Significant earth or life science features	No issues		<ul style="list-style-type: none"> No ANSI identified in project area as indicated by MNR Site Information Package 	N/A	No
Land subject to natural or human made hazards	No issues		<ul style="list-style-type: none"> None identified 	N/A	No
Terrestrial wildlife (numbers, diversity, distribution)	General disturbance to terrestrial habitat and wildlife during construction	Construction	<ul style="list-style-type: none"> limit use of machinery in and around watercourses and sensitive terrestrial areas clearly define access and transportation routes to minimize disturbance use woody debris and non-merchantable logs from corridor clearing to establish brush piles and downed logs adjacent to the cleared right-of-way to improve habitat allow for detour around sensitive habitat areas use mechanical means (not chemical) to clear and manage vegetation within ROW limit removal of vegetation during construction/maintenance to maintain habitat connectivity all construction traffic should adhere to speed limits and construction crews should be aware of the potential for wildlife crossings any roadway mortalities of herpetofauna should be reported and a reduction in speed limits should be imposed in specific areas to prevent additional mortalities the area of disturbance within the overall site boundaries will be kept to a minimum and clearing will only occur where necessitated by construction. high visibility snow fencing will be installed to restrict heavy equipment traffic to the area identified for clearing. travel paths, stockpile areas and staging areas will be carefully planned and followed. Where possible, avoid important habitats Where possible, activities will be scheduled to avoid sensitive nesting, rearing, mating, or staging periods All food and food waste will be properly stored and disposed of to prevent attracting wildlife All Project personnel will use proper care and caution when operating vehicles to avoid collisions with wildlife Wildlife are relocated as required during the work and after the work has been completed 	Low negative impact - Construction Management Plan will be finalized to include protocols and procedures for minimizing the disturbance to wildlife during the construction program. The clearing and grubbing of land will result in a loss of some vegetation and in turn potential wildlife habitat. In-direct impacts also have the potential to occur during construction.	Yes
Terrestrial wildlife (numbers, diversity, distribution)	Access road construction - increased predation, introduction of invasive species	Construction	<ul style="list-style-type: none"> gating roads to prevent further human access re-claim temporary/unused access roads following completion of work enforce speed limits on construction vehicles along access roads to limit road kills inform workers on potential for road mortality of wildlife minimize soil rutting and compaction using specific best management practices winter construction on frozen ground to reduce soil damage rehabilitation should avoid use of invasive plant species 	The construction management plan will include training for staff on proper use and care of vehicles. Use existing roads and infrastructure as much as practical. Re-claim any temporary roads in discussion with MNR and Stakeholder groups, as required.	No
	Impacts related to the creation of facility and headpond creation - impacts to general and Significant Wildlife Habitats	Construction and Operation	<ul style="list-style-type: none"> relative to the areas to be impacted, comparable habitats are abundant in the surrounding region 	Low negative impacts anticipated - small inundation area and impacts to regional populations will be negligible as similar habitat is abundant in the area	Yes
	Impacts upon forest nesting birds as a result of line and road corridor development	Construction	<ul style="list-style-type: none"> Clearing of trees and vegetation in the ROW is to occur outside the migratory breeding bird seasons (May 16 to July 31) Modifying driver behavior, reducing traffic through access controls, and speed restrictions. Road corridor width will be minimized, and areas will be re-vegetated following construction. 	Low negative impacts anticipated - small footprint area and impacts to local populations will be negligible as similar habitat is abundant in the surrounding area	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Natural vegetation and habitat linkages	Effects on vegetation and habitat during access road ROWs maintenance	Construction and Operation	<ul style="list-style-type: none"> • schedule work during winter months, when possible, to minimize habitat disturbance • limit use of machinery in and around watercourses and sensitive terrestrial areas • clearly define access and transportation routes to minimize disturbance • allow areas of exposed soil to naturally regenerate with native species • use mechanical means (not chemical) to clear and manage vegetation within ROW • limit removal of vegetation during construction/maintenance to maintain habitat connectivity • erosion control and run off control measures will be implemented to encourage the recolonization of impacted areas by native plant species 	Low negative effects anticipated.	Yes
	Loss of 12.45 ha of Black Spruce riparian forest community as a result of inundation	Construction	<ul style="list-style-type: none"> • The area affected habitat is negligible in proportion to the abundance of this community in the broader landscape. • Clearing will comply with the requirements of all applicable permits and approvals, the <i>Crown Forest Sustainability Act</i>, and the Forest Operations and Silviculture Manual. 	Low negative effects anticipated - Construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to terrestrial ecosystem during the construction program.	Yes
	Direct impacts to terrestrial forest community (0.78 ha of Black Spruce Forest) from construction of project footprint	Construction	<ul style="list-style-type: none"> • The area affected habitat is negligible in proportion to the abundance of this community in the broader landscape. • Clearing will comply with the requirements of all applicable permits and approvals, the <i>Crown Forest Sustainability Act</i>, and the Forest Operations and Silviculture Manual. 	Low negative effects anticipated - Construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to terrestrial ecosystem during the construction program.	Yes
	Loss of 0.24 ha of Black Spruce/pine vegetation community at footprint of fish ladder structure (fishway option only)	Construction	<ul style="list-style-type: none"> • The area affected habitat is negligible in proportion to the abundance of this community in the broader landscape. • Clearing will comply with the requirements of all applicable permits and approvals, the <i>Crown Forest Sustainability Act</i>, and the Forest Operations and Silviculture Manual. 	Low negative effects anticipated - Construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to terrestrial ecosystem during the construction program.	Yes
	Access road construction - habitat fragmentation, potential for forest fires	Construction and Operation	<ul style="list-style-type: none"> • gating roads to prevent further human access and reduce the risk of forest fires • re-claim temporary/unused access roads following completion of work • project personnel will be prepared and be familiar with the site Fire Preparedness Plan • fire fighting equipment will be available to all workers and the location of such equipment will be outlined in the Fire Preparedness Plan • Locations of equipment and muster points will be advertised as necessary around the site • project personnel will be familiar with fire-fighting techniques and the use of supplied equipment • uncontrolled fires will be immediately reported to the nearest fire emergency service and the MNR in the case of an uncontrolled fire on Crown land • smoking will only be permitted in designated smoking areas equipped with fire extinguishers • disposal and storage of waste will be into proper waste containers to prevent fires 	No impacts anticipated - proper implementation of construction management plan and best management practices, and preparation of Fire Preparedness Plan, will mitigate impacts wherever possible.	Yes
	Wetland impact and loss of wetland along new roadway and power line.	Construction	<ul style="list-style-type: none"> • Power lines should follow existing roads and should utilize the existing right of way. • Where power lines follow existing roads, the power line should be placed on the side of the road opposite the wetland • Maintain existing ditch channels to maintain present water movement • Restoration and maintenance of low vegetation in the right of way. • Existing ditch channels and roadways will be used where possible. • Passive regeneration of existing seed bank. Additional planting maybe required. 	Low negative impacts anticipated with the proper implementation of mitigation measures.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Soil and sediment quality	Soil compaction in construction footprint and ROW for access roads	Construction	<ul style="list-style-type: none"> • schedule construction of temporary access road and power line ROW to minimize ground disturbance (winter) • stop activities when ground conditions could potentially severely disturb soil profile (high precipitation, etc.) • be prepared to alter construction activities as a result of sudden thaw conditions • stabilize high traffic areas with gravel surface layer or other suitable cover material • establish a designated construction access route to minimize area of impact • time construction activities to minimize effects on surface vegetation and subsurface rooting zones • vehicles and equipment access will be restricted to the minimum area necessary • conduct site reclamation activities as soon as possible following the disturbance 	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible. Soil compaction will reverse naturally over time if left undisturbed.	Yes
	Management of excavated materials (blast rock, fill, aggregates, etc.)	Construction	<ul style="list-style-type: none"> • Transport blast rock to lay down area for stockpile and/or crushing; laydown areas will be situated at acceptable distances from water bodies (i.e. greater than 30 m) and install mechanical erosion control measures at blast rock storage site near water body • re-use blast rock for aggregate and shoreline stabilization • apply water to dry soil/rock to minimize dust • instruct workers and equipment operators of dust control methods • install mechanical barriers to prevent run off from dust piles into water bodies 	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible. A Sediment and Erosion Control Plan will be prepared prior to construction.	No
Aquatic and Riparian Ecosystem					
Shoreline Dependent Species	<i>Shoreline dependant Fish Species - See Fish Habitat Section below</i>				
	Impact upon wetland communities and vegetation in the inundation area - Approximately 2.22 ha of the Mineral Thicket Swamp (43.6%) and approximately 0.28 ha (6.3%) of the Mineral Meadow Marsh will be inundated	Construction and Operation	<ul style="list-style-type: none"> • Riparian vegetation is predicted to re-establish within the inundation area where water level fluctuations are less than 25 cm. ROR operations in late June/early July will provide more stable conditions to allow for the establishment of emergent plant species during the growing season. 	Low negative impacts anticipated - riparian vegetation is expected to reestablish within the inundation area. Post construction monitoring will document wildlife utilization of the inundated areas and colonization of the new shorelines by vegetation. Riparian vegetation may re-establish in at least three of the four identified wetlands within the upstream zone of inundation, at the confluence of several tributaries and the Frederick House River as well as within at least two additional areas located along the river periphery. The inundated Mineral Thicket Swamp may also provide Northern Pike spawning habitat post dam construction.	Yes
	Inundation effects on aquatic mammals (beaver and otter, etc.) and their habitat	Construction and Operation	<ul style="list-style-type: none"> • Planning for flooding of new reservoir should avoid the winter/ice over period when filling could cause direct mortality by drowning furbearing mammals in their dens • proper construction sequencing and operations planning will mitigate impacts to aquatic mammal species • post construction monitoring will occur to confirm that otters continue to utilize the river reach upstream of the proposed development. It is anticipated that they will establish new den sites that correspond with the new high water mark. 	Low impacts anticipated - proper construction and operations planning (filling of reservoir during non-winter season) will minimize impacts to aquatic mammal species. Some loss of potential den sites is possible. If the removal of beaver dams is required for the creation of the headpond, the appropriate permits will be obtained from the MNR.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Shoreline Dependent Species	Facility construction activities impacts on shoreline habitats and vegetation	Construction	<ul style="list-style-type: none"> impacts largely isolated to localized clearing and grubbing of riparian vegetation inundation will affect only a small area in relation to the abundance of similar habitat in the surrounding area Vegetation clearing is to occur between September and April, outside the bird breeding season (May 1 - July 31) and peak bat activity season (May 1 – August 31), so as to limit major disruptions and deterrences to nesting and roosting activities of birds and bats in the vicinity, and to avoid destruction of actively inhabited trees. Limit removal of vegetation during construction/maintenance to maintain habitat connectivity. Re-vegetate areas as soon as possible following construction. 	Low negative impacts anticipated.	Yes
	Loss of emergent and riparian vegetation as a result of water level fluctuations	Operation	<ul style="list-style-type: none"> similar vegetation is abundant on the surrounding landscape post construction monitoring will occur to determine if additional mitigation measures or strategies are required Riparian vegetation is predicted to re-establish within the inundation area where water level fluctuations are less than 25 cm. ROR operations in late June/early July will provide more stable conditions to allow for the establishment of emergent plant species during the growing season. 	Low negative impacts anticipated - impacts anticipated to be minor in the context of the surrounding landscape	Yes
Fish Habitat	Impacts to Walleye foraging habitat	Construction	<ul style="list-style-type: none"> Suitable Walleye foraging habitat upstream of the headpond will be unaltered by inundation; inundation will create additional nearshore foraging habitats. Downstream foraging habitat suitability will remain largely unchanged post dam construction as it will remain restricted to the 2m³/s channel where the majority of foraging currently occurs. 	Low negative impacts anticipated - foraging habitat will continue to be available post-construction, both upstream and downstream of the GS site.	Yes
	Impacts to tributary habitat	Construction and Operation	<ul style="list-style-type: none"> Inundation and daily water level fluctuations are expected to extend between 75 to 150 m into the tributaries in the headpond. Beyond this distance, tributary habitats will be unaffected and will continue to function as they currently do. Tributaries with higher gradients will be affected over a shorter distance. 	Negative impact anticipated. Monitoring of the small bodied fish community within the tributaries is recommended to ensure that a significant shift in species assemblages is not occurring.	Yes
	General impacts to fish habitat during construction activities in or near water bodies	Construction	<ul style="list-style-type: none"> respect all-in water timing restrictions isolate in-water construction area before or after in-water timing restrictions to avoid impacts placement of intakes near natural barriers to migration design habitat mitigation and compensation measures through discussion and guidance with relevant authorities employ best management construction practices including fish relocation plan, work site isolation and sediment control measures blasting will occur outside of appropriate fish spawning and incubation periods (specific requirements to be established with DFO and MNR) other blasting mitigation measures may include bubble curtains, isolation and dewatering of blast area, use of smaller charges, staggering of blasts Prompt and effective clean up and restoration once construction is complete Implement sediment and erosion control measures to ensure that water quality is not negatively impacted by construction activities Duration of in-water work will be minimized Blasting activities will adhere to "Measures to Avoid Causing Harm to Fish and Fish Habitat". 	<p>Low negative impacts possible - impacts mitigated or eliminated wherever possible. Construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to aquatic ecosystem during the construction program.</p> <p>DFO will be consulted during regulatory approvals regarding detailed project effects and the potential for Serious Harm to fish related to project activities.</p>	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Fish Habitat	Potential effects on habitat and spawning from dewatering operations	Construction	<ul style="list-style-type: none"> • Suitable containment/treatment areas will be identified by the Contract Administrator and be identified within the Sediment and Erosion Control Plan. • Ensure a qualified person is on hand to oversee de-fishing activities prior to dewatering • Dewatering activities will be done in a controlled manner so as not to discharge turbid water to the receiving watercourse. • Materials such as filter bags, straw bales, filter fabric and paige wire fencing will be on site to create a dewatering corral for waste water as a contingency plan in the event that groundwater is encountered and additional filtering properties are required. • The discharge point in the receiving watercourse will be carefully chosen as an area with low scour potential (e.g. bedrock bottom). • If scour potential does exist, the contractor will use energy dissipation in the form of a splash pad or rock protection for the stream bottom. • Suitable containment/treatment areas will be identified by the Contract Administrator. 	<p>Low negative impacts possible - impacts mitigated or eliminated wherever possible. The ultimate discharge point to the receiving watercourse will be monitored to ensure that the filtering is effective in removing excess sediment.</p> <p>It will also be necessary for qualified professionals under permit from the MNR to complete a fish salvage operation from the area to be dewatered. Authorization may be required from DFO under Sections 32(1) of the <i>Fisheries Act</i>.</p>	Yes
	Loss of fast-water spawning habitat due to the creation of the tailrace and headpond (total of 1,550 m ² no longer functioning as fastwater spawning habitat)	Construction and Operation	<ul style="list-style-type: none"> • Spawning habitat outside of the 500 m² footprint of the tailrace will remain unchanged after construction: a total of 380 m² of spawning habitat will remain at low flows and 1020 m² of habitat will remain at high flows. • Several fast water habitats in the headpond (7.5 km, 8.1 km and 8.5 km upstream of the GS) will experience a relative decrease in flow velocities and increase in flow depth, but will continue to function as fast water habitat post-construction • A 17,500 m² feature, located immediately downstream of the Frederick House Lake Dam and beyond the ZOI of the Wanatango Falls GS, is anticipated to be suitable spawning habitat for Walleye, Sauger, Lake Sturgeon and Shorthead Redhorse, and will remain unaltered by the project. • An offsetting plan, including provisions for the creation of offsetting habitat, will be developed and discussed with DFO once the engineering details for the project have been advanced during the permitting phase of the project. • effectiveness goals will need to be discussed with MNR and DFO to ensure that the effectiveness and intended function of the offsetting habitat can be demonstrated 	<p>While spawning habitat will be affected, suitable habitat will remain outside of the directly impacted area. Offsetting habitat is required for the 1,550 m² of spawning habitat that will be impacted by the creation of the Wanatango Falls GS; the offsetting habitat will be created either: upstream and downstream of the Wanatango Falls GS (if a fishway is constructed), or entirely downstream (under the preferred, 'no fishway' option).</p> <p>Offsetting habitat will be developed in consultation with MNR and DFO.</p>	Yes
	Impacts to Northern Pike spawning and nursery habitat within the downstream ZOI as a result of water level fluctuations and loss of emergent vegetation	Operation	<ul style="list-style-type: none"> • The spawning period for Northern Pike is within the special operations period committed to for Lake Sturgeon and Walleye (run-of-river operation during key spawning periods); as a result spawning for Northern Pike should remain unaffected by water level fluctuations (see Annex I) • Post-construction monitoring will occur to determine if additional mitigation measures or strategies are required to address the potential loss of riparian vegetation • An offsetting plan, including provisions for the creation of offsetting habitat, will be developed and discussed with DFO once the engineering details for the project have been advanced during the permitting phase of the project. • It is anticipated that vegetation will re-establish in areas where water level fluctuations are less than 25 cm. 	<p>No impacts anticipated following the provision of offsetting habitat - Impacts will be minimized through run-of-river operations during spawning and offset by the provision of offsetting habitat. Monitoring of riparian vegetation re-establishment will be completed post-construction.</p>	Yes
	Temporary impacts and loss of habitat related to the construction of cofferdams	Construction	<ul style="list-style-type: none"> • Phase 1 and 2 cofferdam construction will result in the temporary occupancy of river bed in the area of the dam, spillway facility intake, powerhouse and tailrace • The cofferdam is anticipated to be constructed in accordance with the appropriate in-water timing window dictated by DFO and MNR. • During construction, the flow will be maintained uninterrupted downstream through staging and sequencing of construction. • Construction best management practices will be implemented to minimize the risk of off-site migration of sediments as well as adherence to in-stream timing window restrictions for construction activity. 	<p>Temporary negative impacts are anticipated - direct impacts to aquatic habitat may occur. The cofferdam is to be placed to avoid impacts associated with in-water work. The size of the cofferdams and the duration that the cofferdams remain in place will be minimized.</p>	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Fish Habitat	Potential impacts to fish spawning downstream of the facility as a result of operations	Operation	<ul style="list-style-type: none"> Facility will operate as a run-of-river facility during the spring when water temperatures are suitable for spawning, incubation and dispersal (starting when water temperatures reach 4°C until 32 days after 18°C is reached), followed by limited modified operation during Lake Sturgeon larval drift (maximum daily range of 15 m³/s until 56 days after 18°C is reached or 39 days after 20°C is reached). 	No impacts anticipated to downstream spawning activities with run-of-river operations. The proposed operating restrictions were developed to mitigate impacts against Walleye and Lake Sturgeon spawning, but are also expected to benefit spawning activities for Sauger, Northern Pike and Shorthead Redhorse.	No
	Potential impacts to baitfish spawning and nursery areas as a result of loss of aquatic vegetation	Operation	<ul style="list-style-type: none"> Riparian vegetation is predicted to re-establish within the inundation area where water level fluctuations are less than 25 cm. ROR operations in late June/early July will provide more stable conditions to allow for the establishment of emergent plant species during the growing season. Larval drift and nursery habitat for baitfish are not expected to be impacted as the ROR operations proposed for Lake Sturgeon and Walleye will not result in downstream water level fluctuations. 	Post construction monitoring will document wildlife utilization of the inundated areas and colonization of the new shorelines by vegetation. Vegetated areas are expected to re-establish where daily water level fluctuations are less than 25 cm and will continue to provide important nursery habitat for all fish species after construction of the Wanatango GS.	Yes
	Potential effects on aquatic habitat in the by-pass reach due to facility operations	Operation	<ul style="list-style-type: none"> minimum environmental/compensatory flow will be continuously released downstream to ensure ecological function of the bypass reach special operating constraints will be applied during key life stages of Lake Sturgeon, Walleye and Northern Pike (see "Potential impacts to fish spawning downstream of the facility as a result of operations") spawning habitat in the by-pass reach is limited to the vicinity of the Wanatango Falls GS tailrace. 	Low negative impacts anticipated - a minimum flow will be released into the by-pass reach at all times	Yes
	Potential effects on habitat associated with water crossings on ROWs for access roads and power lines	Construction	<ul style="list-style-type: none"> Implement sediment and erosion control measures to ensure that water quality is not negatively impacted by construction activities Impacts to local fish populations and their habitats will be discussed with DFO and MNR as part of overall strategy for dealing with fish habitat at water crossings The guidance provided in DFO's Operational Statement for Overhead Line Construction will be consulted in order to minimise impacts to fish and fish habitat. for culverts, DFO will review the proposals and provide advice on mitigation that should be applied to protect fish and fish habitat. 	<p>Low negative impacts possible - impacts mitigated or eliminated wherever possible. Construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to aquatic ecosystem during the construction program.</p> <p>DFO will be consulted during regulatory approvals regarding detailed project effects and the potential for Serious Harm to fish related to project activities.</p>	Yes
Benthic Habitat	Impacts to benthic habitat in the project footprint - approximately 2,645 m ² of benthic habitat (in the headpond) anticipated to no longer function as fast water habitat under flows of 1 m ³ /s; approximately 400 m ² of potential benthic habitat in the footprint of the control dams to be impacted	Construction	<ul style="list-style-type: none"> Offsetting habitat to be created to compensate for the loss of 1,550 m² of fast water spawning habitat for Walleye and Lake Sturgeon. The offsetting habitat is also expected to provide fast water benthic invertebrate habitat. Loss of fast water benthic habitat will also be partially offset by the creation of the headpond, which will result in the conversion of 12.45 ha of terrestrial habitat into aquatic habitat (increase in the amount of available wetted habitat for benthic invertebrate production). If constructed, the fishway will convert 2,400 m² of terrestrial habitat into aquatic habitat, and may provide additional benthic invertebrate production habitat. (Note that this would not apply for the preferred, 'no fishway' option.) 	<p>2,645 m² of fast water benthic habitat is predicted to become deep water habitat with very low velocity; invertebrate community will see a shift from a fastwater community to one more indicative of a lacustrine environment. This impact will be offset by the creation of new fast water habitat downstream as well as the conversion of terrestrial habitat into aquatic habitat.</p> <p>Post-construction monitoring of benthic habitats will be conducted throughout the entire ZOI to determine whether the benthic community is being impacted as a result of project construction.</p> <p>DFO will be consulted during regulatory approvals regarding detailed project effects and the potential for Serious Harm to fish related to project activities.</p>	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Benthic Habitat	Impacts to benthic invertebrate habitat and productivity	Operation	<ul style="list-style-type: none"> Restricting the maximum turbine flow to 20 m³/s during modified run-of-river operations will mitigate against frequent wetting and drying of benthic habitat. ROR operations during the spring and early summer (productive periods for benthic invertebrates), followed by modified operations with a maximum daily range of 15 m³/s, will mitigate potential impacts to benthic invertebrates. 	Low negative impacts anticipated due to proposed operating restrictions. Monitoring of the downstream benthic invertebrate communities will be completed to verify that productivity is not being impacted.	Yes
Fish Migration	Construction of the dam represents a permanent barrier to the upstream and downstream movement of fish (for the preferred, "no fishway" option)	Construction and Operation	<ul style="list-style-type: none"> Walleye and Sauger are prevalent throughout the river both upstream and downstream of the proposed GS site. An abundance of confirmed Walleye and Sauger spawning habitat upstream of the proposed headpond will remain unaffected. Under the 'no fishway' option, offsetting habitat will be created downstream of the Wanatango Falls GS, and will compensate for the loss of accessibility to the upstream spawning areas. Creation of the headpond may create habitat conditions (silty, slow-moving waters) that are favourable for upstream populations of Goldeye. The population of Lake Sturgeon upstream of Wanatango Falls (estimated to be 14 individuals) will be captured and relocated downstream of the GS through an extensive netting program. 	<p>No significant impacts are anticipated to Walleye, Sauger and Goldeye. Sufficient habitat exists upstream and downstream of the GS site to sustain the fragmented populations.</p> <p>The relocation of Lake Sturgeon out of the headpond and into the river downstream will prevent the population from being further fragmented due to the Wanatango Falls GS.</p> <p>With the creation of offsetting habitat downstream of the GS and the capture and relocation of Lake Sturgeon, no significant impacts as a result of population fragmentation are anticipated.</p>	Yes
	Construction of the dam represents a permanent barrier to the upstream and downstream movement of fish (for the alternate option - creation of a fishway)	Construction and Operation	<ul style="list-style-type: none"> fish passage designs will be confirmed with MNR and DFO staff. fish passage and sufficient flows (3.1 m³/s at the Normal Operating Level) into the bypass reach and nature-like fishway will be provided to allow for maintenance of upstream and downstream migration of fish. effectiveness of fish passage provisions will need to be determined through post construction monitoring. Upstream and downstream movement of fish species will continue to be monitored after dam construction. 	Low negative impacts possible. Proposed fish passage to mitigate the potential barrier to fish movement and migration between upstream and downstream habitats in the Frederick House River. Effectiveness monitoring will be implemented; if the fish passage provision is not functioning as intended, Xeneca will discuss appropriate mitigation strategies with DFO and the MNR.	Yes
Fish Stranding	Fish stranding downstream of facility as a result of intermittent operations	Operation	<ul style="list-style-type: none"> Ramp-up and ramp-down will occur over a period of 60 minutes to minimize sudden changes in outflows from the Wanatango Falls GS Intermittent operation will only occur 17% of the time. Normal flow will return within 24 hours, allowing stranded fish to escape. Fish stranding occurs under existing conditions at Zevery's Rapids due to the rapidly varying outflows from the Frederick House Lake Dam. To mitigate against increased frequency of stranding at Zevery's Rapids, a pathway will be notched from the large pool at the rapids where stranding is known to occur, in order to provide fish with a means of escape. Neeland's Rapids will be monitored to verify whether isolated pools form during operations and whether fish stranding occurs. Should fish stranding be confirmed at Neeland's Rapids, appropriate mitigation measures will be applied (e.g. habitat adjustments similar to those proposed for Zevery's Rapids). 	Low negative impacts possible - proper implementation of mitigation measures will ensure that operations at the Wanatango Falls GS do not exacerbate existing levels of fish stranding downstream of the GS site.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Fish injury or mortality	Fish impingement or entrainment resulting in injury or mortality	Operation	<ul style="list-style-type: none"> • Engineer facility intake and design velocities to account for fish swimming capabilities to minimise potential for impingement or entrainment through turbine(s) • If significant entrainment potential is identified, consider diversion methods for vulnerable fish species including lighting, electrical barriers, air bubbling and sound barriers to prevent entrainment • Possible strategies to mitigate injury/mortality of entrained fish include: <ul style="list-style-type: none"> - Minimize the number of blades or amount of blade leading edge; - Maximize the open space between blades and other structures; - Use blunt leading edges instead of sharp ones; - Minimize runner speed; - Direct fish toward the runner hub and not the runner periphery; - Minimize gaps between fixed and moving parts. 	Specific turbine information such as diameter, number of blades, operational speed (r/min) and hydraulic capacity ranges (m ³ /s) is required for determining turbine mortality and will be determined as part of facility detailed design. Proposed intake structures to be designed with entrance velocity of 0.75 m/s and trash rack spacing of 48 mm to avoid/mitigate the potential risk of entrainment and impingement of fish. A detailed fish mortality assessment will be prepared as part of the regulatory approvals. Due to the potential for Serious Harm to fish, it is likely that an authorization under the <i>Fisheries Act</i> will be required.	Yes
	Fish mortality due to blasting	Construction	<ul style="list-style-type: none"> • Blasting will follow the process outlined in <i>Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters</i>. Appropriate permits and approvals will be obtained for in-water blasting. • Mitigative measures will include the isolation of the work area and removal of fish prior to blasting, the use of smaller charges and staggering of blasts. • Blasting activities will adhere to <i>Measures to Avoid Causing Harm to Fish and Fish Habitat</i>. 	Low negative impacts possible - proper implementation of mitigation measures will ensure that blasting operations minimize any fish mortalities.	Yes
	Fish injury or mortality as a result of cofferdam placement and dewatering	Construction	<ul style="list-style-type: none"> • Placement of the cofferdam will be outside of in-water work restriction period and will be placed so as to minimize mortality. • Fish salvage will be carried out prior to the dewatering process to relocate species. • Pump intakes will be fitted with appropriate screens to prevent fish entrainment and impingement. 	Low negative impacts possible - proper implementation of mitigation measures will ensure that the placement of cofferdams will minimize the potential for fish mortality.	Yes
Erosion and sedimentation	Construction related impacts related to the relocation of sediments and soils - Surface water overland flow paths within the construction areas have the potential to carry construction-related sediment to the watercourse.	Construction	<ul style="list-style-type: none"> • Areas will be identified in advance of construction and receive added protection and scrutiny during routine construction inspections particularly during periods before and after rain events. • Sediment and erosion control measures will be installed prior to construction and maintained diligently throughout the construction operations. • Planting of vegetative cover will then follow in the next growing season. • Maintenance and inspection of the vegetative cover will continue until such time as the disturbed areas are sufficiently stabilized through vegetative growth to prevent overland runoff of suspended materials. • If construction finishes in a cleared area, with insufficient time left in the growing season to establish vegetative cover, an overwintering treatment such as erosion control blankets, fibre matting or equivalent will be applied to contain the site over the winter period. • Stockpile and staging areas will be well removed from the watercourse and be isolated with sediment and erosion control measures to prevent migration of material to the watercourse and natural areas. • Excess material from in-water excavation will be removed immediately from the channel area and temporarily stockpiled in suitable locations identified by the design drawings and on-site areas approved by an environmental inspector. 	No impacts anticipated - Adhere to all applicable standard best management practices available to the industry. A Sediment and Erosion Control Plan will be prepared prior to construction.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Erosion and sedimentation	Increased shoreline erosion and sediment deposition due to water level fluctuations in the inundation area and variable flow reach during operation	Operation	<ul style="list-style-type: none"> Limit maximum daily fluctuations of upstream water levels (1 m fluctuation) Ramp-up and ramp-down to occur over a period of 60 minutes to avoid rapid changes in flows and levels in the headpond and in the river downstream Daily water fluctuation due to operations will not exceed ± 10 cm of the daily average at a point 24 km downstream Facility will operate as a modified run-of-river facility (run-of-river operation during extreme high and low flow periods of the year) inspect and monitor for signs of erosion in the first five years of operation, then years 7 and 10 to document where and degree of erosion and develop and implement additional mitigation measures as required 	<p>Low negative impacts anticipated. Siltation may occur in the headpond, but the accumulated sediment would ultimately be entrained and transported downstream during higher peak flows. Downstream of the dam, the river is characterized by rapids and a bedrock-lined channel bed that should be able to withstand the flows released by the dam during normal operations; the overall geomorphology of the channel is not anticipated to change as a result of the project.</p> <p>Follow-up monitoring will be completed to determine where erosion and sedimentation are occurring as a result of operations and to assess colonization of the new shorelines by vegetation.</p>	Yes
Water levels, flows and movement (surface water)	Creation of headpond and fluctuation in levels/flows		<ul style="list-style-type: none"> Limit maximum daily fluctuations of upstream water levels (1 m fluctuation); magnitude of fluctuations will attenuate with distance upstream Ramp-up and ramp-down will occur over a period of 60 minutes to avoid sudden changes in flows and levels Facility will operate as a modified run-of-river facility (run-of-river operation during extreme high and low flow periods of the year) 	<p>Impacts anticipated. Effects of headpond creation and daily fluctuations are assessed in more detail as they relate to specific environmental components affected. Creation of headpond required for the operation of the facility.</p> <p>Flows upstream and downstream of the project site are already affected by operations at the Frederick House Lake Dam.</p>	Yes
	Variation in flows and water levels within downstream variable flow reach	Operation	<ul style="list-style-type: none"> Facility will operate as a run-of-river facility during the spring when water temperatures are suitable for spawning, incubation and dispersal (starting when water temperatures reach 4°C until 32 days after 18°C is reached), followed by limited modified operation during Lake Sturgeon larval drift (maximum daily range of 15 m³/s until 56 days after 18°C is reached or 39 days after 20°C is reached). Compliance commitment to limit daily water fluctuation due to operations to ± 10 cm of the daily average at a point 24 km downstream (Neeland's Rapids) A downstream minimum environmental flow of 2 m³/s is proposed to be continually passed through the fishway (under the fishway option) and/or through a pipe in the spillway to maintain ecological habitat viability within the variable flow reach. 	<p>Impacts anticipated. The magnitude of daily fluctuations (maximum of ± 10 cm as measured at Neeland's Rapids) are within a range frequently occurring under existing conditions due to operations at the Frederick House Lake Dam.</p>	Yes
	Impact upon wetlands in the downstream flow reach due to water level fluctuations	Operation	<ul style="list-style-type: none"> Beaver dams are expected to mitigate water level fluctuation impacts to one of the wetlands in the variable flow reach. Compliance commitment to limit daily water fluctuation due to operations to ± 10 cm of the daily average at a point 24 km downstream (Neeland's Rapids). Emergent and shoreline vegetation will persist where water level fluctuations are less than or equal to 25 cm. ROR flows during spring and early summer to relieve stress on emergent vegetation during the growing season. 	<p>Minimal impacts are anticipated - vegetation re-establishment will be monitored post-construction. The magnitude of daily fluctuations (maximum of ± 10 cm as measured at Neeland's Rapids) are within a range frequently occurring under existing conditions due to operations at the Frederick House Lake Dam.</p>	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Water Temperature	Changes to thermal regime of waterway within headpond as a result of inundation and temporary storage	Operation	<ul style="list-style-type: none"> • Low residence time of water in the headpond: all flows released from the Wanatango Falls GS over any given 24-hour period will be equivalent to the volume passing through the site in the absence of the project. • Due to relatively shallow water depth in the headpond (average depth of 1.3 m and a maximum depth of 6 m immediately upstream of the dam), the potential for thermal stratification is low. 	<p>No impacts anticipated - due to the relatively shallow headpond and modified run-of-river operations, water temperatures are not expected to change significantly from that of the inflowing river.</p> <p>Post-construction monitoring of water temperatures in the headpond will be conducted to confirm whether the project is resulting in water temperature increases. If thermal condition changes, the results will be reviewed with MOE/MNR to develop an adaptive management plan.</p>	No
Aboriginal Community					
Reserves or Aboriginal Communities					
First Nations reserves or other Aboriginal communities (All First Nations)	Local Aboriginal Communities (LAC), Identified Aboriginal Communities (IAC) have expressed an interest in engagement in regards to the project and potential impacts	Construction and Operation	<ul style="list-style-type: none"> • Ongoing engagement and consultation with Aboriginal communities will continue after completion of EA and through the permits and approvals process. • Proponent has corresponded with identified and Local Aboriginal communities in the EA process • Proponent commits to engage in discussion after the issuance of a Notice of Completion at which time EA will be provided to communities for review for a minimum of 30 days 	<ul style="list-style-type: none"> • Xeneca offered funding for a peer review of the draft ER; • Engagement and consultation with Aboriginal communities for purposes of the EA was completed. Xeneca will continue to advise communities of progress on the project after completion of EA and through the permits and approvals process. 	No
First Nations reserves or other Aboriginal communities (All First Nations)	Project Sites are not located on any First Nations reserve lands or lands allocated to any other aboriginal community. The Project is located within an area covered under Treaty 9.	Construction and Operation	Engagement and consultation with Aboriginal communities for purposes of the EA was completed. Xeneca will continue to advise communities of progress on the project after completion of EA and through the permits and approvals process.	Xeneca has issued Letters of Intent and Term Sheets with identified local communities. An executed Letter of Intent/Term Sheet has been signed by Matachewan FN and Flying Post FN. A Letter of Intent/Term Sheet is under negotiation with Mattagami First Nation.	Yes
Spiritual, ceremonial, cultural, archaeological or burial sites					
Spiritual, ceremonial, cultural, archaeological or burial sites (All First Nations)	Preservation of Aboriginal culture	Construction and Operation	Ongoing engagement and consultation with Aboriginal communities will continue after completion of EA. In addition, a Stage 2 archaeological survey has been conducted in 2012 to identify the presence of and assess impacts to cultural heritage in the footprint of the project. No archaeological or cultural heritage resources were identified during this study. <i>[See also Cultural Heritage Resources; Archaeological Sites.]</i>	<ul style="list-style-type: none"> • Proponent has corresponded with Aboriginal communities in the EA process • Proponent commits to continue discussion after the issuance of a Notice of Completion. • A request to enter into discussions regarding the project and an invitation to share information was issued in June 2010. • Stage 1 Archaeological Summary Report was distributed to the Aboriginal Communities. Stage 2 work was completed in November 2012. The community will be consulted prior to the initiation of Stage 3 work. 	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Spiritual, ceremonial, cultural, archaeological or burial sites (MNO)	Spirit (movement) of the water to be impeded by construction of the dam	Operation	During operation, there will be a minimum flow provided downstream at all times. This minimum flow value will vary monthly based upon base flow conditions and will range from 54 m ³ /s during the spring freshet to a minimum of 2 m ³ /s. During normal operations, the minimum flow provided downstream will be 3.1 m ³ /s. During the months that the Frederick House Dam (OPG) is holding back water, Xeneca will release all incoming flows up to a minimum of 2 m ³ /s. If the incoming flow is between 2 and 20 m ³ /s, Xeneca will release a minimum of 2 m ³ /s at all times as well as release all water within 24 hours).	The Wanatango Falls GS will be operated in an intermittent manner, that will ensure flowing water is always provided within the zone of impact. The intermittent operation for the Wanatango project as currently proposed will allow a minimum environmental flow of 2 m ³ /s to be passed at all times.	No
Spiritual, ceremonial, cultural, archaeological or burial sites (TTN)	TTN concern with burial sites at confluence of Abitibi River	Operation	The burial sites are outside of the ZOI of the project and will not be impacted by operation of the Wanatango GS. [See also Cultural Heritage Resources; Archaeological Sites.]	None required.	No
Spiritual, ceremonial, cultural archaeological or burial sites (Wahgoshig)	Wahgoshig identified concerns with the Stage 1 and 2 archaeological reports regarding these reports not having included traditional land use information and local knowledge	Construction	The TLU study was done after the Stage 1 and 2 Reports. Xeneca has supported the White Spruce Technical Peer Review which provided Wahgoshig FN the opportunity to provide input into the archaeological program. [See also Cultural Heritage Resources; Archaeological Sites.]	Xeneca can follow up on any archaeological type sites such as old cabins (not spiritual or plant gathering sites etc.) from the TK study that were outside of our original high potential areas.	No
Spiritual, ceremonial, cultural archaeological or burial sites (Wahgoshig)	Wahgoshig- The technical review of the Stage 2 archaeological report stated that ancient shorelines should have been evaluated and tested in addition to the inundated areas, to include 2 and 100 year flood elevations.	Construction	Xeneca can follow up on any archaeological sites from the TK study that were outside of our original high potential areas. The 100 year flood elevation has no meaning as far as the MTSC "Standards and Guidelines" are concerned as it is not a physical shoreline. [See also Cultural Heritage Resources; Archaeological Sites.]	Please refer to Section 6 of the ER for additional information.	No
Spiritual, ceremonial, cultural archaeological or burial sites (Wahgoshig)	Wahgoshig-It was not clear in the Stage 2 report how areas were classified as having high, low or no potential.	Construction	Areas of high archaeological potential were surveyed. WHS uses an implicit model to assess archaeological potential based on landscape features and experience. The identification of areas of potential is based on current landscape features (distance to water, slope, drainage. Dr. Pollock noted that they have waypoints and photographs of areas that were considered low archaeological potential. [See also Cultural Heritage Resources; Archaeological Sites.]	Please refer to Section 6 of the ER for additional information.	No
Spiritual, ceremonial, cultural archaeological or burial sites (Wahgoshig)	Wahgoshig-There is insufficient information in the Stage 2 report to develop a strategy for implementing the Stage 3 work.	Construction	As the three archaeological sites identified are of cultural heritage value, a Stage 3 Archaeological Assessment is required to further determine the presence of buried artifacts, define the site stratigraphy, cultural features and collect a representative sample of artifacts. This Stage 3 archaeological work can only be undertaken after consultation with First Nations and MNO, and must be done in advance of any future development. [See also Cultural Heritage Resources; Archaeological Sites.]	Strategies for implementing the Stage 3 work will be included in the Stage 3 report.	No
Spiritual, ceremonial, cultural archaeological or burial sites (Wahgoshig)	Wahgoshig-Locations and plans for the infrastructure, road and transmission corridors had not been finalized at the time of the Stage 1 and 2 Archaeological Studies.	Construction	An additional report on infrastructure, roads, and the transmission corridor has been included in this ER. [See also Cultural Heritage Resources; Archaeological Sites.]	Please refer to ER Annex 3 for reports associated with lines, roads and transmission corridors.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Spiritual, ceremonial, cultural archaeological or burial sites (Wahgoshig)	Wahgoshig-the Stage 2 archaeological report did not consider the potential for erosion of archaeological sites.	Construction	<ul style="list-style-type: none"> the potential for shoreline erosion along shorelines within the zone of influence will be assessed prior to construction by a qualified person Limit maximum daily fluctuations of upstream water levels (1 m fluctuation) Limit the rate of change of upstream water levels Daily water fluctuation due to operations will not exceed ± 10 cm of the daily average at a point 24 km downstream Facility will operate as a modified run-of-river facility (run-of-river operation during extreme high and low flow periods of the year) inspect and monitor for signs of erosion in years one, three and five of operation to document where and degree of erosion and develop and implement additional mitigation measures as required. <i>[See also Cultural Heritage Resources; Archaeological Sites.]</i> 	Operations will be established to minimise erosion where possible. Follow-up monitoring will be completed to determine where erosion and sedimentation are occurring as a result of operations	No
Spiritual, ceremonial, cultural archaeological or burial sites (Mattagami)	Mattagami-Three cultural heritage sites possibly located within the project footprint	Construction	Primary construction work is greater than 300 m from the closest archaeological site. Stage 1 and 2 archaeological reports have been completed that detail the three identified cultural heritage sites. Archaeological reports will be provided to individual communities and government agencies at the same time. <i>[See also Cultural Heritage Resources; Archaeological Sites.]</i>	The Ministry of Tourism, Culture and Sport provided a partial clearance letter indicating its support for construction work to occur prior to the Stage 3 archaeological work to be carried out in the spring of 2015.	No
Traditional land or resources used for harvesting activities					
Traditional land or resources used for harvesting activities (All First Nations)	Project construction may result in the removal of culturally significant medicinal plants and/or trees	Construction	The presence of culturally significant medicinal plants and/or trees was considered but none have been identified within the project footprint.	Construction of infrastructure within the project footprint (including road and transmission line components) does not impact upon any known culturally significant medicinal plants and/or trees. Dominant tree species in the project footprint are comprised of Balsam Fir, Trembling Aspen and Black Spruce which have not been identified as significant medicinal plants or trees.	No
Traditional land or resources used for harvesting activities (All First Nations)	Quality and Clarity of water may be affected by the construction of the facility, which would impact an important cultural and spiritual value for many communities	Construction	During operation, there will be a minimum flow provided downstream at all times. This minimum flow value will vary monthly based upon base flow conditions and will range from 54 m ³ /s during the spring freshet to a minimum of 2 m ³ /s. During normal operations, the minimum flow provided downstream will be 3.1 m ³ /s. During the months that the Frederick House Dam (OPG) is holding back water, Xeneca will release all incoming flows up to a minimum of 2 m ³ /s. If the incoming flow is between 2 and 20 m ³ /s, Xeneca will release a minimum of 2 m ³ /s at all times as well as release all water within 24 hours). <i>[Please also refer to General Natural Environment; Water Quality (surface and groundwater).]</i>	Engagement and consultation with Aboriginal communities for purposes of the EA was completed. Xeneca will continue to advise communities of progress on the project after completion of EA and through the permits and approvals process.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Traditional land or resources used for harvesting activities (All First Nations)	Quality and Clarity of water may be affected by the operation of the facility, which would impact an important cultural and spiritual value for many communities	Operation	Quality and clarity of water will be compared to pre construction condition and reported to Ontario MOE/MNR annually for each monitoring year. No residual effects on the quality or clarity of water are expected. <i>[Please also refer to General Natural Environment: Water Quality (surface and groundwater).]</i>	<ul style="list-style-type: none"> • Pre- and post-development monitoring for mercury in fish tissue and surface water is underway and will be continued into the early operational period. • Headpond created in association with the project will be relatively small and have well moving water compared to other hydropower projects where mercury enrichment has occurred • Water quality samples will be collected three times a year from within the impoundment, upstream and downstream of the facility, and analyzed for a variety of water quality parameters. Should monitoring identify that water quality is impacted, Xeneca will discuss the issue with regulators to determine if additional sampling is necessary and develop appropriate mitigation measures. • Erosion and sedimentation will be monitored to validate post development headpond sediment infilling, sediment transportation and channel dynamics, especially during high flow events. 	Yes
Traditional land or resources used for harvesting activities	Construction may impact use of the area by waterfowl for foraging and nesting activities which could impact subsistence, harvesting, hunting and cultural activities of communities		The construction season is recommended to be limited to August 1st to April 15th annually to limit the potential for impact on migration, mating and nesting of bird species. <i>[Please also refer to Forest Nesting Birds]</i>	<ul style="list-style-type: none"> • The proponent will ensure the communities are aware of the construction schedule for the project to minimize the potential for impact on subsistence, harvesting, hunting and other cultural activities. • Construction noise impact on waterfowl will be mitigated by ensuring construction takes place during appropriate timing windows. Impact on traditional activities will be mitigated through placement of signage, and public notifications. 	No
Traditional land or resources used for harvesting activities (All First Nations)	Furbearing mammals may be impacted by fluctuating water levels in the headpond during the winter months and alteration of habitat resulting in a change in trapping which may impact traditional lifeways and economic resources of aboriginal peoples.	Operation	No additional monitoring or mitigation is recommended for furbearing mammals. If it is identified that First Nation trapping may be impacted, Xeneca will work with affected individuals to determine appropriate mitigations. <i>[Please also refer to shoreline dependent species-inundation effects on aquatic mammals and their habitat.]</i>	<ul style="list-style-type: none"> • No active First Nation traplines have been identified to Xeneca within the project area. • Appropriate timing of the initial inundation (early summer) will minimize mortalities on furbearing mammals (who may be denning in winter, and who would experience mortality if inundation is completed during winter). • Summer flooding will allow sufficient time for furbearers to re-establish new lodging, and for Beavers to gather feed piles prior to winter freeze-up. • Altered river flows could impact upon available food supply for furbearing mammals by impacting upon benthic invertebrate populations, especially within the inundation area. • Operational impacts may result from sudden fluctuations in water during freezing which could result in flooding of dens. This is mitigated through the operations plan. 	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Traditional land or resources used for harvesting activities (All First Nations)	Hunting, harvesting, foraging and trapping activities may be disrupted by construction activities (being unable to access site areas)	Construction	Impact on traditional activities will be limited to the construction footprint and access will be reinstated following project development. <i>[Please also refer to Land and Resource Use; access to inaccessible areas.]</i>	Where crown land is impacted, all stakeholders will be notified of any access restrictions through placement of signage and through media notifications (ie. placement of information on project website). After construction, access controls will be removed.	No
Traditional land or resources used for harvesting activities (All First Nations)	Construction activities may impact food bearing plants and impact foraging and harvesting activities of some communities	Construction	The impact of construction on First Nation foraging and harvesting activities has been considered and is thought to be negligible.	Construction activities will be limited to the project footprint and transmission lines and road corridor. The project footprint has not been identified to Xeneca as foraging or harvesting areas by any of the First Nation communities.	No
Traditional land or resources used for harvesting activities (All First Nations)	Operation activities may impact food bearing plants and impact foraging and harvesting activities of some communities	Operation	The impact of operation on First Nation foraging and harvesting has been considered and is thought to be nonexistent.	Operation activities will impact aquatic areas only, and there are no known aquatic food-bearing plants (i.e. wild rice) that have been identified to Xeneca by First Nation communities.	No
Traditional land or resources used for harvesting activities (All First Nations)	Fish species health and abundance may be impacted by activities related to construction of the facility impacting harvesting and subsistence activities of certain communities during specific times of the year	Construction	Impacts on fish species health and abundance during construction will be appropriately mitigated and should not result in significant impacts to fish populations. <i>[Please also refer to Aquatic and Riparian Ecosystem; Fish Habitat, Fish Injury and Mortality]</i>	The Construction Monitoring Plan outlines mitigations to limit impacts on fish populations due to blasting, noise and vibration through construction BMP's (Land Development Guidelines for the Protection of Aquatic Habitat, DFO). These will include habitat monitoring, in-stream work windows to limit effects to fish at sensitive times, identification and relocation of fish stranded through dewatering, erosion and sedimentation controls, and other BMP's for environmentally sensitive work.	Yes
Traditional land or resources used for harvesting activities (All First Nations)	Fish species health and abundance may be impacted by activities related to operation of the facility impacting harvesting and subsistence activities of certain communities during specific times of the year	Operation	Should monitoring reveal changes in fish communities, abundance or health, additional mitigation or compensation strategies may be developed, or additional monitoring recommended. Operational adjustments may be warranted for issues related to fish stranding, impingement or entrainment. <i>[Please also refer to Aquatic and Riparian Ecosystems; Fish Habitat.]</i>	<ul style="list-style-type: none"> • Fish community sampling will be completed post-construction to obtain data on CPUE (catch per unit effort) and relative abundance, and to compare to pre-construction conditions and determine whether fish community and abundance have changed. • Fish species (mercury levels in fish tissue) will be monitored and the results will be submitted to MOE and MNR on an annual basis. Fish stranding, impingement and entrainment as a result of operations will be monitored on a regular basis and survey results will be submitted to MNR and DFO annually. • Ramping rates will be controlled to mitigate fish stranding, and engineering design factors will be utilized to mitigate fish entrainment. • Preventative measures will be utilized to reduce the entrainment and impingement of fish through proper engineered design of project components such as trash racks and screening, and management of flow velocities in the intake channel through the operation regime. 	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Traditional land or resources used for harvesting activities (All First Nations)	Habitat changes as a result of construction may result in changes in habitats of large game such as moose, bear and deer which communities rely on for food and other products		While impacts to terrestrial habitat in the footprint area, roads and transmission line routes are proposed as a result of clearing activities, loss of this small area of habitat does not constitute a significant loss in the region as a whole. No terrestrial mammals are anticipated to be adversely impacted. <i>[Please also refer to Aquatic and Riparian Ecosystem; Species at Risk; Large game; woodland caribou.]</i>	Temporary impacts to large game within the project footprint will include noise, human presence on the site and general disturbance within the project footprint. Those mammals with large territorial ranges such as White-tailed Deer and Black Bears are unlikely to be impacted by the Wanatango Project construction.	No
Traditional land or resources used for harvesting activities (TTN)	TTN raised concern regarding fish passage at the site.	Operation	<ul style="list-style-type: none"> Xeneca has committed to providing downstream fish passage through use of a fish slide. Turbine selection may allow for the safe downstream passage of fish through the facility. As a result of TTN's identified concerns regarding Lake Sturgeon's lack of ability to migrate downstream, Xeneca has selected a no fish passage option for dam development. <i>[Please also refer to Aquatic and Riparian Ecosystem; Fish Habitat and General Natural Environment; Species at Risk (Lake Sturgeon).]</i> 	Xeneca is committed to working with TTN on an ongoing basis to resolve these concerns.	No
Traditional land or resources used for harvesting activities (TTN)	TTN concern regarding project impacts on Lake Sturgeon during operation	Operation	<p>Xeneca has committed to providing a fish slide for downstream fish passage. A constant compensatory flow of 2 m³/s will be passed for the entire year.</p> <ul style="list-style-type: none"> A discovery protocol will be developed and in place should a SAR species be encountered A permit under Section 17(2)C of the <i>Endangered Species Act</i> will be required and an overall benefit to the species will be required/discussed. Once operation commences an Agreement for Operation and monitoring protocols under the Endangered Species Act will be required/discussed with the MNR. Comparable habitat is commonly available in the surrounding landscape. Project will revert to run of river during spawning periods. <i>[Please also refer to Aquatic and Riparian Ecosystem; Fish Habitat and General Natural Environment; Species at Risk (Lake Sturgeon).]</i> 	Offsetting habitat to be created downstream of the GS at Zeverly's Rapids and at the tailrace as spawning habitat for Lake Sturgeon. Lake Sturgeon upstream of the dam will be safely relocated after project construction.	Yes
Traditional land or resources used for harvesting activities (TTN)	TTN concern regarding incorporation of TEK into archaeological reports	Construction	Xeneca has provided preliminary funding for a scoped TEK review which will hopefully be incorporated into the final ER and is prepared to support other elements during the permitting and approval phase.	Xeneca is committed to continue to work with the communities beyond the specified timeline.	No
Traditional land or resources used for harvesting activities (TTN)	TTN requested additional information on upstream riparian vegetation mapping, mapping of inundation areas, duration of flooding, and the impacts of water level fluctuations on wetlands, sensitive features and aquatic habitats as part of the SVS technical review.	Construction and Operation	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER. <i>[Please also refer to Social & Economic; Property Flooding/Flood Risk.]</i>	Please refer to ER Table 16, Section 6.6.5 for further details.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Traditional land or resources used for harvesting activities (TTN)	TTN identified issues with the proposed fishway design and related design parameters	Operation	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER.	Please refer to ER Table 16, Section 6.6.5 for further details.	No
Traditional land or resources used for harvesting activities (TTN)	TTN identified issues with downstream fish passage at the fish slide	Operation	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER.	Please refer to ER Table 16, Section 6.6.5 for further details.	No
Traditional land or resources used for harvesting activities (TTN)	TTN recommended that compensation efforts be focused on habitat creation and enhancing existing habitat downstream rather than implementing the existing fishway design	Construction and Operation	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER.	Please refer to ER Table 16, Section 6.6.5 for further details.	Yes
Traditional land or resources used for harvesting activities (TTN)	TTN identified concerns with Species at Risk (nesting birds), Migratory Birds, permitting and the sharing of SAR information with MNR	Construction	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER. <i>[Please refer also to Terrestrial Wildlife (Forest nesting birds).]</i>	Please refer to ER Table 16, Section 6.6.5 for further details.	No
Traditional land or resources used for harvesting activities (TTN)	TTN identified concerns with the impact of blasting on fish and fish habitat	Construction	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER. <i>[Please also refer to Fish Mortality due to Blasting]</i>	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER.	Yes
Traditional land or resources used for harvesting activities (MNO)	MNO concern regarding the cumulative impact of hydro development combined with other forms of development	Construction and Operation	The extent of the project influence extends below the tailrace of the FHLD (approximately 1.4 km downstream). As such, Xeneca's project cannot have any impact on the FHLD or upstream areas, including Nighthawk Lake. Changes to water levels will be well within existing conditions experienced within the project zone of influence. Although water level fluctuations may be more frequent, the fluctuations will be well within the range currently experienced as a result of operation of OPC's FHLD. <i>[Please also refer to General Natural Environment; surface and groundwater (above).]</i>	Commitments are in place to ensure water levels are maintained in a manner that allows critical life stages to occur for aquatic species i.e. spawning. Extensive work on flows that avoid fish stranding and allow for fish passage has also been undertaken.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Traditional land or resources used for harvesting activities (Wahgoshig)	Wahgoshig-Concern regarding local flooding and the cumulative impact of project development on reserve lands.	Construction and Operation	Wahgoshig First Nation lands are situated outside of the proposed inundation area. Waterways adjacent to Wahgoshig First Nation lands will not experience any impacts as a result of the project. <i>[Please also refer to Social & Economic; Property Flooding/Flood Risk.]</i>	The ZOI has been delineated by Xeneca as per the Waterpower Class EA. The headpond of the Wanatango Falls Dam will extend 8.6 km to about 1.4 km downstream of the Frederick House Lake Dam. Xeneca has no authority or intention to change the existing operating plan of the FHLD. The proposed project will not have any effect on the operation and water level of the FHLD. Flow alterations resulting from the operation of the project attenuate gradually with distance downstream, resulting in a downstream ZOI that ends just upstream of the Neeland's Rapids. Xeneca has committed to restrict water level fluctuations at the Neeland's Rapids to be within ± 10 cm. Changes to water levels will be well within the range currently experienced as a result of operation of OPC's FHLD. Commitments are in place to ensure water levels are maintained in a manner that allows critical life stages to occur for aquatic species. Extensive work on flows that avoid fish stranding and allow for fish passage have also been undertaken.	No
Traditional land or resources used for harvesting activities (Wahgoshig)	Wahgoshig identified concerns with the impacts to fish species	Construction and Operation	<ul style="list-style-type: none"> • minimum environmental and/or compensatory flow will be continuously released downstream to ensure ecological function (see draft Operating Plan in Annex I) • special operating constraints will be applied during key life stages of Lake Sturgeon, Walleye and Northern Pike • a compensation plan, including provisions for the creation of compensatory habitat, will be developed and discussed with DFO once the engineering details for the project have been advanced during the permitting phase of the project. • effectiveness goals will need to be discussed with MNR and DFO to ensure that the effectiveness and intended function of the compensation habitat can be demonstrated 	No impacts anticipated - Xeneca will meet with MNR and DFO to confirm minimum flow and compensation requirements in order to mitigate impacts so that no net impact to fish habitat results	No
Traditional land or resources used for harvesting activities (Mattagami)	Mattagami-Concern regarding impacts upon spawning areas within the downstream zone of influence	Operation	Operational restrictions during spring spawning will ensure protection of spawning areas. When water temperatures reach 4°C, operations will change to ROR with no modified peaking.	No impacts anticipated following the provision of compensatory habitat - Effects will be mitigated through run-of-river operational regime during spawning period to ensure water level fluctuations are minimised	No
Employment					
Employment (All First Nations)	Potential impact on employment of First Nation community members.	Construction and Operation	Xeneca will proactively explore employment opportunities with First Nation communities as part of ongoing consultations.	Xeneca has issued draft Letters of Intent and Term Sheets which include the offer of economic benefits that provide for preferential bidding for contracts during the construction and operation of the proposed project. Xeneca has also included a contracting and procurement policy as part of the Term Sheet that favours First Nations employment.	Yes

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Land Subject to Land Claims					
Lands subject to land claims (All First Nations within Treaty 9)	The Project site is located in an area where a land claim is on file between the Federal Crown and Nishnawbe Aski Nation which is the Grand Council of Treaty 9. An Agreement in Principle has been reached but no final agreement has been settled.	Construction and Operation	Xeneca will monitor the land claim process and continue to engage with its local aboriginal communities to identify issues which may arise.	Xeneca proposes an accommodation as part of its economic benefits package with the identified First Nation communities that takes into account treaty and traditional territorial claims as part of the accommodations process.	Yes
Economic Development					
Economic development (Wahgoshig)	Business opportunities may be possible with nearby First Nation communities (i.e. Wahgoshig)	Construction and Operation	Xeneca will proactively explore business opportunities with First Nation communities as part of ongoing consultations. Xeneca is open to developing equity partnerships and economic development opportunities with First Nation communities.	Potential impacts are beneficial.	Yes
Economic development (TTN)	TTN concern regarding other First Nations participating in business opportunities and with initiation of EA process prior to agreement with First Nation communities	Construction and Operation	Xeneca takes an agnostic position on which communities benefit. Xeneca has suggested that discussions between communities take place to clarify the nature of project impacts on each community and the resulting benefits that could accrue.	Xeneca is committed to continue to work with the communities beyond the specified timeline.	Yes
Other					
Other (All First Nations)	Impact on First Nation access to the project area during construction	Construction	Privately owned lands, degree of access will be determined in land tenure agreements.	<ul style="list-style-type: none"> Install temporary gates, fencing and signage during construction to limit unauthorised public access Operational staff to monitor for signs of unauthorised access and report to appropriate local authorities/MNR A schedule of activities will be posted to the project website, or sent out to communities in advance of construction periods 	Yes
	Community concern regarding water level modifications downstream of the project during operations	Operation	Variations in flows in the variable flow reach will be inevitable. The proposed operating constraints will minimize the magnitude and frequency with which such variations will occur. <i>[Please also refer to Social and Economics; Property Flooding]</i>	<ul style="list-style-type: none"> A downstream minimum environmental flow of 2 m³/s is proposed to be continually released into the variable flow reach during modified run-of-river operations in order to maintain ecological habitat viability. 	Yes
Other-Safety (TTN)	TTN concern with safety near Zevelley's Bridge	Operation	Xeneca is committed to implementing safety signage and limiting water level fluctuations.	Xeneca has issued a response to TTN regarding these stated concerns.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Other (TTN)	TTN representative raised concern regarding initiation of the EA process prior to agreement with First Nations.	Construction and Operation	Xeneca explained the tight timelines involved in the process including an 18-24 month window for construction.	Engagement and consultation with Aboriginal communities for purposes of the EA was completed. Xeneca will continue to advise communities of progress on the project after completion of EA and through the permits and approvals process.	No
Other (TTN)	Part II Order Request received from TTN after submission of the Draft ER.	Construction and Operation	Subsequent to the Part II order request, meetings were held with TTN to further discussions around MOU development and signing, development of a Non-Disclosure Agreement and TTN protocols. Xeneca stated its policy to have ongoing and continuing dialogue throughout the development process and even after the construction of the site.	Engagement and consultation with Aboriginal communities for purposes of the EA was completed. Xeneca will continue to advise communities of progress on the project after completion of EA and through the permits and approvals process.	No
Other (TTN)	TTN requested that several documents (including the ARD Management Plan, the Blasting Plan, Construction Management Plan, reclamation plan and plans showing the extent of fencing, vegetation removal and soil stabilization methods during and after construction be developed in a collaborative manner with TTN during the post-EA process.	Construction	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16, Section 6.6.5 of the ER.	Please refer to ER Table 16, Section 6.6.5 for further details.	No
Other (TTN)	TTN-Final impact, mitigation and compensation plans for the dam site should be integrated and included in the Construction Management Plan.	Construction	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16, Section 6.6.5 of the ER.	Details of mitigations for the Shared Value Solutions technical peer review are outlined in Table 16 of Section 6.6.5 of the ER.	No
Other (Wabun TC)	Wabun TC expressed concern about the commencement of 'consultation exercises' (public information centres and the release of project descriptions) prior to finalizing an agreement with Wabun.	Construction and Operation	Engagement and consultation with Aboriginal communities for purposes of the EA was completed. Xeneca will continue to advise communities of progress on the project after completion of EA and through the permits and approvals process.		No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Economic Development					
Economic development (Wabun TC)	Wabun TC concern with MNR process used to identify communities involved in B to B process	Construction and Operation	Xeneca is in partnership with various Aboriginal communities and will defer to their processes and what they collectively agree to.	Engagement and consultation with Aboriginal communities for purposes of the EA was completed. Xeneca will continue to advise communities of progress on the project after completion of EA and through the permits and approvals process.	No
Land and Resource Use					
Access to inaccessible areas	Facilitation of access as a result of upgrades/maintenance of area access roads and bridges	Construction and Operation	<ul style="list-style-type: none"> install gates, fencing and signage to limit unauthorised public access where required to maintain public safety and where access is currently limited operational staff to monitor for signs of unauthorised access and report to appropriate local authorities/MNR 	Low negative impacts - road upgrades and ongoing maintenance activities could result in increased access to the area	Yes
Navigation	Construction, inundation and variable flows may alter navigational access within the project zone of influence	Construction and Operation	<ul style="list-style-type: none"> The creation of the headpond will not negatively affect the navigability of the waterway upstream of the facility. The falls at the project site currently acts as a barrier to navigation. Daily fluctuations in water levels and flows downstream of the Wanatango Falls GS will remain within the range occurring under existing conditions as a result of operations at the Frederick House Lake Dam. Install signage at private areas to alert recreational users of the river. 	<p>The Frederick House River is a non-scheduled navigable water under the new <i>Navigation Protection Act</i>, and therefore the proposed project does not automatically require approval from Transport Canada under the <i>NPA</i>. Xeneca nonetheless has the option to submit an Opt-in Request to TC to review the associated works under the <i>NPA</i>. Xeneca may wish to do this in order to proceed with the added assurance that the work's interference with navigation is sanctioned under the <i>NPA</i>.</p> <p>If Xeneca decides to submit an Opt-in Request and TC decides to accept this request, future consultation with TC will be required as the project moves forward in the development process. Detailed engineering drawings will be required by the Agency before it can proceed with their review under the <i>NPA</i>.</p>	Yes
Waste	Proper disposal of waste from the project site	Construction and Operation	<ul style="list-style-type: none"> Solid nonhazardous construction waste (e.g. material packaging) generated during the construction process will be removed from the site to an approved disposal location. The proponent will make the appropriate arrangements prior to construction for all waste disposal. Industrial liquids such as paints, sealants, fuels and lubricating fluids will be stored in secure containment areas and disposed of in accordance with provincial and federal liquid waste disposal regulations (e.g. Environmental Protection Act, O. Reg. 347, and <i>Transportation of Dangerous Goods Act</i>). Utilize approved waste handling and disposal practices for VOC and organic waste management Organic/food waste will be collected daily and stored in closed, animal resistant containers until disposed of at an approved waste disposal site 	No impact anticipated - A site licensed for acceptance of the waste will be located.	No
Riparian rights or privileges	Impacts associated with inundation	Construction and Operation	<ul style="list-style-type: none"> Creation of the headpond will only proceed once all necessary land ownership agreements have been finalized. 	Once the agreements are secured, no impact are anticipated. Land ownership agreements are required prior to the creation of the headpond.	No
Recreational use	Impacts to general recreational enjoyment quality at Wanatango Falls - construction period	Construction	<ul style="list-style-type: none"> Recreational activities that may be affected are primarily related to navigation or angling. See the rows on 'Navigation' and 'Angling, hunting opportunities' for applicable mitigation measures. 	See the rows on 'Navigation' and 'Angling, hunting opportunities' for applicable mitigation measures.	

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Angling, hunting opportunities	Projects fall within Bear Management Areas - effects on bear hunting	Construction and Operation	<ul style="list-style-type: none"> area to be cleared is very small in relation to the abundance of similar available habitat on the surrounding landscape keep trap lines and trails clear of slash minimize harassment of wildlife keep staging areas tidy and free of litter Any new restrictions on access will be limited to the immediate vicinity of the construction area and built structures for safety reasons. 	No impact anticipated - impacts to the habitat of targeted species and any loss of access for hunting are anticipated to be negligible in proportion to the availability of suitable habitat/range in the surrounding the area.	No
	Potential impacts to angling opportunities	Construction and Operation	<ul style="list-style-type: none"> maintain access around the site and within the zone of influence to ensure safe passage access for anglers The creation of the headpond may improve the navigability of the river upstream, which in turn may improve access to fishing opportunities 	Low impacts anticipated - recreational fishing is prevalent both upstream and downstream of the proposed project location.	Yes
Trapping	A registered trap line is present in the general area	Construction and Operation	<ul style="list-style-type: none"> area to be cleared is very small in relation to the abundance of similar available habitat on the surrounding landscape keep trails clear of slash minimize harassment of wildlife keep staging areas tidy and free of litter Planning for flooding of new reservoir should avoid the winter/ice over period when filling could cause direct mortality by drowning furbearing mammals in their dens Impacts to dens of fur-bearing mammals upstream of the Wanatango Falls GS are anticipated to be minimal, as the proposed fluctuation in water levels are much less than existing seasonal water level fluctuations, and it is anticipated that new dens will be established according to the new high water mark. The daily fluctuations in water levels resulting from operations at the Wanatango Falls GS will be within the extent of larger seasonal fluctuations. Additionally, mammal denning currently exist under the existing water level fluctuation regime associated with operations at the Frederick House Lake Dam. 	<p>No impact anticipated with the proper implementation of mitigation measures. Habitat loss of targeted species is anticipated to be negligible in proportion to the availability of suitable habitat surrounding the area.</p> <p>It is expected that, if required, issues will be communicated and addressed via dialogue with the MNR and local trappers.</p>	No
Baitfish harvesting activities	Projects fall within registered commercial baitfish harvesting areas	Construction and Operation	<ul style="list-style-type: none"> see <i>Fisheries and Fish Habitat</i> issues and mitigation above 	<p>Impacts to baitfish harvesting are expected to directly correspond to effects on fish and fish habitat, as described above.</p> <p>It is expected that, if required, issues will be communicated and addressed via dialogue with the MNR and baitfish harvesters.</p>	
An existing land or resource management plan	Forest resources on Crown Land in the vicinity of the site are allocated under a Sustainable Forestry License to Abitibi River Forest Management Inc.; clearing of resource in alignment with FMP and knowledge of SFL	Construction	<ul style="list-style-type: none"> negotiate with SFL holder and MNR to permit for the harvesting/clearing of forest resources within the proposed inundation area/road construction ROW prior to construction/flooding 	Ongoing engagement and consultation with SFL holder will continue after completion of EA; agreement will be sought with SFL to ensure first rights to merchantable wood and improved access routes.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
An existing water management plan	Following the completion of construction, an amendment to the Abitibi River WMP will be required	Operation	<ul style="list-style-type: none"> The operation of the facility will be aligned with the existing Abitibi River WMP Water management planning principles taken into account during project planning and incorporated into operating plan for the facility As part of the EA, Xeneca has endeavoured to meet the intent of WMP requirements as they relate to the design and operation of the facility, as well as agency, public and aboriginal consultation. 	Engagement and consultation with Abitibi River WMP SAC will continue after completion of EA as part of approvals required under the <i>Lakes and Rivers Improvement Act</i> .	No
Protected areas	No protected areas identified	N/A	N/A	N/A	No
Forestry	Harvesting of merchantable timber during construction	Construction	<ul style="list-style-type: none"> restrict clearing to approved right-of-way to minimize area of impact negotiate with SFL holder and MNR to permit for the harvesting/clearing of forest resources within the proposed facility footprint/inundation area/road construction prior to construction/flooding stumpage fee for merchantable timber on Crown land 	Positive impact - Timber removal represents a potential benefit to local SFL holder by sale/processing of merchantable timber.	Yes
Mine claims	Wanatango Falls project Zone of Influence is within several existing mine claims	Construction	<ul style="list-style-type: none"> Changes to the <i>Mining Act</i> in Ontario now recognizes waterpower and other resource development and provision exists for the claim holder to cede first right of refusal on surface rights to the developer of a renewable energy facility 	Discussions are underway to obtain mining claim consent. No impacts anticipated once consent is obtained.	No
Existing Dams	Impacts to operations of Frederick House Lake Dam upstream of facility and on other dams on the system	Operation	<ul style="list-style-type: none"> Frederick House Lake Dam is located beyond the upstream limit of the ZOI The operation of the facility will be aligned with the existing Abitibi River Water Management Plan (WMP) The nearest downstream GS (Island Falls GS) is located more than 120 km downstream, beyond the downstream ZOI for the project by almost 100 km. Daily water fluctuation due to operations will not exceed ± 10 cm of the daily average at a point 24 km downstream 	No impacts anticipated	No
Agricultural land	Impacts to agricultural lands due to water level and flow fluctuations downstream of facility	Operation	<ul style="list-style-type: none"> variable water levels and flows will not extend beyond variable flow reach which will not intersect agricultural lands Daily fluctuations in water levels and flows downstream of the Wanatango Falls GS will remain within the range occurring under existing conditions as a result of operations at the Frederick House Lake Dam. 	No impacts anticipated	No
Cultural Heritage Resources					
Archaeological sites	Disturbance or destruction to archaeological resources	Construction	<ul style="list-style-type: none"> Stage 1 and Stage 2 archaeological assessments confirmed the presence of three pre-contact archaeological sites. As primary construction work for the Wanatango Falls GS is located more than 300 m away from the closest archaeological site, Xeneca received partial clearance from the Ministry of Tourism, Culture and Sport for construction at Wanatango Falls. In the Stage 3 archaeological assessment, the spatial extent of the archaeological sites will be delineated, and the cultural heritage value or interest of the sites will be thoroughly evaluated. The Stage 4 archaeological assessment, if recommended, will involve the implementation of long-term protection strategies and/or the removal of the artifacts. If previously-unidentified archaeological or heritage resources are discovered during clearing or construction, work will be stopped until an archaeologist has assessed the find and a course of action is determined. A Discovery Protocol will be prepared and implemented for project construction. 	The Stage 3 and, if necessary, Stage 4 archaeological assessments are slated for the spring of 2015. As the Stage 3 assessment will thoroughly document the location and characteristics of the sites, and the Stage 4 assessment (if recommended) will see the archaeological resources protected and/or removed from the site, no residual effects are anticipated.	No
Buildings or structures	Disturbance or destruction to heritage buildings or structures	Construction	<ul style="list-style-type: none"> Stage 1 archaeological assessment did not identify potential for built heritage structures within the project area. No built heritage structures were encountered within the project area during the Stage 2 archaeological assessment. 	No impacts anticipated - no built heritage structures were identified or encountered during Stage 1 and Stage 2 archaeological assessments.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Cultural heritage landscapes	Disturbance or destruction to cultural heritage landscapes	Construction	<ul style="list-style-type: none"> Stage 1 did not identify potential for cultural heritage landscapes within the project area. 	No impacts anticipated - Stage 2 survey was completed in fall 2012 and no cultural heritage landscapes were identified.	No
Social and Economic					
The location of people, businesses, institutions or public facilities	Disruption to access, schedules and activities	Construction	<ul style="list-style-type: none"> limit disruptions to traffic flow by maintaining adequate access along travelled routes, and alternate access if required avoid sensitive time periods and advise residents of planned activities that may cause a disruption in access construction materials and equipment should be segregated in staging areas during off hours monitor condition of gravel roads; if construction traffic is causing damage, ensure that repairs are undertaken promptly 	No impacts anticipated - the project site is remotely located and accessed via logging access roads which are not widely utilized	No
Community character, enjoyment of property or local amenities	Potential effects on property enjoyment, recreational water use, tourism values, aesthetic image	Construction and Operation	<ul style="list-style-type: none"> project Zone of Influence is remotely located facility will operate as a modified run-of-river facility (run-of-river operation during extreme high and low flow periods of the year); the daily fluctuations in water levels downstream of the Wanatango Falls GS will be within a range frequently occurring on the river due to current operations at the Frederick House Lake Dam; water levels in the headpond of the Wanatango Falls GS will have a maximum daily fluctuation of 1 m. maintain access around the site and within the zone of influence to ensure safe passage access for anglers and campers 	Low negative impacts possible - Aesthetic impacts associated with construction will be short in duration; the project site will undergo restoration activities (seeding, tree planting, etc.) after the end of construction.	Yes
Employment - Local and regional labour supply	Construction activities will support direct and indirect local employment	Construction	<ul style="list-style-type: none"> promote contract bids and offers of service from local communities including Iroquois Falls and Cochrane 	Positive impact - construction and operation represents a potential benefit to local communities	Yes
Public health and/or safety	Forest or brush fires caused as a result of project activities	Construction and Operation	<ul style="list-style-type: none"> project personnel will be prepared and be familiar with the site Fire Preparedness Plan fire fighting equipment will be available to all workers and the location of such equipment will be outlined in the Fire Preparedness Plan Locations of equipment and muster points will be advertised as necessary around the site project personnel will be familiar with fire-fighting techniques and the use of supplied equipment uncontrolled fires will be immediately reported to the nearest fire emergency service and the MNR in the case of an uncontrolled fire on Crown land smoking will only be permitted in designated smoking areas equipped with fire extinguishers disposal and storage of waste will be into proper waste containers to prevent fires 	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
	Public safety in the immediate vicinity of the Wanatango Falls GS site	Construction and Operation	<ul style="list-style-type: none"> Restriction of public access to the site during construction (fencing, signage, etc.) provide and maintain routes for the public to be able to bypass the site (portage, etc.) proper barriers and warning devices installed following construction to restrict public access to intake/tailrace areas during operation, including safety booms, fencing and signage 	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
	Impacts for navigation and recreation associated with facility operation	Operation	<ul style="list-style-type: none"> A public safety measures plan will be developed for the site to identify hazards and suggest mitigation measures to address identified safety issues proper barriers and warning devices installed following construction to restrict public access to intake/tailrace areas during operation, including safety booms, fencing and signage 	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No

Environmental Component	Issue	Phase of Development	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Public health and/or safety	Production of waste in and around work site	Construction	<ul style="list-style-type: none"> Appropriate disposal containers will be available for the prompt disposal of waste full disposal containers will be removed to the appropriate waste disposal facility on a regular basis Organic/food waste will be collected daily and stored in closed, animal resistant containers until disposed of at an approved waste disposal site keep staging areas tidy and free of litter Bear awareness training will be provided to all Project personnel. 	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
Water Supply	Impacts to local water supply	Construction	<ul style="list-style-type: none"> A search of the Ministry of the Environment well records revealed no private or municipal ground water wells within 1 km of the site It is possible that recreational users are taking river water for personal consumption - see Water Quality Proper mitigation measures will be utilized during concreting activities to mitigate potential impacts to water quality - see <i>Water quality (surface and groundwater)</i> 	No impacts anticipated	No
Cottaging and tourism	Potential impact to Nighthawk Lake	Operation	Nighthawk Lake is located upstream of the Frederick House Lake Dam, itself located approximately 10 km upstream of the proposed Wanatango Falls GS. As the Frederick House Lake Dam is located beyond the boundaries of the Zone of Influence for the Wanatango Falls GS, by extension Nighthawk Lake will not be affected by the proposed project.	No impacts anticipated	No
Property flooding/Flood Risk	Impacts to private property	Construction and Operation	<ul style="list-style-type: none"> Creation of the headpond will only proceed once all necessary land ownership agreements have been finalized. 	Once the agreements are secured, no impact are anticipated. Land ownership agreements are required prior to the creation of the headpond.	No
	MNR bridge spanning Frederick House River 500 m downstream of facility	Construction and Operation	<ul style="list-style-type: none"> A memorandum of understanding (MOU) may be required for the use of this bridge and discussions with the MNR The daily fluctuations in water levels downstream of the Wanatango Falls GS will be within a range frequently occurring on the river due to current operations at the Frederick House Lake Dam. The maximum range in flow rates from the proposed facility (15 to 50 m³/s during continuous modified run-of-river operations) are below the channel-forming flow rates that would pose a risk to channel stability. 	No impacts anticipated - the requirement for a MOU for the use of the bridge will be discussed with the MNR	No
Aesthetic image of the surrounding area	Disruption due to presence and operation of proposed facility	Construction and Operation	<ul style="list-style-type: none"> Minimize site clearing. Landscape to rehabilitate the construction site. Apply Best Management Practices and traffic planning to contain construction equipment in designated work areas. The powerhouse is small and is located at Wanatango Falls; little aesthetic impact is anticipated. Re-vegetate areas as soon as possible following construction. Use natural materials in the new structures wherever practicable. A minimum environmental flow will be released into the river downstream at all times. 	Low impacts anticipated with the implementation of mitigation measures.	Yes
Energy/Electricity					
Reliability	Voltage support	Operation	<ul style="list-style-type: none"> Capacity of new power generation units are relatively small 	Operation of facility in parallel with the existing power grid will provide minor impact on the overall power system reliability and power quality (voltage and frequency)	Yes
Electricity flow patterns	Power flow system	Operation	<ul style="list-style-type: none"> Appropriate mitigation technical measures will be proposed in the control system of the power grid and new generation units if required 	Operation of the new power generation units will redistribute power flow in the existing distribution system.	Yes
Other	Protection control settings	Operation	<ul style="list-style-type: none"> Appropriate mitigation technical measures will be proposed in protection and control system of the power grid. 	Operation of the new power generation units will affect existing protection and control settings in the distribution system.	Yes

7.3 IDENTIFIED POTENTIAL ECOLOGICAL EFFECTS

For discussion purposes, the natural environment effects are grouped into the following categories:

- Air Quality
- Water Quality
- Species at Risk and Species of Conservation Concern
- Terrestrial Habitat – Potential Impacts During Construction
- Terrestrial Habitat and Species – Potential Impacts During Operations
- Aquatic Habitat and Species
- Erosion and Sedimentation
- Ice Scour

The assessment of the effect of the project on these attributes in each category is detailed in the following sections and described in Table 30. Additional information can be found in the technical reports in the annexes of this document.

7.3.1 Air Quality

Impacts to air quality associated with the project (i.e., dust, odour, exhaust, etc.) are all expected to occur mainly during the construction phase of the project and will be curtailed during operation. Given the mitigative measures which will be taken as described in the Table, these impacts are anticipated to be both short term and minor, and are therefore not considered to be significant.

It is noted that an effect includes the offset of greenhouse gases. This is considered a positive effect as noted in the Table 30.

7.3.2 Water Quality

Potential Water Quality Impacts During Construction

Consideration was given to the effects of the project on surface and groundwater quality, including the potential use of the waterway as a potable water supply.

There are potential adverse effects on water quality (surface and groundwater) during construction. This is due the potential for erosion and sedimentation, accidental spills, clearing, backfilling, contouring and excavation. As a result, construction industry best management practices will be maintained during the construction program to prevent accidental spills, control erosion and sedimentation, and to manage any groundwater that must be removed from excavations. A preliminary sediment control plan has been developed and is presented in Annex II. Surface water quality testing will be continued post-construction to ensure that

sedimentation is not occurring, and that all water quality parameters measured do not exceed baseline levels. Based on the proposed mitigation, the residual effects are not expected to be significant.

A cofferdam will be utilized to isolate the work area during construction and its use may cause the potential for excess sediment to be suspended and carried downstream by river flow. To minimize potential impacts, construction and removal of the cofferdam will take place during a low flow period, when no significant precipitation is expected. Appropriate timing windows will be developed in conjunction with MNR, to ensure protection of fish species during spawning and egg incubation times. Residual effects are not expected to be significant.

During construction, there is potential for spills or leaks of hazardous substances. Spill prevention and emergency fuel supply containment measures will be required within the facility throughout the operational period; mitigation measures are described in detail in Table 30. Residual effects are not expected to be significant.

Sediment

Based on an assessment of water quality in the Frederick House River (recall Section 2.8.2; see also the report, “Pre-Development Water Quality and Mercury in Fish Tissue” in Annex IV), it is anticipated that the Wanatango Falls facility should not affect the alkalinity, pH or buffering capacity of the river. However, other water quality parameters may be affected. If appreciable sediment accumulates in the impoundment of the project area, turbidity and TSS could increase during peak flows as sediment flushes. The concentrations of metals and nutrients adsorbed to sediment would also increase, possibly resulting in reduced water quality. Impacts will be mitigated whenever possible to reduce the potential for the increase in suspended sediment. Therefore, it was determined that these events have a low residual effect.

Accidental Releases

Spill prevention and containment measures will be put into place throughout the construction and operational periods to mitigate the potential for a spill into the waterway. Workers will be adequately trained in the implementation of a spill response plan, and will be trained in the proper handling and storage of hazardous materials.

A complete description of pre-development water quality and post-development monitoring is included in Annex IV. Practices to be implemented for spill prevention and clean-up are outlined in the Construction Management Plan in Annex II.

Based on this assessment there is the low residual effect as impacts will be mitigated or eliminated whenever possible.

Water Temperature

The primary contributors to water temperature impacts in newly inundated areas include an increase in the surface area of open water, an increase in residence time and thermal stratification. The increase in water temperature in new impoundments, particularly under conditions of low flow and extreme summer temperatures, may result in lower dissolved oxygen concentrations as the water's capacity to retain oxygen decreases. The higher water temperatures in combination with lower dissolved oxygen levels may in turn cause stress on fish populations. As the proposed Wanatango Falls GS involves the creation of a headpond and storage (albeit short-term) of water in this headpond, the potential for water temperature increases have been identified as a potential impact of the Wanatango Falls GS.

In a screening assessment of potential water temperature changes (see the July 14, 2013 letter, "Screening Assessment – Water Temperature – Frederick House River (Wanatango Falls)" in Annex IV), it was determined that the new inundation at Wanatango Falls GS will result in less than a 1% change in surface water area of the watershed. These results suggest that the contribution to the overall summer temperature baseline in the watershed at the macro scale is likely insignificant.

Water residence time for low flow scenarios was estimated to be between 6.5 hours and 2.5 days for the Wanatango Falls GS, with an average residence time of approximately 1 to 1.5 days. Based on the knowledge that a series of hot consecutive days are required to cause a notable increase in water temperature from the summer baseline, the additional residence time of 1 to ½ days are not likely to result in a significant change in water temperature under normal conditions.

The potential for stratification was also considered; thermal stratification can occur in deep reservoirs whereby the water at depth remains cooler than the water at the surface. The inundation area of the Wanatango Falls GS is relatively shallow, with an average depth of 1.3 m and a maximum depth of 6 m immediately upstream of the dam. It is anticipated that these depths will not be sufficiently large to result in significant thermal stratification in the headpond.

Additionally, as illustrated in the conceptual plans in Annex II, the Wanatango Falls GS will draw water from the bottom of the water column. Should some degree of thermal stratification and warming of water temperatures occur, these can be expected to be at least partially offset by the release of deeper, cooler water from the headpond into the downstream channel.

Thus, it is apparent from the small increases in open water area, the short residence times and the absence of stratification resulting from the proposed waterpower projects, that the propensity for water temperature changes in the Frederick House River is low. Monitoring of water temperatures is proposed in order to confirm the above assessment; details of the monitoring plan are presented in Table 37 in Section 13.2 (Post-Construction/Operation Monitoring).

Potential Water Quality Impact During Operations

Mercury

The operation of the Wanatango Falls GS has the potential to increase mercury concentrations within the Project Area. Any flooding of land has the potential to effect the concentrations of available mercury in surface water, including the bioavailable form – methyl mercury.

The headpond inundation can lead to increases in bioaccumulation of methyl mercury in fish tissue for resident sport fish. The MOE's fish consumption advisories for Ontario water bodies ("Guide to Eating Ontario Sport Fish," 2013) recommend monthly consumption limits for sport fish. The suggested consumption limits are categorized by fish species, length and receptor sensitivity (i.e. 'general population', or 'sensitive population' such as children or women of child bearing age). The suggested consumption limits are based on fish tissue concentrations for various substances with methyl mercury being the predominant substance of interest due to its pervasive occurrence in the natural environment. Methyl mercury in fish tissue is the primary factor in most consumption advisories in northern areas. The methyl mercury threshold limits underlying the suggested consumption advisories are described in Section 2.8.2.

The median mercury concentrations in the existing Walleye populations chosen to represent commonly consumed sport fish are slightly above the 'monthly consumption' restriction for Sensitive Population, and even the highest concentrations are below the 'no consumption' restriction for Sensitive Population.

Headpond inundation is expected to result in an increase in methyl mercury concentrations in fish tissue with a gradual return to baseline levels over a period of 5 – 20 years. Table 31 below shows measured pre-construction and operational values from four headponds in northern Ontario referenced as headpond "A", "B", "C" and "D" (confidential agency source, February 19, 2014). Information for Wanatango Falls has been included for comparison.

Table 31: Fish Tissue Methyl Mercury Reference Data

	Unit	A	B	C	D	Wanatango Falls
Headpond Size	ha	65	401	1769	519	73
New Inundation	ha	39	172	1380	176	16
New Inundation	%	60%	43%	78%	34%	22%
Flow	km ³ /yr	1.0	4.4	1.0	1.2	1.0
40 cm Walleye Hg – Pre	ug/g	0.7	0.8	0.5	0.4	0.3
40 cm Walleye Hg – Post	ug/g	1.5	1.5	2.2	0.3	0.3-0.5*
Walleye Increase	%	114%	85%	320%	-25%	
55 cm Pike – Pre	ug/g	0.6	0.7	0.1	0.3	
55 cm Pike – Post	ug/g	0.9	0.4	1.5	0.3	
Pike Increase	%	50%	-40%	1400%	0%	
Time Inundated	Yrs.	17	7	4	5	

Note * denotes the range of values that are projected based on a straight line extrapolation of mercury values from Site D and Site B, which have similar new inundation percentage to the Project.

As shown in Table 31, the measured pre-construction and operational values from the reference sites range widely, from a decrease in methyl mercury to a multifold increase. The variances are consistent with significant differences in baseline values and headpond parameters. Literature sources (eg. Ullrich, S.M. et al, 2001) suggest a complex relationship among various factors such as availability of organic material to stimulate methylation, concentration of mercury in the system, anoxic conditions to allow methylation to occur, the portion of watershed and food chain affected by new inundation and the ongoing flushing and attrition of methylated mercury from the system. Thus, the portion of new inundation area is a major factor that impacts the increase of methyl mercury in the headpond.

Compared to the reference sites in the table above, the proposed headpond increase (22%) compares closely to reference sites “D (34%)” and “B (43%)”. After monitoring of the actual mercury increase in fish tissue in these headponds, it was observed that the mercury level was increased within a range from -25% to 85% within 5 to 7 years. Based on these experiences of existing hydro facilities’ operation, it is projected that the potential increase in fish tissue mercury in the proposed Wanatango headpond might be from 0% to 85% with a total concentration from all sources of about 0.3 to 0.5 ug/g.

This projection is considered quite conservative since the proposed Project involves less new inundation than the sites used for comparison (Site D and Site B). Additionally, Xeneca proposes to minimize the risk of increased methylation by removing biomass, trees and large shrubs from the proposed inundation area before initial inundation. Such mitigation was not routinely practiced in the industry 20 to 40 years ago. As well, the proposed Project features a series of mitigation measures described below to help minimize methylation. The following considerations further demonstrate the mercury level would be less impacted compared to the reference sites.

- Headpond Size: the proposed headpond is at the lower size range of the references sites (i.e. small portion of watershed);
- New Inundation: the proposed new inundation (22%) is less than the reference sites D (34%) and B (43%) (i.e. small portion of food chain affected);
- Flushing: the Frederick House River has a flushing flow rate that is similar to the reference projects but in relation to smaller amount of new inundation (i.e. greater flushing and attenuation of methyl mercury from the system over time);
- Length of Exposure: The headpond extends 8.6 km and then there is 1.4 km until the next impassable barrier which is the Frederick House Lake Dam, and only 22% of the total area is new inundation that may cause the potential for methyl mercury generation resulting in less exposure to methyl mercury;

- Biomass removal, rapid daily flushing of the headpond on a daily basis as water is not retained for long periods as part of the operation of this project.

The MOE's fish consumption advisories can be used as a surrogate to assess the potential effect of increased methyl mercury concentrations in fish tissue on human health. If the conservatively projected increase in fish tissue concentrations were to occur, the resulting change to the fish consumption advisories would be affected as follows:

- Under existing conditions, the baseline fish tissue level for the Project area exceeds the monthly consumption advisory level for Sensitive Populations (i.e. children and women of child bearing age) but remains below the no consumption advisory level for Sensitive Population.
- The projected post construction fish tissue mercury levels range from 0.3-0.5 ug/g and hence would remain within the same fish consumption advisory level.

Consultation over the past 4 years did not identify a population group that relies on fish consumption from the Frederick House River as a primary dietary source. Fish consumption appears to be largely recreational and supplemental reducing the potential effect directly related to human health.

In addition to the seasonal monitoring recommended by MOE, downstream post development turbidity, suspended solids, metals and nutrient monitoring will be conducted during peak flows from the facility to establish a worst-case scenario for contaminants related to suspended sediment. During sampling, the discharge conditions at the upstream OPG dam will be noted, as discharge from that facility is likely to strongly influence water quality at Wanatango Falls.

Extensive mitigation has been incorporated in the project design to minimize the potential for increased methyl mercury in fish tissue. Specific aspects include:

- Minimize Organic Material: Tree and shrub vegetation will be removed prior to inundation to minimize the introduction of additional organic for methylation.
- Minimize Anoxic Potential: The headpond is designed to be long and narrow to ensure water circulation and minimize stagnant areas. Water depth has been limited to ensure vertical circulation and minimize oxygen stratification. The Facility operations (see the Operating Plan in Annex I) have been designed to release all water each day to avoid stagnation and related anoxic conditions. Water temperature modeling (Annex IV) has been carried out to ensure that future headpond water temperature will not increase such that dissolved oxygen level is decreased.
- Minimize New Inundation: The area of new inundation has been minimized to limit the percentage of watershed forage area potentially affected by increased methylation. To the extent possible, the headpond uses the existing riverbed and un-vegetated channel bank areas.

- Promote Flushing to Decrease Concentrations: Total headpond size has been kept small in relation to average annual flow rate such any free floating or dissolved methyl mercury is adequately flushed. The Facility operations (Annex I) have been designed such that all water is released every day to ensure continual flushing and minimize settling of particles with methyl mercury.

Extensive monitoring is proposed to identify potential increases in fish tissue methyl mercury levels (see Section 13.2). The results of monitoring programs will be reported such that agencies can issue consumption advisories through the existing consumption advisory program should this become necessary. This will minimize the potential for a human health risk to arise.

7.3.3 Species at Risk and Species of Conservation Concern

A list of significant species (SAR and SCC) potentially present and/or confirmed present in the study area was provided in Table 2 in Section 2.9.5 above. A discussion of the project's potential impacts to these species is provided in the following sections.

Birds – SAR and SCC

Suitable habitat for Common Nighthawk exists in the general landscape around the proposed Wanatango Falls GS, but was not found within the project's ZOI, nor were individuals of this species identified during field investigations. As such, this species is not anticipated to be affected by the proposed development.

Similarly, during field investigations of the areas that will be directly impacted due to the required vegetation clearing (the footprint of built structures and the inundation area), no suitable habitats nor individuals were observed for the following species:

- Peregrine Falcon
- Chimney Swift
- Bobolink
- Olive-Sided Flycatcher
- Short-Eared Owl
- Rusty Blackbird
- Barn Swallow
- Black Tern
- Bank Swallow

The Black Spruce-Pine Conifer forest (B114) community is considered Significant Wildlife Habitat for Canada Warbler. Approximately 0.78 ha of this forest community will be cleared for the construction of the Wanatango Falls GS. An additional 12.45 ha of B114 will be cleared for the inundation area, therefore, resulting in a direct habitat loss of this forest type for Canada

Warbler. However, the area to be cleared is very small in relation to the abundance of this habitat type on the surrounding landscape outside of the study area; in comparison, the study area itself (lands within 120 m of the proposed development activities and inundation area) contains a total of approximately 356 ha of B114 vegetation community. Additionally, construction of the permanent and temporary access roads and upgrades to existing access roads may impact upon Canada Warbler and Eastern Wood-Pewee as tree clearing (3.63 ha) may remove potential nesting habitats for these species. However, these impacts will be mitigated or eliminated wherever possible; the mitigation measures outlined in Section 7.3.5 to minimize impacts on forest birds will also serve to protect significant bird species in the project's ZOI and within the access road corridors.

Bald eagle nesting and foraging habitat was confirmed 8.3 km upstream of the proposed Wanatango Falls GS. Being located close to the upper limit of inundation (which will extend 8.6 km), this habitat is in an area that will not be impacted by vegetation clearing. Although water levels in the river adjacent to this habitat may rise up to 1 m above existing water levels, the increase in water levels will not impact the nesting habitat as the latter is located 30 m up an embankment from the shoreline. Similarly, eagle foraging and perching habitat will not be impacted by operations at the Wanatango Falls GS, as the increase in water levels will remain within the existing channel and will not result in the loss of any perch trees along the shoreline in the vicinity of the nesting habitat.

There is potential for disturbance to Bald Eagle nesting sites during clearing of right-of-ways and construction. If any Bald Eagle nests are discovered near any proposed development, MNR will be notified and the appropriate guidelines will be followed. The standard operation prescription for bald eagle nest 'areas of concern' is prescribed in OMNR's 2010 Forest Management Guide for Conserving Biodiversity. New roads, landings and aggregate pits are not permitted within 200 m of primary nests and reasonable efforts will be made to avoid locating them within 400 m of primary nests.

Bats

The B114 forest community may also provide seasonal habitat for Northern Myotis and Little Brown Myotis, which are designated as Endangered species under the *ESA* (2007). The removal of 12.45 ha of B114 forest within the proposed inundation area may impact these two bat species through loss of breeding season habitat. Vegetation removal is recommended to occur outside of the timing window when bats utilize maternity roosts (April 30 - September 1). It is expected that occasional cavity tree removal may occur in the areas identified for vegetation removal, but this is expected to have a minor impact on local bat populations based on the extensive amount of wooded habitat surrounding the study area. It is also recommended that pre-construction cavity tree surveys be completed to determine an estimate of the number of cavity trees within the areas proposed to be cleared for construction and inundation.

For mitigation of potential losses, an estimation of the number of cavity trees should be assessed prior to construction. This will assist with development of an appropriate Construction Mitigation Plan as required under the *Endangered Species Act*. If tree removal must occur during the critical time period of April 30 - September 1, potential bat maternity roost habitat (cavity trees) will be identified and exit surveys will be conducted before removal occurs to confirm no active roosts are present. Exit surveys will follow the *Bats and Bat Habitats: Guidelines for Wind Power Projects* authored by the MNR (2011), which stipulate that a 1.5-hour visual survey should be conducted to confirm use. This survey will be completed within 24 hours of the tree being removed to limit the possibility of a roost establishing after the survey has been completed.

Within the 3.63 ha and 0.75 ha of forest to be cleared for the road corridors and the construction areas, respectively, an estimated 22 snag trees will be removed (assuming an average density of 5 roost trees/ha). This could be reduced by avoiding portions of those stands with clumps of snag trees or reducing the right-of-way width when snags are encountered. The impact of removing about 22 snag trees is unlikely to be significant on *Myotis* populations for the same reasons indicated above.

Little Brown *Myotis* and Northern *Myotis* commonly forage along roads and power lines. Traffic noise and forest canopy gaps created by roads sometimes cause foraging bats to alter travel routes, and thus increased road density presumably alters foraging area. The severity of this effect is not known; however, particularly in areas with relatively low road density such as the Wanatango Falls study area, no significant negative impacts are anticipated on foraging habitat for bats. Given the expected low traffic noise (particularly at night) and relatively high proportion of forest cover in the surrounding landscape, the impacts of the road on bat populations will probably be insignificant.

Mitigations for impacts to bat species will include maintaining clumps of snag trees, avoidance of road placement through older hardwood and mixedwood stands, and minimizing road right-of-way width to the minimum width practical. Clearing of the road right-of-way will be conducted during the non-roosting season (not May 1-August 31st, which is the roosting season), and traffic restrictions will minimize traffic noise. Where possible, an interlinking canopy will be maintained over roads.

Woodland Caribou

Despite a lack of recent records and suitable habitat, impacts on Woodland Caribou may need to be addressed at the range level. MNR will be consulted about appropriate mitigation actions. Measures may include:

- Minimizing the project footprint
- Minimizing habitat changes and fragmentation

- Minimize the density of linear features by using existing road corridors
- Minimizing habitat disturbance and sensory disturbance near High Use Areas
- Minimizing activities that increase the risk of caribou mortality (i.e. vehicle collisions, hunting)

Significant Fish Species

As outlined in Section 2.9.5, two fish Species of Conservation Concern are known to exist in the general project area: Lake Sturgeon (Southern Hudson Bay – James Bay) and Goldeye. The construction and operation of the proposed Wanatango Falls GS are anticipated to result in impacts to fish spawning and fish passage. As the potential impacts and proposed mitigation measures would apply to various fish species, and not exclusively Lake Sturgeon and Goldeye, these are discussed in Section 7.3.6 below.

7.3.4 Terrestrial Habitat – Potential Impacts During Construction

Potential impacts to terrestrial habitat and species are largely associated with the permanent removal of vegetation in the footprint of the built structures associated with the Wanatango Falls GS, as well as the inundation of terrestrial land during the creation of the 8.6 km headpond. Additional temporary disturbances are anticipated during construction to accommodate temporary laydown areas and stockpile areas. While most impacts associated with the operation phase of development will occur within aquatic habitats (see Section 7.3.7), daily peaking activities are also anticipated to impact shoreline habitat due to frequent fluctuations in water levels, and will be discussed in Section 7.3.6.

The following subsections provide a summary of the potential impacts that are anticipated to occur within terrestrial areas. The reader is directed to Annex III of this ER for the original technical reports from which the information below is derived.

Footprint of Permanent Built Structures

The construction of the permanent built structures associated with the Wanatango Falls GS (powerhouse, embankment dams, headrace canal, etc., as presented in Section 3.2) will result in direct, permanent impacts to terrestrial habitat in the form of localized clearing and grubbing of existing riparian vegetation. The total area to be impacted will depend on whether or not fish passage is to be provided at the project site: under the preferred, “no fishway option”, approximately 5,400 m² of terrestrial vegetation will be lost as a direct result of the construction the Wanatango Falls GS. Should the alternate option (“fishway option”) be pursued, the fish passage structure will be constructed on the island at the project site and require the removal of an additional 2,400 m² of vegetation. The resulting loss of terrestrial vegetation under the two options is summarized in Table 32 below.

Table 32: Terrestrial footprint of the built structures of the Wanatango Falls GS

Structure	Approx. terrestrial footprint (fishway option)	Approx. terrestrial footprint (no fishway option)
Headrace	1,500 m ²	1,500 m ²
Embankment dams	2,700 m ²	2,700 m ²
Powerhouse, powerhouse yard and substation	1,200 m ²	1,200 m ²
Fishway	2,400 m ²	N/A
Total terrestrial area	7,800 m²	5,400 m²

Under both the “fishway option” and the “no fishway option”, the forest community that will be affected is B114 Black Spruce-Pine Conifer. As well, 0.09 ha of balsam fir dominated forest on clay soil (Ecosite B085TtD) will be permanently lost due to the installation of the powerhouse yard and substation. This is not considered a substantial impact as forests of these compositions; structure and age are relatively common at a landscape level. Therefore, the total loss of 5.4 – 7.8 ha of this vegetation community (mostly B114 Black Spruce-Pine Conifer plus 0.09 ha of balsam fir dominated forest (Ecosite B085TtD)) is anticipated to have a low residual effect.

Inundation Area

The creation of the 8.6 km long inundation area will require the removal of all vegetation within its footprint. The following four ELC communities will be impacted; the estimated areas to be flooded are included in parentheses:

- B114 Black Spruce-Pine Conifer-Moist, Fine (12.45 ha);
- B134S Mineral Thicket Swamp (2.22 ha);
- B142N Mineral Meadow Marsh (0.28 ha); and
- B148N Mineral Shallow Marsh (0.37 ha).

A total of 15.32 ha of terrestrial habitats will be lost due to their conversion from terrestrial to aquatic habitat. Riparian vegetation is predicted to re-establish within the inundation area where water level fluctuations are less than 25 cm. ROR operations in late June/early July will provide more stable conditions to allow for the establishment of emergent plant species during the growing season. Post construction monitoring will document wildlife utilization of the inundated areas and colonization of the new shorelines by vegetation. Riparian vegetation may re-establish in at least three of the four identified wetlands within the upstream zone of inundation, at the confluence of several tributaries and the Frederick House River as well as within at least two additional areas located along the river periphery. The inundated Mineral Thicket Swamp may also provide Northern Pike spawning habitat post dam construction.

Temporary Construction Areas

Creation of the temporary laydown areas and stockpile areas will require the removal of 0.63 ha of mature trembling aspen dominated forest on clay soil (Ecosite B088TtD) and 0.12 ha of balsam fir dominated forest on clay soil (Ecosite B085TtD), representing a total area of 0.75 ha that will be impacted. However, as the laydown and construction areas are only required for the construction phase of development, these areas will be temporarily impacted and then rehabilitated after construction.

Road Construction

As outlined in Section 3.3, access to the Wanatango Falls GS project site will require the construction of 150 m of new road, the construction of 406 m of temporary roads, and upgrades to 1,743 m of existing roads. A total corridor width of 20 m will be required, necessitating the removal of 3.63 ha of vegetation, predominantly mature trembling aspen dominated forest on clay soil (Ecosite B 088TtD), as well as a narrow band of young balsam fir and speckled alder. Following construction, approximately 0.82 ha of the affected area will be rehabilitated.

The existing road on the west side of the river, proposed to be upgraded to a permanent access road, transects a wetland. When evaluated against the MNR's Northern Ontario Wetland Evaluation System, it was determined that it is potentially provincially significant. This wetland covers 36 ha of swamp and marsh that drains from a beaver dam. To minimize impacts on the wetland due to the road upgrade, the existing ditch channels should be maintained, to allow for proper drainage. To minimize impacts related to loss of vegetation in the new road and power corridor area, low vegetation should be maintained in the power line right of way. To avoid compaction and rutting of peat during construction, winter construction on frozen ground will minimize damage along with use of appropriate equipment. Rehabilitation should avoid the use of invasive plant species.

Power Line Construction

The proposed 43.6 km long power line, which will travel south from the Wanatango Falls GS to connect to the Hoyle DS, will intersect and/or skirt several wetlands that have the potential to be provincially significant. Approximately 11.7 km of the power lines' total length will intersect/skirt potential provincially significant wetlands; of this, 9.2 km will run alongside existing roads that are already intersecting/skirting these wetlands, and 2.5 km will represent 'new' corridor (i.e. with no existing road) (see the "Wetlands Rapid Assessment" by Northern Bioscience, 2013, in Annex III). For those sections of power line paralleling existing roads, no significant alterations to groundwater or surface water movement are expected to occur given the relatively small area involved and the fact that drainage patterns are already disrupted by existing ditches and fill. No highly sensitive wetland types such as rich, patterned fens are known to occur along any of the proposed routes. To mitigate general impacts, the power line will be placed on the side of the

road opposite the wetland whenever possible. To avoid diversion into or out of the wetland, existing ditching will be maintained and will not be made any deeper or wider. To avoid the loss of vegetation, low vegetation will be restored and maintained on the power line right of way. Trees will be replanted where feasible, especially black spruce and tamarack. Equipment and techniques to avoid compaction and rutting of peat will be used and winter construction on frozen ground will minimize soil damage. Rehabilitation will avoid the use of invasive plant species such as reed canary grass.

Mitigation Measures

As the removal of terrestrial vegetation during construction cannot be avoided, various mitigation measures and construction best management practices will be applied in order to minimize the magnitude of the potential impacts and ensure that these impacts will not be significant. Impact on bird species nesting within the project footprint areas will be minimized by conducting vegetation clearing outside the peak bird nesting season of May 16-July 31st. If this is not possible, a breeding bird survey will be conducted to determine if any nests are present and setbacks around nest locations will be established. During construction, noise and vehicular traffic may impact upon bird species nesting or adjacent to the proposed power corridor route. Increased road kill of bird species may occur due to the traffic on site. The following mitigations will attempt to lessen the severity of these impacts:

- Where possible, clearing of trees and vegetation in the ROW is to occur outside the migratory breeding bird seasons (May 16 to July 31);
- A limited number of new roads are proposed to assist in construction;
- Minimizing road corridor width to 20 m;
- Speed limits of 50 km/hour will be applied at dusk and dawn (one hour at sunset and one hour at sunrise) on new roads to prevent collisions with birds and other wildlife during the nesting season (May 16 to July 31);
- All workers will be required to comply with provincial hunting regulations, which prohibit hunting, possessing a loaded firearm or discharging a firearm within eight metres from the edge of the travelled portion of a road right of way;
- All workers will be given an orientation on environmental management including a focus on non-harassment of wildlife;
- All waste and foods sources are to be properly maintained so as to minimize supplemental feeding (e.g., American Crows, Common Raven, Bald Eagle, gulls);
- Revegetating temporary roads and construction areas after construction.

Within the first approximately 500 m of the new inundation area, where the increase in water depth will be the most pronounced, any existing Otter den sites within this area will be flooded out. The proposed inundation may also affect the resident Otter's aquatic prey populations including Molluscs, Fish and Frogs, resulting in the abandonment of Otter den sites and/or force

them to travel across land where they are more exposed to predation. To mitigate this potential effect, inundation during winter or ice-over period should be avoided as this could cause direct mortality by drowning mammals in their dens. Construction sequencing and operations planning will be used to mitigate potential impacts to aquatic mammal species and post-construction monitoring is proposed to confirm that Otters continue to utilize the river reach upstream of the proposed development.

7.3.5 Terrestrial Habitat and Species – Potential Impacts During Operations

Following the completion of all construction activities, including the initial filling of the headpond, potential impacts on terrestrial habitat and species due to project operation will largely be limited to impacts on shoreline vegetation due to daily fluctuations in water levels.

Potential Impacts Upstream of the Wanatango Falls GS

As noted in Section 5.5, water levels in the headpond will vary between 258.0 masl and 259.0 masl, for a maximum daily fluctuation of 1 m at the most downstream point of the headpond (i.e. immediately upstream of the dam). Most riparian and emergent plants will not tolerate daily water level fluctuations exceeding 25 cm, and modified run-of-river operations will likely inhibit the establishment of shoreline vegetation below 259.0 masl in areas where water levels vary by more than 25 cm on a daily basis. A band of bare substrate will likely develop along the periphery of the headpond in such areas. However, in the upstream sections of the headpond, where the daily fluctuation in water levels becomes increasingly attenuated, some emergent or wetland vegetation species may re-establish in areas where daily fluctuations fall below 25 cm.

Impacts to otter denning upstream of the Wanatango Falls GS are anticipated to be minimal, as the proposed fluctuation in water levels are much less than existing seasonal water level fluctuations, and it is anticipated that denning otters will establish new den sites according to the new high water mark (259.0 masl following project construction). Post-construction monitoring of otter denning will be conducted, as detailed in Section 13.2 below.

Potential Impacts Downstream of the Wanatango Falls GS

In a similar manner to potential impacts upstream, the potential impacts to terrestrial habitat and species downstream of the Wanatango Falls GS are anticipated to occur largely for emergent and riparian vegetation along the riverbanks, and to hydrologically-connected wetlands. The magnitude of the potential impacts will be limited by the proposed operating restriction to limit water level fluctuations to within ± 10 cm just upstream of Neeland's Rapids (approximately 24 km downstream of the proposed Wanatango Falls GS) (recall Section 5.7).

The three closest hydrologically-connected wetlands downstream of the Wanatango Falls GS are located approximately 1.1 km, 2.7 km and 4.3 km downstream. Based on hydraulic modelling of water levels during facility operations, the largest fluctuations in water levels at these three wetlands are anticipated to occur in August, during which a maximum fluctuation of 47 cm, 33 cm and 32 cm, respectively, will occur in the Frederick House River adjacent to these wetlands. A loss of emergent and shoreline vegetation are anticipated in areas of the wetlands experiencing a daily fluctuation in water levels exceeding 25 cm. To mitigate these effects, Xeneca proposes to maintain limited turbine capacity of 20 m³/s in August to maintain the water level compliance commitment at Neeland's Rapids. ROR flows during spring and early summer will serve to relieve stress on emergent vegetation during the growing season.

While otter denning is identified as Significant Wildlife Habitat in the downstream reaches of the Frederick House River below the Wanatango Falls GS, no impacts to otter denning are anticipated in these areas. The daily fluctuations in water levels resulting from operations at the Wanatango Falls GS will be within the extent of larger seasonal fluctuations. Additionally, otter denning currently exist under the existing water level fluctuation regime associated with operations at the Frederick House Lake Dam (approximately 10 km upstream of Wanatango Falls GS).

Impacts to terrestrial habitat and species will be further alleviated when the facility operates in purely run-of-river mode during the spring spawning season, as flows and levels in the river and the hydrologically-connected wetlands will match those that would occur in the absence of the project.

7.3.6 Aquatic Habitat and Species

The proposed Wanatango Falls GS will result in varying levels of impact to aquatic habitats and species, both during the construction and operation phases of development. Where possible, mitigation measures and offsetting measures are proposed in order to bring the level of impact down to an acceptable level.

The potential impacts to aquatic habitat and species and the proposed mitigation and offsetting measures are assessed in detail in the Natural Environment Characterization and Impact Assessment Report (NRSI, 2014) and the addendum (NRSI, 2014) in Annex III of this ER. A summary of the findings are presented below.

Potential Construction-Related Impacts – Permanent Built Structures

Some of the physical structures associated with the Wanatango Falls GS will be built on the river bed of the Frederick House River. The in-water structures will result in the permanent loss of aquatic habitat due to the permanent covering and infilling of the river channel within the

structures' footprints. The footprints of the proposed in-water structures and the resulting loss of aquatic habitat are approximately:

- Control Dam with Obermeyer gate (east channel): 200 m²
- Control Dam with Obermeyer gate (west channel): 200 m²
- Tailrace: 500 m²

The in-water footprints listed above will be the same whether or not a fishway is installed at the Wanatango Falls GS, as the fishway would be constructed on terrestrial land.

The construction of all in-water structures must be conducted in isolation from the river flow through the use of cofferdams. The dewatering and isolation of the in-water construction areas are anticipated to result in temporary disturbance to fish habitat. In order to offset potential impacts during construction, construction best management practices will be implemented, such as:

- Avoiding carrying out in-water works during spawning and egg incubation periods for spring-spawning fish species (typically April 1 to July 15 for Walleye and Lake Strugeon). Specific timing windows should be established in agreement with local MNR as part of the permitting process;
- Retain qualified professionals, under permit from the MNR, to conduct a fish salvage operation in the isolated work areas;
- Minimize the duration of all in-water works, etc.

A significant spawning site is also known to exist at the base of the falls, where the tailrace of the Wanatango Falls GS is to be located. The final design of the tailrace will ensure that the value of this habitat is preserved.

The construction of the tailrace and control dams will require the river bed to be restructured to form smooth, re-graded concrete or bedrock channels, and will therefore result in the permanent alteration or loss of the natural features (existing natural substrates, aquatic vegetation, riffles, chutes, pools, etc.). These alterations and losses will by extension impact the function and productivity of these habitats.

The proposed location for the tailrace currently contains spawning habitat, in which spawning activity by Goldeye and Shorthead Redhorse was confirmed during field investigations in 2010 – 2012. The construction of the tailrace will therefore result in the loss of 500 m² of this habitat, although the spawning habitat outside of the 500 m² footprint will nonetheless remain unchanged following construction: based on measurements made during site visits, it is estimated that, after project construction, 380 m² of the existing spawning habitat will remain at low flows, and 1,020 m² of habitat will remain at high flows. The loss of 500 m² of spawning habitat is a major impact, and will require offsetting measures through the creation and installation of new

habitat (to be discussed in Section 9). Possibilities for offsetting include resurfacing the tailrace with appropriate substrate and providing appropriate flows to support spawning activity. Effective offsetting measures will be developed in consultation with DFO during the detailed design phase of development.

The construction of the two control dams will result in the loss of pool habitat and the alteration of the pool and riffle sequence downstream of these structures. The pool and riffle sequence is not identified as spawning habitat, so its alteration will have a relatively low impact on fish habitat in the ZOI. Rather, the pool and riffle sequence may be of greater importance to benthic invertebrate production, and its removal may result in an alteration or loss of productivity for the benthic invertebrate community.

Impacts to stream crossings during road construction can be mitigated through following standards, guidelines and best management practices described in MNR's Stand and Site Guide. Although the affected streams are not subject to the provisions of the new *Navigation Protection Act*, the technical requirements outlined in this Act and the former *Navigable Waters Protection Act* may provide additional suitable guidelines.

Potential Construction-Related Impacts – Inundation Area

The creation of the proposed headpond for the Wanatango Falls GS will result in a backwater effect extending upstream approximately 8.6 km upstream, increasing water depths and inundating adjacent riparian habitats. In approximately the first 500 m upstream of the dam, water levels will become approximately 4.0 m higher compared to existing conditions. In the remainder of the headpond, the relative increase in water levels will be more limited, rising approximately 1.0 m above existing levels.

As a result of the creation of an 8.6 km-long headpond, six (6) fast water habitats within the inundation area will be altered due to an increase in depth and wetted width and associated reductions in velocity. Five of the habitats will cease to function as fastwater habitats as water levels will increase by almost 4 m. Two fastwater habitats located 7.5 km and 8.1 km upstream of the Wanatango Falls GS will experience decreases in flow velocity and increases in wetted perimeter and depth; however, due to their distance from the dam site, these effects are not anticipated to be as significant as those experienced in the downstream sections of the headpond.

Based on the modeled (HEC-RAS) post-construction flow conditions within the proposed inundation area, and compared against the preferred depths and velocities for Walleye and Lake Sturgeon spawning, it is anticipated that the functionality of spawning habitat located approximately 500 m upstream of the Wanatango Falls GS dam will be altered as a result of the creation of the headpond. Other spawning habitat, located 7.5 km and 8.1 km upstream of the dam, will retain their functionality, due to the limited decrease in velocity and increase in depth following inundation. Overall, a total of approximately 1,050 m² of functional fastwater

spawning habitat will be altered as a result of the creation of the headpond, and will require offsetting measures (to be discussed in Section 9).

Despite the loss of functionality of 1,050 m² of fastwater spawning habitat, impacts to the Walleye and Lake Sturgeon populations upstream of the Wanatango Falls GS are anticipated to be minor, as there will be two important fast water features that will remain unchanged. The fast water feature 8.5 km upstream of the Wanatango Falls GS contains important spawning habitat, in which spawning activity by Walleye, Sauger and Shorthead Redhorse was confirmed. Hydraulic modelling results indicate that, although located within the inundation area, the changes in flow conditions and substrate will be very minor, and will not alter the functionality of the feature. Another 17,500 m² feature, located immediately downstream of the existing Frederick House Lake Dam and outside of the ZOI for the Wanatango Falls GS is characterized by flow conditions and substrate indicative of suitable spawning habitat for Walleye, Sauger, Lake Sturgeon and Shorthead Redhorse (although this could not be confirmed as access to the river immediately below the dam is prohibited). This feature will remain entirely unchanged by the creation of the headpond at the Wanatango Falls GS.

Project construction will result in impacts to walleye foraging habitat. Suitable Walleye foraging habitat upstream of the headpond will be unaltered by inundation; inundation will create additional nearshore foraging habitats. Downstream foraging habitat suitability will remain largely unchanged post dam construction as it will remain restricted to the 2m³/s channel where the majority of foraging currently occurs.

Inundation will result in impacts to tributary habitats. Inundation and daily water level fluctuations are expected to extend between 75 to 150 m into the tributaries in the headpond. Beyond this distance, tributary habitats will be unaffected and will continue to function as they currently do. Tributaries with higher gradients will be affected over a shorter distance. Monitoring of the small bodied fish community within the tributaries is recommended to ensure that a significant shift in species assemblages is not occurring.

Hydraulic modelling was also used to predict the potential changes to benthic invertebrate habitat as a result of inundation of the fast water habitats. At flows of 1 m³/s, representative of the periods when the Frederick House Lake Dam is shut down and approximately 1 m³/s is leaking through the stop logs, an estimated 3,185 m² of fastwater benthic invertebrate habitat is available under existing, pre-construction conditions. Following the creation of the headpond for the Wanatango Falls GS, it is anticipated that 2,645 m² of that total will no longer function as fast water habitat under flows of 1 m³/s. These habitats are predicted to become deep water habitats with very low velocity, and the invertebrate community will see a shift from a fastwater community to one more indicative of a lacustrine environment.

It is anticipated that the construction of offsetting habitat for Walleye and Lake Sturgeon spawning will also provide effective fast water benthic invertebrate production habitat. As will be discussed in Section 9, approximately 1,550 m² of offsetting habitat will be created to compensate for the loss of 500 m² of spawning habitat in the footprint of the Wanatango Falls GS tailrace, as well as the 1,050 m² in the headpond that will lose its functionality. The loss of fastwater benthic habitat will also be partially offset by the creation of the headpond, which will result in the conversion of 12.45 ha of terrestrial habitat into aquatic habitat, effectively increasing the amount of available wetted habitat for benthic invertebrate production. If constructed, the fishway will also convert 2,400 m² of terrestrial habitat into aquatic habitat that may also provide additional benthic invertebrate production habitat. Overall, significant impacts to the benthic invertebrate community within the proposed headpond are not anticipated due to the increase in available wetted habitat and the creation of offsetting habitat. Further need for benthic invertebrate production habitat offsetting will be discussed with MNR and DFO.

Potential Operation-Related Impacts

Following the initial filling of the headpond and the resulting alteration to fastwater habitat in the headpond, additional impacts to aquatic habitat as a result of operations are expected to occur predominantly downstream of the Wanatango Falls GS. In the absence of mitigation measures, daily fluctuations in flows could negatively impact fish spawning by dewatering and desiccating eggs; similarly, larval and young-of-year fish may be impacted by frequent water level fluctuations if they are left stranded for long periods of time following a sudden drop in water levels.

The loss of aquatic vegetation from water level fluctuations may result in potential impacts to baitfish spawning and nursery areas. Riparian vegetation is predicted to re-establish within the inundation area where water level fluctuations are less than 25 cm. ROR operations in late June/early July will provide more stable conditions to allow for the establishment of emergent plant species during the growing season. Larval drift and nursery habitat for baitfish are not expected to be impacted as the ROR operations proposed for Lake Sturgeon and Walleye will not result in downstream water level fluctuations. Post construction monitoring will document wildlife utilization of the inundated areas and colonization of the new shorelines by vegetation. Vegetated areas are expected to re-establish where daily water level fluctuations are less than 25 cm and will continue to provide important nursery habitat for all fish species after construction of the Wanatango GS.

In order to mitigate potential operation-related impacts on fish spawning, the Wanatango Falls GS will revert to run-of-river operations to accommodate Walleye and Lake Sturgeon spawning, egg incubation and larval drift. The start of the operating restrictions will be determined according to water temperature triggers, at which active spawning by Walleye and Lake Sturgeon are known to occur. When the Wanatango Falls GS returns to modified run-of-river operations, it will do so with a more limited daily fluctuation (a maximum range of 15 m³/s) and no

intermittent operations (i.e. the facility will not shut down at night) in order to protect the drift of larval Lake Sturgeon. The proposed operating restrictions are presented in the Operating Plan (Annex I), and are summarized in Tables 33 and 34 below.

Table 33: Operating Restrictions for Walleye Spawning

Walleye Life Stage	Water Temperature / Timing	Temperature / Cumulative Time Trigger	Mode of Operation	Objective
Beginning of Walleye staging and spawning	4°C	4°C	Begin run-of-river	Ensure staging is not affected by operations.
Beginning of active Walleye spawning	6°C	-	Continue run-of-river	Ensure spawning is not affected by operations.
End of active Walleye spawning, ongoing egg incubation	12°C	-	Continue run-of-river	Ensure eggs are not dewatered by operations.
Walleye egg incubation time from end of spawning until hatch	Allow 18 days after spawning	-	Continue run-of-river	Ensure eggs are not dewatered by operations.
Hatch, yolk sac absorption and continued larval development until fry are free swimming	Allow additional 15 days after hatch	-	Continue run-of-river	Ensure recently hatched larvae are not stranded due to operations.
Fry disperse into open water	-	33 days after 12°C is reached	End run-of-river, begin normal summer operations	Allow transition to other operations once fry have dispersed from the spawning grounds.

Table 34: Operating Restrictions for Lake Sturgeon Spawning

Lake Sturgeon Life Stage	Water Temperature / Timing	Temperature / Cumulative Time Trigger	Mode of Operation	Objective
Beginning of Lake Sturgeon spawning	8°C	8°C	Begin run-of-river	Ensure spawning is not affected by operations.
Beginning of active Lake Sturgeon spawning	11°C	-	Continue run-of-river	Ensure spawning is not affected by operations.
End of active Lake Sturgeon spawning, ongoing egg incubation	18°C	-	Continue run-of-river	Ensure eggs are not dewatered by operations.
Lake Sturgeon egg incubation from end of spawning until hatch	Allow 14 days after spawning, or when water temperature reaches 20°C	-	Continue run-of-river	Ensure eggs are not dewatered by operations.
Hatch, yolk sac absorption and continued larval development	Allow additional 18 days after hatch	-	Continue run-of-river	Ensure recently hatched larvae are not stranded due to operations.
Beginning of Lake Sturgeon larval drift	-	32 days after 18°C is reached, or 18 days after 20°C is reached	Begin modified operations with a maximum daily range of 15 m ³ /s and no intermittent operations	Facilitate lake sturgeon larval drift.
Lake Sturgeon larval drift	Allow 21 days for larval drift	-	Continue the modified operations with a maximum daily range of 15 m ³ /s and no intermittent operations	Facilitate lake sturgeon larval drift.
End of Lake Sturgeon larval drift	-	56 days after 18°C is reached, or 39 days after 20°C is reached	End special operating restrictions for Lake Sturgeon larval drift, begin normal summer operations.	Allow normal summer operations once ample time has been given for drift in the downstream zone of influence.

Fish Stranding

During field investigations at Zevery's Rapids (approximately 500 m downstream of the Wanatango Falls GS location), fish stranding was confirmed to be occurring at these rapids due to the rapidly varying outflows from the Frederick House Lake Dam. Stranding is expected to continue at Zevery's Rapids following the construction of the Wanatango Falls GS, possibly with increased frequency when the GS is operating in modified run-of-river mode.

As a mitigation measure against increased stranding at Zevery's Rapids, a pathway will be notched from the large pool at the rapids where stranding is known to occur, in order to provide fish with a means of escape. Monitoring will be conducted to verify that this mitigation measure is functioning as intended, and that further stranding is not occurring.

There are no known cases of fish stranding at Neeland's Rapids. Xeneca will nonetheless monitor the rapids during the first year of intermittent operations in order to verify whether isolated pools form during operations, and whether fish become stranded in the pools. Should fish stranding be confirmed, a potential mitigation measure that may be applied are habitat adjustments at problem areas (in a similar manner to the proposed mitigation measure at Zevery's Rapids).

Fish Mortality due to Blasting

Blasting during construction has the potential of causing mortality to fish populations. To mitigate these potential effects, blasting will follow the process outlined in Guidelines for Use of Explosives In or Near Canadian Fisheries Waters. Fish will be removed from the area prior to blasting, and the work area will be isolated. Appropriate permits and approvals will be obtained for blasting, and activities will adhere to *Measures to Avoid Causing Harm to Fish and Fish Habitat*. Proper implementation of mitigation measures will ensure that blasting operations minimize any fish mortalities. Residual effects due to blasting are possible, but the geographic extent of impact and duration of impact will be low. This effect is not thought to be significant, after mitigative measures are applied.

Fish Passage

As noted in Section 3.1, the preferred option with regards to fish passage is to *not* incorporate a fish passage structure in the Wanatango Falls GS. The alternate option is to construct a fishway across the island immediately downstream of the dam that will connect the headpond to the upstream limit of the by-pass reach. In the following section, the potential impacts associated with the two fish passage options are discussed.

Fishway option

The alternate (not preferred) option of providing a fishway structure is proposed as a means of maintaining upstream and downstream passage of fish past the proposed Wanatango Falls GS (recall Section 3.2.7 for a description of the proposed fishway; conceptual engineering drawings of the fishway can be viewed in the Construction Management Plan (Annex II) and in Appendix XIV of the Natural Environment Characterization and Impact Assessment Report, in Annex III of this ER).

Under the fishway option, the compensatory flow of 2 m³/s will be provided through the fishway most of the time. Provision of the compensatory flow through the fishway will therefore serve a dual purpose, namely to ensure that minimum environmental flow requirements into the river downstream are met, and to ensure that sufficient flow is passing through the fishway to facilitate upstream and downstream passage. When water levels in the headpond are at the Normal Operating Level of 259.0 masl, which will occur mostly during run-of-river operations, flows into the fishway will be 3.1 m³/s.

As per the fishway design criteria provided by the agencies (see the table, “Agency comments & Xeneca responses – DFO”, in Appendix C), the minimum attraction flow for downstream fish passage should be about 5% of the total flow. With the proposed fishway design and plant operation, flow through the spillway will typically meet the minimum attraction flow requirements for downstream passage. In the spring high flow season, one or both spillways will be lowered to manage the headpond level, in which condition fish can move safely downstream either over the spillway or through the fishway.

Under the fishway option for the Wanatango Falls GS, it is the design intent that most fish will move upstream and downstream via the fishway. Therefore, the effectiveness of the passage structure will be monitored in the post-construction period for this option, and Xeneca is prepared to explore additional mitigation measures to deter fish from the intake area and attract them to the fishway entrance. With all these provisions in place, it can be safely concluded that the majority of fish will safely move downstream of the project headpond area.

Under existing conditions, there is no passage when flows are 2 m³/s or less, and there is limited passage when flows are between 15 - 50 m³/s and greater than 50 m³/s. The majority of passage likely occurs when flows are between 2 - 15 m³/s. Successful upstream fish passage is required to be provided between April 1 - June 31.

The estimated frequencies of flows through the proposed fishway are as follow:

- The proposed fishway will allow for passage when flows are less than 2 m³/s as ledges within the bypass will be modified. This will occur 27% of the time.

- When flows are between 2 - 15 m³/s, fish passage in the fishway will provide improved passage compared to existing conditions due to modifications in the bypass. This will occur 17% of the time.
- When flows are between 15 - 50 m³/s, and when they exceed 50 m³/s, limited passage will occur in the proposed fishway. This would occur 42% and 14% of the time, respectively.
- The average flow within the bypass reach is approximately 20 m³/s and the proposed fishway will have a flow of 2 m³/s for the majority of the day.

The fishway area will not have permanent access after the completion of construction. Minor maintenance work on the fishway can be carried out manually. If major maintenance work is required on the fishway, equipment can be transported using a temporary bridge or barge.

It is anticipated that fish will need to use their burst swimming abilities in order to ascend the fishway; however, the fishway will incorporate several resting pools to facilitate the ascent. Downstream fish passage would occur predominantly through the fishway, but also through a 12" straight pipe to be located near the trash racks. At normal operating level, the pipe will discharge 0.2 m³/s with a flow velocity of 2.83 m/s. This velocity is slightly higher than the burst swimming speeds of species such as Walleye, Sauger and Northern Pike, which will help ensure that fish will not attempt to swim back up the pipe only to get stuck or blocked by other fish travelling downstream.

'No fishway' option

Study results of fish passage indicate that Walleye, Sauger, Goldeye and Lake Sturgeon are passing through the proposed location of the Wanatango Falls GS into the upstream reaches of the river. The 'fishway option' detailed above was previously explored in order to mitigate against the fragmentation of fish populations, particularly for Lake Sturgeon. However, studies of existing fish passage structures at other sites indicate that such structures are generally unsuccessful at facilitating the upstream passage of the large-bodied Lake Sturgeon, and the risks associated with downstream passage are generally not minimized. Due to the substantial uncertainty surrounding the effectiveness of fish passage structures for Lake Sturgeon, Xeneca is currently proposing an alternate approach for mitigating impacts associated with fragmentation, namely the capture of Lake Sturgeon upstream of the proposed Wanatango Falls GS through an extensive netting program and their relocation downstream. As only Lake Sturgeon will be subject to this relocation program, the construction of the Wanatango Falls GS without a fish passage structure will impede the upstream movement of the other species (Walleye, Sauger and Goldeye) and result in fragmentation of their populations.

As Walleye and Sauger are migratory species with extensive home ranges, the construction of the Wanatango Falls GS without the provision of fish passage will fragment the populations of these two species into two distinct subpopulations within the Frederick House River. However, as

Walleye and Sauger are prevalent throughout the river both upstream and downstream of the proposed Wanatango Falls GS site, it is not anticipated that a fragmentation of their populations will adversely impact these species. As an abundance of confirmed Walleye and Sauger spawning habitat is located upstream of the proposed headpond of the Wanatango Falls GS, and will remain unaffected by the proposed development, reproduction will not be impacted. Sufficient foraging habitat will also remain to sustain the upstream populations, and it is anticipated that nursery habitat will re-establish within the Wanatango Falls GS headpond. The downstream populations are not expected to be impacted by the lack of upstream movement, as a large home range and an abundance of spawning, foraging, refuge and nursery habitat will continue to remain downstream. Additionally, under the 'No Fishway' option, fish habitat compensation measures will be focused in the downstream reach, resulting in even greater quantities of spawning habitat being available for Walleye and Sauger populations to exploit.

Goldeye was the most abundant fish species captured during field surveys both upstream and downstream of the proposed Wanatango Falls GS location. As the species is thriving along the river, it is not anticipated that the species will be significantly impacted by fragmentation. The creation of the headpond may also create habitat conditions that are favourable for Goldeye (silty, slow-moving waters), which may benefit the upstream populations.

Based on estimates from the MNR, approximately 14 individual Lake Sturgeon are believed to exist in the upstream reach of the Frederick House River between the Frederick House Lake Dam and Wanatango Falls (compared to the estimated population of 117 Lake Sturgeon in the downstream reach between Wanatango Falls and Highway 11). The construction of the Wanatango Falls GS without the provision of fish passage risks isolating the upstream population of Lake Sturgeon in a 10 km section of river that is believed to be insufficient in meeting the habitat and life cycle requirements of this highly migratory, large-bodied and long-lived species. Additionally, the isolation of Lake Sturgeon upstream of the Wanatango Falls GS may result in this population experiencing negative impacts due to over-crowding, limited food supply, decreased growth rate and increased mortality due to entrainment through the turbines.

The relocation of Lake Sturgeon out of the headpond of the Wanatango Falls GS will help mitigate against population fragmentation, but will also result in upstream spawning habitats being no longer accessible. In order to mitigate against the loss of access to these upstream spawning habitats, offsetting spawning habitat will be created in the tailrace of the Wanatango Falls GS as well as at Zevery's Rapids (to be discussed in Section 9).

Fish Entrainment, Impingement and Turbine Mortality

A discussion of identified potential effects and general mitigation measures in regards to fish entrainment; impingement and turbine mortality is presented in the Natural Environment Characterization and Impact Assessment Report in Annex III, and summarized below.

Entrainment occurs when fish travelling downstream toward a hydro facility are swept into the turbines or other portions of the water control structure. The installation of trash racks at the intake will serve as both a visual and physical deterrent for fish that may approach the intake; however, if entrance velocities at the intake exceed the swimming capabilities of a fish, the latter may get entrained into the turbines, or (if the fish is larger than the trash rack spacing) may become impinged against the trash rack.

The likelihood of a fish being entrained into the turbines or impinged against the trash racks is influenced by the intake velocity, the swimming ability of the species, the individual fish's stage of development (larval, juvenile or adult), as well as disease or the presence of pre-existing injury. Generally, older fish with stronger swimming speeds and who are healthy/uninjured will have a greater likelihood of avoiding entrainment and impingement at a given waterpower site.

As outlined in Table 7 in Section 3.2.5, two options are being explored for the turbine installation at the Wanatango Falls GS: the first option involves the construction of a single, 4-blade Kaplan turbine with a diameter of 2,600 mm and a rotational speed of 200 RPM, whereas the second involves the construction of two, 5-blade turbines, each with a diameter of 2,000 mm and rotational speeds of 228 RPM. For both options, trash racks will have a spacing of 48 mm and an entrance velocity of 0.75 m/s. This entrance velocity is lower than the burst swimming capabilities of adult Northern Pike, Walleye, Sauger and Lake Sturgeon, which will help mitigate against impingement of adults of these species on the trash racks.

Due to their smaller size and weaker swimming abilities, smaller fish will often simply pass through the trash racks and turbines, and out the tailrace channel; however, some fish may suffer turbine mortality during entrainment. Weakened or diseased adults may similarly be at risk of entrainment into the turbines. Mortality can be caused by injury due to mechanical damage, pressure changes, cavitation damage and shearing damage. In an estimate of turbine survival based on fish length, number of turbine blades and runner rotational speed, the one-turbine option for Wanatango Falls GS is predicted to be associated with a turbine survival of 93.3% for 100 mm fish, with the chances of survival decreasing with increasing fish size (down to 82.5% for 500 mm fish). Under the two-turbine option for Wanatango Falls, a turbine survival of 91.1% is predicted for 100 mm fish, decreasing down to 80.3% for 500 mm fish. In both scenarios, the chance of surviving entrainment decreases for increasingly large fish; however, it should also be noted that larger fish are also less likely to pass through the 48 mm trash rack spacing.

Given the above, smaller and juvenile fish, particularly those capable of fitting through the 48 mm trash rack spacing, are more likely than adults to be entrained through the turbines due to their smaller size and weaker swimming speeds. However, the chances of their survival through the turbines are also higher compared to adults. At this time, significant impacts due to entrainment are not anticipated at the Wanatango Falls GS, as the percentages of survival for fish between 100 and 500 mm are greater than 80%.

Monitoring of fish mortality from entrainment and impingement is proposed for the first year of operations, the details of which are discussed in Section 13.2 below.

7.3.7 Erosion and Sedimentation

Rapid changes in shoreline water levels can increase erosion. Where pore water in the soil dissipates too quickly, pore pressure can loosen soil grains and cause loss of stability in the soil structure, thereby enhancing erosion. A geomorphic assessment was conducted in order to determine the potential impacts associated with erosion and sedimentation associated with the proposed Wanatango Falls GS (see the Geomorphic Assessment report in Annex I).

As noted in Section 2.8, the Frederick House River in the general vicinity of the project site is characterized by long stretches of relatively flat water separated by short, steep reaches with exposed bedrock. The creation of the headpond will result in a longer and deeper backwater area upstream of the dam. Compared to existing conditions, the ability of the flow to transport sediment downstream through the proposed headpond will be reduced; this, in combination with potential bank erosion due to fluctuating water levels, may result in siltation in the headpond. However, the accumulated sediment would ultimately be entrained and transported downstream during higher peak flows.

Downstream of the proposed dam, the river is characterized by rapids and a bedrock-lined channel bed that should be able to withstand the moderate flows that will be released by the dam during operations. Some finer material downstream may be eroded, but erosion is not anticipated to be a significant issue downstream, and the overall geomorphology of the channel is not anticipated to change as a result of the project.

7.3.8 Ice Scour

Ice can have potentially serious ecological implications within a riverine system, both upstream and downstream of a hydro facility. Localized ice formation behind a dam, and the resulting backwater flooding and breakup during spring freshet, can have profound effects on bank morphology, substrate erosion, sedimentation, and vegetation removal. Ice dams behind the hydro facility can create narrowing of the river through induction of over-bank full flooding. During freshet flows, break-up ice flowing downstream can scour substrate along erodible banks, increasing particulate loading of the waterway through sediment deposition as flows decrease and/or ice melts, thereby potentially decreasing surface water quality as a result. Spring breakup

of ice can cause shoreline scour and ice jams on outside river bends. Monitoring will be conducted to determine impacts with respect to ice scour.

7.4 IDENTIFIED POTENTIAL SOCIOECONOMIC EFFECTS

For discussion purposes, the socio-cultural-economic identified environmental effects are grouped into the following categories:

- Access
- Navigation
- Public health and Safety
- Civil structures and private property
- Potable water supply
- Area aesthetics
- Noise
- Employment and economy
- Land use/Land tenure
- Mining
- Fishing/Hunting
- Trapping
- Canoeing/Kayaking
- Waste Management
- First Nations
- Archaeological Sites

The assessment of the identified effects and mitigation measures of the project on these categories is provided in the following sections.

7.4.1 Access

The Wanatango Falls GS site can be accessed from Highway 11 via Newmarket Concession Road 5 & 6 or from Highway 11 via Dunn Road. For safety reasons, any direct access by the public to the construction area will be limited. However, once construction is complete, public access to the trails should be restored.

7.4.2 Navigation

The river is not used for commercial navigation but is used for recreational purposes. As mentioned previously, the Frederick House River in proximity to the project site is utilised for primarily for recreational navigation, angling and camping. The construction of a dam across a navigable waterway will require an approval by Transport Canada under the *NPA*.

A boat access point is situated approximately 550 m upstream from the proposed location of the water control structure. Recreational use and enjoyment of the waterway was discussed during the PIC and other stakeholder consultation events. Members of the public in attendance appeared to be satisfied with these management strategies.

Navigation impacts downstream of the site could result during times of modified ROR operation in the Variable Flow Reach. During certain hours, the flows and water depths would be lower than those presently experienced. At other times, flows and water depth would be greater than normal.

Intermittent operation would occur only in periods while flows are low, most of which occur during the winter months when the river is frozen and not navigable. During summer months, the proponent is committed to the provision of minimum flows that would occur when the facility is stopped to mitigate potential restrictions to watercraft.

7.4.3 Public Health, Construction and Operational Safety

Construction of the proposed Wanatango Falls GS project on the Frederick House River poses potential public safety concerns as the area is used for various recreational activities. Primary potential public health and safety risks are generally related to construction traffic, noise and dust levels and restrictive measures for access to the site construction area. Workers safety is the subject to the requirements of the Ontario Ministry of Labour, Occupational Health and Safety Act *O. Reg. 213/91* pertaining to construction sites. This Regulation includes references to other programs including the NBC & OBC's, (National & Ontario Building Codes), WHMIS (Workplace Hazardous Materials Information System) and MSDS (Material Safety Data sheet) and OSHA guidelines (Occupational Safety and Health Association). First aid equipment will be maintained on site throughout the construction period and workers will be trained to deal with emergency situations. Worker safety at the site will be ensured via strict adherence to the Ministry of Labour occupational health and safety regulations pertaining to construction sites. First aid equipment will be maintained on site throughout the construction period and workers will be trained to deal with emergency situations.

Public access to the immediate Wanatango Falls GS project area will be controlled during construction for the safety of the public and project personnel. A combination of fencing and signage will be used to isolate construction areas from available recreational areas and to alert the public of the area about the dangers of construction and location inaccessibility. Further hazards to the public can also be mitigated by restricting public access to 'at risk' areas of the dam through the use of physical safety measures, including fences, railings, safety booms and buoys.

Accidents or malfunctions during the construction phases of the hydroelectric dam or other project related infrastructure could be hazardous to the public. These accidents vary in severity and could include accidental spills, excessive dust levels or dam failure. The primary protective

measure for accidents and equipment malfunctions is the safe design, construction, operation, maintenance, and decommissioning of the Wanatango Falls GS project and ancillary facilities. Furthermore, contingency planning will be implemented to deal with emergency situations (e.g. the Spill Response Plan to deal with accidental spills of materials followed by adequate spill containment and cleanup materials).

Where reasonable, similar practices can be used effectively to either eliminate or mitigate the hazards to the public during the operating (post-construction) stage of the project. Moreover, post-construction monitoring will ensure that all equipment is tested and inspected thoroughly to complete safety requirements. Monitoring would occur routinely on a frequency determined within the review process and may include both visual and comprehensive inspections.

A more comprehensive public health and safety assessment for the Wanatango Falls GS project will occur during the detailed design stage in accordance with the scope, tenants and responsibilities outlined in Xeneca's Waterway Public Safety Management Guideline (WPSMG) (Appendix F). As previously noted, communication of this plan to the public is an element of this process.

Public safety during construction and operation of the project has been identified as a concern. Those effects and management strategies associated with the construction and operation of the facility are summarised in the Proposed Operating Plan & WMP Amendment report found in Annex I and in the Construction Management Plan found in Annex II.

A Fire Preparedness Plan will be prepared for project personnel to adhere to. Petroleum products, fuels, oils and lubricants will comply with industry best practices and regulatory requirements with regard to shipping and handling. Equipment and vehicles will yield the right of way to wildlife, and proper care and caution will be taken when operating vehicles to avoid wildlife collisions. Public access to the immediate project area will be controlled during construction; areas that are under construction will be fenced and signed to prevent access. A site assessment will be developed to identify conditions that may present an environmental or safety concern. Project personnel will monitor weather forecasts and identify storms that may affect the project.

Construction of the proposed Wanatango Falls GS project poses potential public safety concerns as the area is used for various recreational activities. There are ATV trails which allow access to a boat access point upstream of the dam. The construction program will require that specific measures are implemented to ensure public safety in proximity to the construction area. ATV access will be re-established following the construction phase to allow continued access to this area. Temporary alternative routing for ATVs will be provided during construction.

In the operational phase of the project, access to areas near water intakes or around high voltage equipment will need to be restricted for safety reasons, but the remainder of the project area will generally remain accessible to the public. The proponent will hire a qualified third party to assess safety at the project site; additionally, during safety review and audit, the proponent will consult with stakeholders on access and resource use.

Hazard Potential Classification

In a preliminary assessment of the Hazard Potential Classification, it was concluded that a dam failure of the Wanatango Falls GS under flood conditions would have very little impact on water levels at property locations along the Frederick House River. As such, the Hazard Potential Classification for the dam is anticipated to be low, and the preliminary Inflow Design Flood could be taken as the 100-year flood (467 m³/s). The findings of the preliminary assessment can be found in the report, "Preliminary Inflow Design Flood Determination for Ontario North Projects" (Hatch, 2011) in Annex I of this ER.

7.4.4 Civil Structure and Private Property

The following steps were taken in developing the proposed operating parameters for the Project to mitigate impacts to civil structures and private property:

The maximum upstream operating water level was set based on the results of the HEC-RAS Study to specifically avoid infringing on the pre-construction High Water Mark at any civil structure or private property. The proposed operating values were reviewed to ensure that any backwater inundation effect does not exceed the natural High Water Mark in areas where the potential for impact exists. The operating plan parameters proposed in Annex I for daily fluctuation were reviewed to ensure that impact on civil structures would not be a concern. During flood passage, where the natural flow exceeds the maximum turbine capacity, the facility will be operated to minimize flood impacts upstream by operating the spillway, turbine and bypass structures accordingly. The spillway and bypass structures will be sized and designed to provide the amount of flood passage capacity required to meet the objectives of the operating plan. This step will be assessed in more detail in the detailed engineering design stage.

7.4.5 Potable Water Supply

Consideration was given to the effects of the project on surface water quality, including the potential use of the waterway as a potable water supply.

There are potential adverse effects on water quality during construction due to erosion and sedimentation, accidental spills, clearing, backfilling, contouring and excavation. As a result, standard construction and industry best management practices will be maintained during the construction program to prevent accidental spills, control erosion and sedimentation, and to manage any groundwater that must be removed from excavations. Spill prevention and

emergency fuel supply containment measures (as required by Technical Standards and Safety Authority) will be required within the facility throughout the operational period; mitigation measures are described in detail in Table 30. Should a major accident or malfunction occur during construction, a notification protocol will be followed to warn downstream water users.

During operation, potential effects on water quality may occur as a result of accidental spills and sedimentation as a result of shoreline erosion caused by inundation and water level fluctuation in the head pond. The proponent has committed to a pre- and post-development water quality and fish tissue sampling program. The Surface Water Quality and Fish Sampling Guidance for the proposed Wanatango Falls GS is provided in Annex IV.

7.4.6 Area Aesthetics

The area of the falls has an aesthetic value with local residents and tourists: people engage in camping, hiking, fishing, hunting and other associated outdoor pursuits. Short term impacts to the local aesthetics will be apparent during the construction phase of the project, though the preservation of the natural aesthetics of the waterway and surrounding area will be considered as part of the proposed development. Construction activities such as clearing, grading, blasting, pouring concrete, and installing structural steel and machinery will disturb the solitude of the site and be deemed visually unpleasant to those expecting a more natural outdoor experience, but restoration activities (seeding, tree planting, etc.) will enhance site aesthetics once construction is complete. During consultations with the public and First Nations, no issues associated with area aesthetics were identified.

7.4.7 Noise

A hydroelectric generating station is largely unobtrusive in terms of its impact on the noise environment within the region it occupies. Most of the noise that occurs through operations originates inside the powerhouse and is mitigated by a powerhouse enclosure. The more likely source of noise associated with this project is during the construction phase. Sound levels within the area will also be influenced by natural processes such as the falling of water over rocks. Xeneca has not identified any sound sensitive points of reception within 1000 metres of the facility as part of their preliminary feasibility work. The only source anticipated to emit sound to the outdoors at the facility will be a small, oil filled transformer with a capacity of approximately 3.83 Megawatts (4.6 MVA), with integral cooling fans. The location of the transformer will be within 30 metres of the proposed powerhouse. Anticipated sound levels are within 40 dBA, which is the standard criterion for the identified area (Class 3, Rural). A sound study was completed for the Wanatango Falls project by HGC Engineering. The study can be referenced in Annex II.

7.4.8 Employment & Economic Effects

Construction and operation of the project will generate a positive economic effect in the Town of Cochrane and Town of Iroquois Falls resulting in opportunities for employment of community members. Similar employment opportunities will also exist for the FN and Aboriginal community members.

Economic benefits will include employment, expenditures on materials, equipment and services. The proposed Frederick House River - Wanatango Falls GS will have a total installed capacity of approximately 3.7 MW. Waterpower creates jobs, generates revenue for the taxpayers of Ontario, and is the longest lived and most reliable source of renewable electricity:

- Direct economic activity to build a waterpower project in Ontario is approximately \$5 million per megawatt. Generally, about half of this amount is spent locally (approximately \$23.35 million in the case of this project), in procuring construction labour & materials, consulting and legal services, trucking and other services such as accommodation, food and fuel. Local merchants (e.g., accommodation, food, gas providers) in the area are expected to benefit from construction activities.
- Direct job creation (construction) is estimated to be approximately 46,700 person hours of work. Indirect job creation is estimated to be approximately 70,050 person hours of work supporting the project and personnel.
- A significant return to the people of Ontario paid through GRC and provincial and federal income taxes. Return to the people of Ontario will continue past the 40 year contract, likely as long as the facility is in operation, and will begin approximately 10 years after the project contract.

Waterpower lasts. Many power plants built in the early 1900s are still in operation and with regular maintenance and upgrades can last for many generations. In comparison, the life span for other sources of renewable power is: nuclear 40 years, wind 20 years and solar 20 years.

7.4.9 Land Use/Land Tenure

The Wanatango Falls GS will be constructed entirely on Crown Land. However the higher dam option may result in upstream effects to privately owned land. The proponent is presently working towards securing agreements with private landowners.

Within the General Use Area that encompasses the study area, the MNR Crown Land Use Policy Report for the area (G1745: Southern Resource Area) indicates that access road development and maintenance, for both new and existing roads, is permitted where required to provide access for resource management purposes. Furthermore, the development of commercial power development is also permitted (as evidenced by the release of these sites by MNR for commercial

development). Therefore, the use of the site for waterpower production conforms to MNR's management guidelines for the area.

The Wanatango Falls GS is a land use that is consistent with the policies for the existing Crown land area (G1745: Southern Resource Area) and is, therefore, not an issue with current land use or tenure in the local area. Power lines and access roads have been routed to avoid existing patent land.

7.4.10 Mining

Xeneca's operations are not expected to have any negative effect on mining activities since mining companies are subject to a '400' surface rights reservation around all lakes and rivers' (CLAIMaps). Provisions, like the latter, within the *Mining Act* allow for the development of renewable energy (waterpower) on mining claims. Generally, waterpower and mining operations are compatible as they can share infrastructure (power lines/roads) and that are a readily available source of reliable power. To request disposition on a mining claim, MNR requires consent from all stakeholders. Xeneca will be required to provide the MNR with an agreement with each Mining Claim holder. Xeneca has approached claim holders Tres-Or Resources and a private individual. Discussions are underway to obtain mining claim consent.

7.4.11 Fishing/Hunting

Recreational fishing opportunities may be slightly impacted during construction by limited access to the Wanatango Falls GS project site for safety reasons. Recreational fishing is also prevalent both upstream and downstream of the project location and fishing in those areas are unlikely to be affected during construction of the proposed powerhouse development.

Hunting activities in the area might be temporarily interrupted during the period of construction as animals tend to avoid areas of high human activity. There will also be limited hunting opportunities in the immediate vicinity of the construction areas in order to protect the workforce. Warning signs will be placed along the entrance to the secondary access roads, alerting hunters of construction work at the sites. Following construction, improved access along the roads near the project will allow easier access for local hunters. No significant changes to large mammal/game populations are expected due to the project since abundant similar habitat is available in the surrounding area.

As a result of operational activity, changes to river flow patterns and safety concerns, recreational fishing near the proposed powerhouse development will be adversely impacted. Opportunities for recreational fishing are likely to be available both upstream and downstream from the site location. Improved navigation on the Frederick House River may provide additional fishing opportunities on currently underutilized reaches in the river.

Hunting opportunities may be enhanced during the operational period due to improved access to potential hunting areas along the new access road and power line corridors. Operation of the facilities is not anticipated to have any significant adverse impact on game species; therefore, no impact on hunting success as a result of operation of the project is anticipated to occur.

7.4.12 Trapping

There are two commercial traplines (CC033 and CC044) in the vicinity of the site location along the Frederick House River. The Frederick House River acts as the boundary between these traplines. Xeneca anticipates minimal impacts to trapping activities as a result of the dam construction since very little habitat will be lost for furbearing species. A member of the trapping community expressed support for the project during the June 2012 Public Information Centre, noting that the proposed development could improve his trapping, particularly for beaver.

However, Xeneca may compensate licensed trapline operators if their revenue is negatively affected during the construction of the project.

7.4.13 Canoeing/Kayaking

Recreational use of the Frederick House River/Wanatango Falls (e.g., canoeing, kayaking) in the project area will be affected to some degree during the construction period. Construction activities will be encountered by canoeists and kayakers that use the river and specific procedures will be adopted to ensure such recreational opportunities are maintained (e.g. signage will be used to advise recreational users of the river about construction hazards like construction traffic, blasting, etc.) There are no existing portages around the site, however the existing boat access point above Wanatango Falls (currently accessible via ATV) existing above a rock ledge will be flooded out after construction of the dam. Filling of the headpond will result in submersion of the rock ledge, however fishermen will still be able to access the river immediately above the dam. Xeneca will make best effort to maintain a consistent operating plan level year around at the Wanatango Falls site to reduce impact to recreational users of the river.

Boating or canoeing opportunities throughout the study will likely be enhanced during facility operation. Higher, more stable water levels will eliminate or minimize existing navigational hazards (e.g., boulders, dead wood) throughout much of the area, making boating potentially safer. Warning signs will be posted indicating that flow may change at any time and advising boaters to stay out of the immediate tailrace area. Implementation of the identified mitigation will reduce/minimize safety risks to the greatest extent possible.

7.4.14 Waste Management

Solid wastes will be properly stored on site prior to disposal off site at local registered disposal facilities. Food wastes should be properly contained to avoid a nuisance bear situation prior to disposal off site.

Xeneca will provide a compliance plan for construction and operation and will meet all regulatory obligations required by statutes in Ontario.

7.4.15 First Nations

The Wanatango Falls GS will have a very significant positive, long-term impact on the FN communities involved in a business-to-business relationship with Xeneca due to the economic benefits that will be accrued to these communities over the life of the project. These economic benefits are expected to translate into improvements in standard of living, education and health care for those communities.

Xeneca also acknowledges to work together with those communities to address the rights, culture and concerns of all Aboriginal people since consultation with affected communities is a part of Xeneca's ongoing policy.

Local Aboriginal Communities (LAC), Identified Aboriginal Communities (IAC) have expressed an interest in engagement in regards to the project and potential impacts. Ongoing engagement and consultation with Aboriginal communities will continue after completion of EA and through the permits and approvals process. Xeneca has corresponded with identified and Local Aboriginal communities in the EA process and has offered funding for peer reviews of the Draft ER documents to individual communities and organizations. Xeneca has committed to engage in discussion after the issuance of a Notice of Completion at which time EA will be provided to communities for review for a minimum of 30 days. Although engagement and consultation with Aboriginal communities for the purposes of the EA have been completed once the 30-day formal review period has ended, Xeneca will continue to advise communities of progress on the project after completion of the EA through the permits and approvals process.

Traditional Land and Resources Used for Harvesting Activities

Effects to traditional lands and resources that are used for harvesting activities include issues associated with water quality and clarity. The quality and clarity of water is an important cultural and spiritual value for Aboriginal communities and to mitigate any impacts on water quality and clarity, minimum flows will be provided downstream at all times, but will vary depending upon flow conditions to range from 2 to 54 m³/s. No residual effects on the quality and clarity of water are expected. Quality and clarity of water will be compared to pre construction condition and reported to Ontario MOE/MNR annually for each monitoring year.

Aboriginal communities have raised issues related to the preservation of Aboriginal culture as a result of the project. A Stage 2 archaeological survey was conducted in 2012 to identify the presence of and assess impacts to cultural heritage values in the footprint of the project. Communities were invited to participate in the archaeological field program. A Stage 1 Archaeological Report was distributed to the Aboriginal Communities. Stage 2 work was

completed in November 2012 and was shared with communities, and the communities will be consulted prior to the initiation of Stage 3 work in the summer of 2014. Please refer to Section 7.4.16 below on Archaeological Sites.

First Nation communities have identified that construction may impact use of the area by waterfowl for foraging and nesting activities which could impact subsistence, harvesting, hunting and cultural activities of communities. The construction season is recommended to be limited to August 1st to April 15th annually to limit the potential for impact on migration, mating and nesting of bird species. The proponent will ensure the communities are aware of the construction schedule for the project to minimize the potential for impact on subsistence, harvesting, hunting and other cultural activities. Construction noise impact on waterfowl will be mitigated by ensuring construction takes place during appropriate timing windows. Impact on traditional activities will be mitigated through placement of signage, and public notifications.

Furbearing mammals may be impacted by fluctuating water levels in the headpond during the winter months and alteration of habitat resulting in a change in trapping which may impact traditional lifeways and economic resources of aboriginal peoples. No active First Nation traplines have been identified to Xeneca within the project area. Appropriate timing of the initial inundation (early summer) will minimize mortalities on furbearing mammals (who may be denning in winter, and who would experience mortality if inundation is completed during winter). Summer flooding will allow sufficient time for furbearers to re-establish new lodging, and for Beavers to gather feed piles prior to winter freeze-up. Altered river flows could impact upon available food supply for furbearing mammals by impacting upon benthic invertebrate populations, especially within the inundation area. Operational impacts may result from sudden fluctuations in water during freezing which could result in flooding of dens. This is mitigated through the operations plan.

Hunting, harvesting, foraging and trapping activities may be disrupted by construction activities (being unable to access site areas). Impact on traditional activities will be limited to the construction footprint and access will be reinstated following project development.

7.4.16 Archaeological Sites

Two registered archaeological sites are present within 30 km of the project area. Due to its proximity to a major water source and the existence of rapids, the presence of pre-contact portage routes, it was concluded that areas of high archaeological potential exist for the proposed Wanatango Falls site. The Stage 1 Archaeological Assessment was completed in January 2011. The project team identified areas of high archaeological potential along the river and recommended a Stage 2 investigation. The Stage 2 Archaeological Assessment identified three pre-contact archaeological sites. Given that these sites were of further archaeological value, prior to construction activities it was recommended that the project area be subject to a Stage 3 and, if required, a Stage 4 Assessment. In August 2013, Xeneca received a partial clearance letter

from the MTCS for construction at Wanatango Falls. It is Xeneca's intent to complete the Stage 3 and potentially Stage 4 assessments in the Spring of 2015. The MTCS indicated that due to the archeological sites being greater than 300 m from the construction zone, there are no concerns for impact.

No built heritage structures were encountered within the project area during the Stage 2 Archaeological Assessment.

Archaeological sites and objects may be encountered during construction activity. These features represent valuable cultural resources, and uncontrolled disturbance could result in loss or damage to these resources and the valuable information represented by them. If archaeological or heritage resources are discovered during clearing or construction, work will be stopped until an archaeologist has assessed the find and a course of action is determined. A step-by-step Discovery Protocol will be prepared and implemented for project construction.

7.5 CONSIDERATION OF ACCIDENTS AND MALFUNCTIONS

This section presents the identified issues specifically related to potential accidents and malfunctions during operation. Please also refer to Section 7.4.3, Public Health, Construction and Operational Safety.

The environmental assessment of the undertaking must consider the effects to the environment if an accident or malfunction were to occur during the construction or operation of the project. Consideration must be given to such events as spills and leaks, power failures, toxic substances, and worker and public health and safety.

As the mitigation measures and best management practices detailed in Table 30 of this document will be implemented, it is unlikely that spills and leaks would occur during the construction period. The engagement of an environmental monitor to oversee construction activities should further ensure the prevention of releases of deleterious substances to the environment. Additionally, the health and safety of all contractors and construction crews on both federal and provincial lands will be subject to *Ontario Regulation 231.91* which governs construction projects in Ontario. The health and safety of operational staff at the generating station will be governed by the *Occupational Health and Safety Act*. Public access will be restricted during the construction activities at both the GS site and along the power line.

Toxic substances are rarely employed at hydroelectric generating stations. Generally, only small quantities of normal industrial lubricants are required for operation. A diesel generator for emergency power supply at the generating station will be required, necessitating the installation of an above-ground storage tank (AST) for diesel fuel. The installation and operation of the AST will be subject to the *Technical Standards and Safety Act*, Ontario Reg. 213.01 (fuel oil).

A power failure at the generating station will result in the inability of the powerhouse to discharge water (emergency shut-down) which will affect project revenues. Should this power failure occur during peak flow periods, the proponent will be responsible for ensuring that peak discharge can be passed downstream. During unscheduled/emergency shut-downs of the facility, minimum flows will continue to be provided into the river downstream of the Wanatango Falls GS. This can be accomplished through the installation of a powerhouse bypass valve that will allow a continuous release of flow until normal operations resume. Alternately, a special turbine-generator package can be used that would allow the continued passage of flow through the turbines even during an emergency shut-down. The final selection of either the powerhouse bypass valve or the turbine-generator package will occur during the detailed engineering design process.

8. EFFECTS OF ENVIRONMENT ON THE PROJECT

The project team has also considered how the environment may affect the project. These may be of short duration such as a heavy rainfall event, or longer duration such as the anticipated effects of climate change on the project.

Disruptions in energy power and generation would result in decreased economic returns for the proponent. The powerhouse will be equipped with a back-up generator to ensure that station service power can be restored to the facility should a grid failure occur. However, the facility cannot be operated (i.e. generation cannot recommence) until the electrical grid can accept the power generated. In this situation (emergency shutdown) no water would be passed through the powerhouse but would be directed through the by-pass designed into the facility. The design of this by-pass will represent at least the pre-project capacity of the natural falls. This aspect of the approval process will be dealt with after the environmental assessment process is completed, as the detailed engineering design is being finalized.

8.1 PRECIPITATION AND FLOODING

Operations during extreme events, such as floods, droughts and safety emergencies may need to deviate from the normal operating parameters to manage flows and mitigate impacts. Proposed operational changes in response to floods are described in Section 5.6

It should be noted that the facility is not designated to mitigate the effects of naturally occurring events such as floods and droughts. However, there are circumstances where the existence of the facility can either aid in managing such an event or pose an additional risk. The flood risk aspects are managed, in part, through the government approval under the *LRIA* of the engineering plans and specifications for the design of the facility. The purpose of this process is to ensure that the flood passage capacity of the facility is adequate and that the risk to property and public safety is

duly considered. This aspect of the approval process will be dealt with after the environmental assessment process is completed and when the detailed engineering design is being finalized.

8.2 EXTREME WEATHER CONDITIONS

Extreme cold weather conditions may lead to a build-up of ice at the intake that could necessitate plant shut-down and an interruption to the delivery of electricity to the provincial supply grid.

Drought conditions could necessitate the shut-down of the facility and an interruption to the delivery of electricity to the provincial supply grid as a result of reduced flows within the river.

8.3 LIGHTNING STRIKES

A direct hit on the facility may lead to facility immediate shut-down and prolonged interruption to the delivery of electricity to the provincial supply grid.

8.4 ACCIDENTAL FIRES

Lightning strikes, as well as manmade fires could result in uncontrolled forest/brush fires which may interrupt the operation of the facility and the delivery of electricity to the provincial supply grid. Forest fires may also limit the ability of personnel to access the facility to conduct operations or maintenance. During both construction and operation of the facility, the proponent will follow the *Forest Fire Prevention Act* with respect to debris management and will secure the required burning permits where needed.

8.5 EARTHQUAKES

The continual shifting of large segments of the earth's crust, called tectonic plates, causes more than 97% of the world's earthquakes. Eastern Canada is located in a relatively stable continental region within the North American Plate and, as a consequence, has a relatively low rate of earthquake activity. Nevertheless, large and damaging earthquakes have occurred here in the past, and will inevitably occur in the future.

The project area is located in the Northeastern Ontario Seismic Zone, and according to NRCAN (<http://earthquakescanada.nrcan.gc.ca>) this zone experiences a very low level of seismic zone activity. NRCAN reports that from 1970 to 1999, on average, only one or two magnitude 2.5 or greater earthquakes were recorded in this area, and two magnitude 5 earthquakes (northern Michigan and northwest of Kapuskasing) have occurred in this region. The location of the project in this low seismic activity area presents a low potential for the facility to be affected by this type of geological event.

8.6 CLIMATE CHANGES AND OTHER WEATHER RELATED EFFECTS

According to the National Round Table on the Environment and the Economy (www.nrtee-trnee.com), widespread impacts are expected across Canada as a result of increasing temperatures and moisture levels. Among the changes predicted, the Round Table is forecasting that Ontario will experience increased disruptions to energy generation and power. Among the many predictions offered, there includes a doubling in the frequency of extreme rain events and increasing costs to providing community services in Canada during the 21st century.

9. FISH HABITAT COMPENSATION

Identified effects that cannot be avoided, prevented or where mitigation measures were unable to effectively reduce the magnitude and duration of the impact to inconsequential levels (or repair the situation post-impact to return to a pre-impact state) will need to be compensated for through other means, in order to off-set the ecological impact of the effect. There are circumstances for this proposed project where offsetting the impact through other means is necessary. The compensation situation and measures that will be used are discussed in this section.

Aquatic Habitat Compensation

To obtain permits from DFO and MNR under the federal *Fisheries Act* and the provincial *Lakes and Rivers Improvement Act*, respectively, fish habitat compensation is required.

Key fish habitat upstream of the Wanatango Falls GS will be impacted by inundation to 8.6 km upstream, and by operations downstream of the proposed dam site to the crest of Neeland's Rapids (approximately 24 km downstream). The inundation resulting from the proposed Wanatango Falls GS project is anticipated to have permanent residual effects on aquatic species and habitat within the project's ZOI. Compensation will be required for two main areas; the tailrace area habitat within the facility footprint, and riffle areas that acts as spawning habitat within the inundation area.

Inundation Area

Spawning Habitat

Within the inundation area, riverine habitat will change to lacustrine habitat, which will alter the available spawning habitat for Walleye, Sauger and Lake Sturgeon. Approximately 500 m upstream of the proposed GS, a riffle area of 1,050 m² that is available to fish during spawning will be affected. Flows are anticipated to decrease by 5.02 m³/s and depth will increase by 2.97 m. These changes will result in a loss of functional spawning habitat for Walleye and Lake Sturgeon that requires compensation.

Benthic Habitat

Approximately 2,645 m² of fast water benthic invertebrate habitat will be lost within the inundation area (based on low-flow measurements). While some impact is expected, the construction of the offsetting fish habitat will provide benefit to offset the impacts. Although focus of the design will be on improving the habitat for fish spawning, several aspects of the spawning habitat will be beneficial to benthic invertebrates. Any new areas of gravel and/or cobble substrate will provide habitat for benthic invertebrates that live on hard substrates in fast water. In addition, more varied and complex habitat will be created as a result of measures to modify water depths and velocities, such as the placement of boulders to create resting areas for the fish.

Dam Site Footprint

The structural components of the Wanatango Falls GS that will affect aquatic habitat will include two control dams with Obermeyer gates, headrace and tailrace which will result in permanent changes to aquatic habitat. The two spillways have a combined total area of 400 m² however, these areas are not identified as spawning habitat, indicating a relatively low impact to fish habitat. The headrace will be constructed in a location where impacts to aquatic habitat are minimal. The construction of the tailrace will result in a permanent loss of 500 m² of spawning habitat for Goldeye and Shorthead Redhorse.

Offsetting Habitat Creation

Since avoidance is not possible, and all efforts to mitigate impacts have been explored and implemented, the residual impacts require authorization and will be addressed by offsetting. The total area of aquatic habitat requiring fish habitat compensation/replacement as a result of net spawning habitat loss at the Wanatango Falls GS project is 1,550 m². VEC species that are the most sensitive and significant species within the Frederick House River that are affected by this habitat loss are Walleye, Sauger, Goldeye and Lake Sturgeon. Off-setting is required to compensate for this permanent loss regardless of whether fish passage is or is not required at the site.

The life histories of these fish species (spawning, rearing, foraging or overwintering habitats) may be altered, especially for the large bodied, long living, Lake Sturgeon above the Wanatango Falls GS. The risk that the migration of fish through a fish passage structure is unsuccessful is a higher for the downstream migration than for the upstream migration routes. While the upstream migration of Lake Sturgeon may continue with the incorporation of the fish passage structure, the downstream migration of Lake Sturgeon may be disrupted. The resulting fragmentation and isolation of critical downstream Lake Sturgeon habitat (spawning and overwintering) may cause factors such as overcrowding, limited food supply, and decreased growth rate in the species. Increased mortality may also result from these factors.

Therefore, the preferred proposed compensation for the fragmentation impacts for Lake Sturgeon is a relocation program and the building of key habitat areas downstream of the project site (for the preferred, “no fishway” option only). The entire Lake Sturgeon population in the 9.5 km stretch between the Frederick House Lake Dam and the Wanatango Falls GS (estimated to be ± 14 fish) will be relocated downstream of the Wanatango Falls GS through means of an extensive netting program.

In accordance with the fisheries management objectives discussed throughout this report and the proposal to relocate Lake Sturgeon downstream, the offsetting habitat will be located downstream of the proposed Wanatango Falls GS. The most likely area for offsetting habitat is in the general vicinity of Zevery’s Rapids and extending upstream to the proposed Wanatango GS tailrace.

Replacement habitats are being designed to support Lake Sturgeon spawning, however, since Lake Sturgeon spawning substrates, depths and velocities overlap with those preferred by Walleye and Sauger, the offsetting habitat will also support Walleye and Sauger spawning. Goldeye is abundant in the river system and is expected to adjust to the changes imposed by the project.

No impact to downstream fish populations (or to other smaller fish species upstream of the dam) is expected as a result of dam development. The downstream Walleye and Sauger populations will likely continue to migrate upstream to spawn at Zevery’s Rapids or within the tailrace area. Effectiveness of habitat offsetting measures and the use of remaining fast water habitat for spawning will be monitored through post-construction monitoring.

The final decision as to the locations for off-setting will be determined during consultation with DFO, MNR, TTN and Xeneca. Off-setting may also be required in the upstream reach of the Wantango GS by the regulators.

10. RESIDUAL ADVERSE EFFECTS AND SIGNIFICANCE

A summary of the specific issues identified during the regulatory agency and public consultation process is presented in Table 30. The final column in Table 30 indicates whether an issue remains unresolved and is therefore considered a residual effect.

The residual effects of a project are those that are expected to remain despite the application of mitigation measures. Section 4.3.1 of the OWA Class EA for Waterpower Projects (January 2014) provides criteria for assessing significance:

Value of Resource

The value or importance placed on the resource by stakeholders or society at large as determined through consultation and the consideration of overall environmental requirements. The value may be related to the relative abundance of the resource, the interest of participating parties, etc.

High Value of the resource which will be affected is considered high. The resource has some form of regulatory status or protection, generates a high level of public interest, is considered scarce or is essential to the integrity of the regional economic and/or ecological environment.

Medium Value of the resource which will be affected is neither high nor low. The resource is acknowledged as an important part of the regional ecological and economic environment, but is not essential. Interest has arisen through consultation but has not been a focus issue.

Low Value of the resource which will be affected is considered low. The resource is abundant, does not significantly contribute to the regional economy or environment, and no concerns have arisen through consultation.

Magnitude

The magnitude of an effect refers to the extensiveness, scale, degree, or size of that effect. As the assessment of this criterion has a high potential to be subjective/qualitative, and measures of scale vary between effects, each level of magnitude has several specific measures for the means of clear definition. When possible, pre-established quantitative scales of magnitude specific to a given effect should be used and referenced. Mitigation measures and strategies or conditions may affect the magnitude of a residual effect to some degree.

High Effect will exceed regulatory or guideline criteria and/or remains controversial by the majority of stakeholders and/or is deemed high by expert judgment/historic precedence, and/or exceeds the carrying capacity of the surrounding ecosystem.

Medium Effect will noticeably change or exceed existing conditions. The change remains within regulatory or guideline criteria, is capable of being absorbed by the surrounding ecosystem, and is not considered controversial by the majority of stakeholders.

Low Effect will only be evident at or slightly above existing conditions, will be well within the carrying capacity of the surrounding ecosystem, and will have low social impact as shown through public consultation.

Geographic Extent

The geographic area over which the effect would occur. This can relate to either a linear distance (km) or area (km²), depending on the issue or effect being described.

<1	Effect will be limited to less than a 1 km (distance/area) from the project site
1-10	Effect will be limited to between 1 and 10 km (distance/area) from the project site
11-100	Effect will be limited to between 11 and 100 km (distance/area) from the project site
101-1,000	Effect will be limited to between 101 and 1,000 km (distance/area) from the project site
1,001-10,000	Effect will be limited to between 1,001 and 10,000 km (distance/area) from the project site
>10,000	Effect will be extend beyond 10,000 km (distance/area) from the project site

Frequency and Duration

The frequency of when an effect might occur intermittently over a given period of time. Generally, events that occur less frequently or for a more limited period of time are considered less significant.

Frequency:

<11	The effect will occur less than 11 times per year
11-50	The effect will occur between 11 and 50 times per year
51-100	The effect will occur between 51 and 100 times per year
101-200	The effect will occur between 101 and 200 times per year
>200	The effect will occur more than 200 times per year
Continuous	The effect will be occur continuously

Duration:

<1	The effect will occur for less than a month
1-12	The effect will occur for between 1 month and a year
13-36	The effect will occur for between 1 and 3 years
37-72	The effect will occur for between 3 and 6 years
>72	The effect will occur for more than 6 years

Reversibility

Whether or not the effect is reversible if the activity or component of the project which is causing the effect is halted, altered or removed. Irreversible impacts are considered more significant than reversible impacts.

Reversible Existing conditions would be re-established if the cause of the effect is halted, altered or removed.

Irreversible Existing conditions would not be re-established if the cause of the effect is halted, altered or removed. In the event that reversibility is unknown, the effect should be considered irreversible.

Waterpower facilities typically have a lifespan in excess of 80 years and can be refitted to last decades longer. The longevity of waterpower projects mean that, once constructed, they are more likely to be upgraded or refitted rather than decommissioned. As a result, when considering the reversibility of residual effects, the physical footprint of the facilities and the inundation area are considered as permanent and irreversible. Additionally, those project components or activities that are required for maintenance or public safety are likewise considered permanent while the facility exists. If these components were to be decommissioned and removed it is conceivable that the environment would return to its natural state but, when compared to the timeframe for other project effects, these effects are not considered reversible.

Ecological/Social Context

The significance of an effect may be considered more or less significant when considered against an environment that is untouched or has been previously impacted by other activities or issues. The focus during the determination of the significance of the effect is on the change brought about on the existing environment by the project. Therefore, changes to a relatively pristine environment are considered more significant than changes to a previously impacted environment.

Relatively Pristine The value or resource being affected has not been previously influenced.

Previously Impacted The value or resource being affected has already been influenced by other source(s).

Likelihood of Effect

Some mitigation measures may address the potential of residual effects by reducing the likelihood of their occurrence rather than by reducing the magnitude of the effect.

High	The effect is highly likely to occur
Medium	The effect may occur
Low	The effect is still unlikely to occur

By applying and considering all of the listed criteria, residual effects can be classified as either **Not Significant**, or **Significant** within the context of the project and the environment in which it is proposed. The project may also have residual effects which are considered **Positive** which should be considered and weighed against the potential significant adverse effects.

An assessment of the residual effects (including the positive impacts) of the proposed undertaking are presented in Table 35.

TABLE 35: Residual Environmental Effects and Significance

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
General Natural Environment										
Air quality	Noise from operation of electrical generator and transformer at powerhouse	Yes	Medium	Low	< 1	Continuous	Reversible	Relatively Pristine	High	Not Significant
	Exhaust emissions from equipment and vehicles	Yes	Medium	Low	1-10	13-36	Reversible	Relatively Pristine	High	Not Significant
	GHG Offsets	Yes	High	Low	> 10,000	Continuous	Reversible	Previously Impacted	High	Positive
	Dust emissions from construction activities and vehicles	Yes	Medium	Low	1-10	13-36	Reversible	Relatively Pristine	Medium	Not Significant
Water Quality (surface and groundwater)	Surface water - general terrestrial and riparian construction activities along shoreline of waterway at facility and water crossings along power line route and access roads	Yes	High	Low	1-10	13-36	Reversible	Relatively Pristine	Low	Not Significant
	Surface water - In-water works construction and removal of the cofferdam: potential for excess sediment to be suspended and carried downstream by river flow	Yes	High	Low	1-10	13-36	Reversible	Relatively Pristine	Low	Not Significant
	Contamination from spills or leaks of hazardous substances	Yes	High	Low	1-10	13-36	Reversible	Relatively Pristine	Low	Not Significant
	Surface water - Inundation area at Wanatango Falls site may alter water quality (<u>methyl-mercury</u>) in reservoir	Yes	High	Medium	1-10	> 72	Reversible	Previously Impacted	Medium	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Water Quality (surface and groundwater)	Surface water - increased phosphorous levels in the headpond	Yes	High	Low	1-10	Continuous	Reversible	Previously Impacted	Medium	Not Significant
Species at Risk (SAR) and Species of Conservation Concern (SCC)	Impact to habitats of identified terrestrial Species at Risk due to construction and operation of facility	Yes	High	Low	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Impacts to Canada Warbler (SCC) habitat as a result of vegetation clearing - species confirmed present in study area	Yes	High	Low	< 1	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Impacts to Lake Sturgeon due to construction and operation of facility (preferred "No Fishway" option)	Yes	High	Medium	11-100	Continuous	Irreversible	Previously Impacted	High	Not Significant
	Impact Lake Sturgeon due to construction and operation of facility (Fishway Option)	Yes	High	Medium	1-10	Continuous	Irreversible	Previously Impacted	High	Not Significant
	Impacts to Northern/Little Brown Myotis (SAR) seasonal habitat	Yes	High	Low	< 1	13-36	Irreversible	Relatively Pristine	High	Not Significant
Terrestrial wildlife (numbers, diversity, distribution)	General disturbance to terrestrial habitat and wildlife during construction	Yes	Medium	Low	11-100	Continuous	Reversible	Relatively Pristine	High	Not Significant
	Impacts related to the creation of facility and headpond creation - impacts to general and Significant Wildlife Habitats	Yes	Medium	Low	11-100	Continuous	Irreversible	Relatively Pristine	High	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Terrestrial wildlife (numbers, diversity, distribution)	Impacts upon forest nesting birds as a result of line and road corridor development	Yes	Low	Low	11-100	13-36	Reversible	Previously Impacted	High	Not Significant
Natural vegetation and habitat linkages	Effects on vegetation and habitat during access road ROWs maintenance	Yes	Low	Low	11-100	Once every few years for maintenance along the power line corridor and road corridor	Reversible	Previously Impacted	High	Not Significant
	Loss of 12.45 ha of Black Spruce riparian forest community as a result of inundation	Yes	Low	Low	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Direct impacts to terrestrial forest community (0.78 ha of Black Spruce Forest) from construction of project footprint	Yes	Low	Low	< 1	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Loss of 0.24 ha of Black Spruce/pine vegetation community at footprint of fish ladder structure (fishway option only)	Yes	Low	Low	< 1	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Access road construction - habitat fragmentation, potential for forest fires	Yes	Medium	Low	11-100	Continuous	Irreversible	Previously Impacted	Low	Not Significant
	Wetland impact and loss of wetland along new roadway and power line.	Yes	High	Low	11-100	Continuous	Irreversible	Relatively Pristine	Low	Not Significant
Soil and sediment quality	Soil compaction in construction footprint and ROW for access roads	Yes	Low	Low	11-100	13-36	Reversible	Relatively Pristine	Low	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Aquatic and Riparian Ecosystem										
Shoreline Dependent Species	<i>Shoreline dependant Fish Species - See Fish Habitat Section below</i>									
	Impact upon wetland communities and vegetation in the inundation area - Approximately 2.22 ha of the Mineral Thicket Swamp (43.6%) and approximately 0.28 ha (6.3%) of the Mineral Meadow Marsh will be inundated	Yes	Medium	Medium	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Inundation effects on aquatic mammals (beaver and otter, etc.) and their habitat	Yes	Medium	Medium	1-10	Continuous	Reversible	Relatively Pristine	High	Not Significant
	Facility construction activities impacts on shoreline habitats and vegetation	Yes	Medium	Medium	1-10	13-36	Reversible	Relatively Pristine	High	Not Significant
	Loss of emergent and riparian vegetation as a result of water level fluctuations	Yes	Medium	Medium	1-10	> 200	Reversible	Previously Impacted	High	Not Significant
Fish Habitat	Impacts to Walleye foraging habitat	Yes	Medium	Low	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Impacts to tributary habitat	Yes	Medium	Medium	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	General impacts to fish habitat during construction activities in or near water bodies	Yes	High	Low	1-10	13-36	Reversible	Relatively Pristine	Medium	Not Significant
	Potential effects on habitat and spawning from dewatering operations	Yes	High	Low	< 1	13-36	Reversible	Relatively Pristine	High	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Fish Habitat	Loss of fast-water spawning habitat due to the creation of the tailrace and headpond (total of 1,550 m ² no longer functioning as fastwater spawning habitat)	Yes	High	Medium	1-10	Continuous	Irreversible	Relatively Pristine	High	It is expected that offsetting measures will reduce the significance of this residual effect to "Not Significant"
	Impacts to Northern Pike spawning and nursery habitat within the downstream ZOI as a result of water level fluctuations and loss of emergent vegetation	Yes	High	Low	11-100	> 200	Reversible	Previously Impacted	High	Not Significant
	Temporary impacts and loss of habitat related to the construction of cofferdams	Yes	High	High	<1	13-36	Reversible	Relatively Pristine	High	Not Significant
	Potential impacts to baitfish spawning and nursery areas as a result of loss of aquatic vegetation	Yes	High	Low	11-100	> 200	Reversible	Previously Impacted	High	Not Significant
	Potential effects on aquatic habitat in the by-pass reach due to facility operations	Yes	Low	Medium	< 1	> 200	Reversible	Previously Impacted	High	Not Significant
	Potential effects on habitat associated with water crossings on ROWs for access roads and power lines	Yes	High	Low	11-100	13-36	Reversible	Relatively Pristine	Medium	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Benthic Habitat	Impacts to benthic habitat in the project footprint - approximately 2,645 m ² of benthic habitat (in the headpond) anticipated to no longer function as fast water habitat under flows of 1 m ³ /s; approximately 400 m ² of potential benthic habitat in the footprint of the control dams to be impacted	Yes	High	Medium	1-10	Continuous	Irreversible	Relatively Pristine	High	It is expected that offsetting measures will reduce the significance of this residual effect to "Not Significant"
	Impacts to benthic invertebrate habitat and productivity	Yes	High	Medium	11-100	> 200	Reversible	Previously Impacted	Medium	Not Significant
Fish Migration	Construction of the dam represents a permanent barrier to the upstream and downstream movement of fish (for the preferred, "no fishway" option)	Yes	High	High	1-10	Continuous	Reversible	Relatively Pristine	High	It is expected that the creation of offsetting habitat and relocation of Lake Sturgeon will reduce the significance of this residual effect to "Not Significant".
	Construction of the dam represents a permanent barrier to the upstream and downstream movement of fish (for the alternate option - creation of a fishway)	Yes	High	Low	1-10	Continuous	Reversible	Relatively Pristine	High	Not Significant
Fish Stranding	Fish stranding downstream of facility as a result of intermittent operations	Yes	High	Low	11-100	> 200	Reversible	Previously Impacted	Low	Not Significant
Fish injury or mortality	Fish impingement or entrainment resulting in injury or mortality	Yes	High	Low	< 1	Continuous	Reversible	Relatively Pristine	Low	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance	
Fish injury or mortality	Fish mortality due to blasting	Yes	High	Low	< 1	13-36	Reversible	Relatively Pristine	Low	Not Significant	
	Fish injury or mortality as a result of cofferdam placement and dewatering	Yes	High	Low	< 1	13-36	Reversible	Relatively Pristine	Low	Not Significant	
Erosion and sedimentation	Construction related impacts related to the relocation of sediments and soils - Surface water overland flow paths within the construction areas have the potential to carry construction-related sediment to the watercourse.	Yes	Medium	Low	11-100	13-36	Reversible	Relatively Pristine	Low	Not Significant	
	Increased shoreline erosion and sediment deposition due to water level fluctuations in the inundation area and variable flow reach during operation	Yes	Medium	Low	11-100		Continuous	Reversible	Previously Impacted	Medium	Not Significant
Water levels, flows and movement (surface water)	Creation of headpond and fluctuation in levels/flows	Yes	Medium	Medium	1-10		Continuous	Irreversible	Previously Impacted	High	Not Significant
	Variation in flows and water levels within downstream variable flow reach	Yes	Medium	Low	11-100		> 200	Reversible	Previously Impacted	High	Not Significant
	Impact upon wetlands in the downstream flow reach due to water level fluctuations	Yes	Medium	Low	11-100		> 200	Reversible	Previously Impacted	High	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Aboriginal Community										
Reserves or Aboriginal Communities										
First Nations reserves or other Aboriginal communities (All First Nations)	Project Sites are not located on any First Nations reserve lands or lands allocated to any other aboriginal community. The Project is located within an area covered under Treaty 9.	Yes	High	Low	11-100	> 72	Reversible	Relatively Pristine	Medium	Positive
Traditional land or resources used for harvesting activities										
Traditional land or resources used for harvesting activities (All First Nations)	Quality and Clarity of water may be affected by the operation of the facility, which would impact an important cultural and spiritual value for many communities	Yes	High	Low	1-10	37-72	Reversible	Relatively Pristine	Low	Not Significant
Traditional land or resources used for harvesting activities (All First Nations)	Furbearing mammals may be impacted by fluctuating water levels in the headpond during the winter months and alteration of habitat resulting in a change in trapping which may impact traditional lifeways and economic resources of aboriginal peoples.	Yes	Low	Low	1-10	Continuous	Reversible	Relatively Pristine	Medium	
Traditional land or resources used for harvesting activities (All First Nations)	Fish species health and abundance may be impacted by activities related to construction of the facility impacting harvesting and subsistence activities of certain communities during specific times of the year	Yes	Medium	Low	< 1	13-36	Reversible	Relatively Pristine	Low	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Traditional land or resources used for harvesting activities (All First Nations)	Fish species health and abundance may be impacted by activities related to operation of the facility impacting harvesting and subsistence activities of certain communities during specific times of the year	Yes	Medium	Low	< 1	1-12	Reversible	Relatively Pristine	Low	Not Significant
Traditional land or resources used for harvesting activities (TTN)	TTN recommended that compensation efforts be focused on habitat creation and enhancing existing habitat downstream rather than implementing the existing fishway design	Yes	High	High	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
Employment										
Employment (All First Nations)	Potential impact on employment of First Nation community members.	Yes	Medium	Medium	1-10	13-36	Reversible	Relatively Pristine	Medium	Positive
Land Subject to Land Claims										
Lands subject to land claims (All First Nations within Treaty 9)	The Project site is located in an area where a land claim is on file between the Federal Crown and Nishnawbe Aski Nation which is the Grand Council of Treaty 9. An Agreement in Principle has been reached but no final agreement has been settled.	Yes	Medium	Medium	1-10	Continuous	Reversible	Relatively Pristine	Medium	Positive
Economic Development										
Economic development (Wahgoshig)	Business opportunities may be possible with nearby First Nation communities (i.e. Wahgoshig)	Yes	Medium	Medium	1-10	Continuous	Reversible	Relatively Pristine	Medium	Positive

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Other										
Other (All First Nations)	Impact on First Nation access to the project area during construction	Yes	Low	Low	1-10	13-36	Reversible	Relatively Pristine	Low	Not Significant
	Community concern regarding water level modifications downstream of the project during operations	Yes	Medium	Medium	1-10	Continuous	Reversible	Relatively Pristine	High	Not Significant
Land and Resource Use										
Access to inaccessible areas	Facilitation of access as a result of upgrades/maintenance of area access roads and bridges	Yes	Medium	Low	1-10	Continuous	Reversible	Previously Impacted	High	Not Significant
Navigation	Construction, inundation and variable flows may alter navigational access within the project zone of influence	Yes	Medium	Low	11-100	Continuous	Reversible	Previously Impacted	High	Not Significant
Angling, hunting opportunities	Potential impacts to angling opportunities	Yes	Medium	Low	< 1	Continuous	Reversible	Relatively Pristine	High	Not Significant
Forestry	Harvesting of merchantable timber during construction	Yes	High	Low	1-10	13-36	Irreversible	Relatively Pristine	High	Positive
Social and Economic										
Community character, enjoyment of property or local amenities	Potential effects on property enjoyment, recreational water use, tourism values, aesthetic image	Yes	Medium	Low	1-10	13-36	Reversible	Previously Impacted	Medium	Not Significant
Employment - Local and regional labour supply	Construction activities will support direct and indirect local employment	Yes	High	High	101-1000	13-36	Reversible	Previously Impacted	High	Positive
Aesthetic image of the surrounding area	Disruption due to presence and operation of proposed facility	Yes	Medium	Low	< 1	Continuous	Irreversible	Previously Impacted	High	Not Significant

Environmental Component	Issue	Residual Effect (Yes/No)	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/Social Context	Likelihood of Effect	Significance
Energy/Electricity										
Reliability	Voltage support	Yes	High	Low	> 10,000	Continuous	Reversible	Previously Impacted	High	Positive
Electricity flow patterns	Power flow system	Yes	High	Low	1001-10,000	Continuous	Reversible	Previously Impacted	High	Not Significant
Other	Protection control settings	Yes	High	Low	1001-10,000	Until installed	Reversible	Previously Impacted	High	Not Significant

11. CUMULATIVE EFFECTS

Cumulative effects can be defined as long term changes that may occur as a result of the combined effects of each successive action on the environment. Cumulative effects may result from interacting effects of multiple projects in a given area, or multiple activities acting on a single ecosystem component. The assessment of the potential cumulative effects posed by a project was a requirement under the previous *CEAA* (1992). Although the previous *CEAA* (1992) and the current *CEEA, 2012* do not apply to the project. Xeneca felt other planning process requirements may also be met by this discussion and therefore have included it herein.

The assessment of cumulative effects examines past, present and “reasonably foreseeable” future activities in addition to the activities posed by the project, and considers how these would affect the VEC within the project area, and beyond, if necessary.

The assessment of cumulative effects outlined below is based on a precautionary approach and the professional judgement of the project team. As additional information about the Wanatango Falls GS and other projects and activities in the area becomes available, the characterization and assessment of cumulative effects will be further discussed through the detailed design, and permitting stages of the project.

The potential cumulative effects of the proposed development are discussed in the following sections.

Energy and Air Quality

Xeneca’s proposed hydroelectric generating facility on the Frederick House River will have an installed capacity of 3.7 MW and will have a positive cumulative effect along with all other new generation facilities of the province. The idea of “every kilowatt counts” will be collectively met to contribute to the government’s goal of generating clean energy for the province, compensating for the shutdown of coal-fired generation facilities, and reducing greenhouse gas emissions.

Variable Outflows from the Frederick House Lake Dam and the Wanatango Falls GS

The Frederick House River at the proposed location of the Wanatango Falls GS currently experiences highly variable flows and levels over the course of any given year due to regulation by the existing Frederick House Lake Dam (FHLD) approximately 10 km upstream. As noted in Section 7.1.2, the FHLD is shut down and not releasing flow on average 100 days per year; during such periods of zero flow, leakage from the stop logs and tributary input result in flows being approximately 2 m³/s and 4 m³/s upon reaching the Wanatango Falls GS site and Neeland’s Rapids, respectively. As the proposed operations at the Wanatango Falls GS facility also involves the regulation of flow, the potential cumulative impacts of having two water control structures in sequence on the Frederick House River are discussed here.

As outlined in Section 5 (Proposed Operating Plan), under the proposed operating restrictions for the Wanatango Falls GS, daily fluctuations in water levels at Neeland's Rapids will not exceed ± 10 cm. This limit will ensure that the Frederick House River downstream of the Wanatango Falls GS is not subject to a larger water level fluctuation than it currently experiences on a regular basis (the existing average 7-day fluctuation at Neeland's Rapids is approximately 23 cm). Furthermore, the amount of water passed through the Wanatango Falls GS in any 24-hour period will be equal to the natural run-of-river flows. This limit on the duration of storage, in conjunction with the maximum ± 10 cm daily fluctuation at Neeland's Rapids, will serve to control the magnitude of variable flow releases from the GS.

Additionally, a minimum of $2 \text{ m}^3/\text{s}$ (Q_{EA} , the environmental flow) will be released downstream at all times when the Wanatango Falls GS is operating intermittently (i.e. shut down at night). This is equivalent to the flow currently passing through the proposed GS site on average 100 days per year, when the FHLD is shut down. In applying this minimum flow requirement, flows downstream of the Wanatango Falls GS will not be decreased any further than what occurs regularly under existing conditions.

Given the above, the Wanatango Falls GS will operate in such a way that the magnitude of fluctuations in flows and levels will generally remain within the range occurring under existing conditions as a result of regulation by the FHLD. Rather, there may be an increase in the frequency of peaking events, e.g. during periods when day-to-day flow releases from the FHLD are relatively stable and there is sufficient inflow into the Wanatango Falls GS' headpond to permit modified run-of-river operations.

Fish Stranding

Even under existing conditions, fish stranding is known to occur at Zevery's Rapids (approximately 500 m downstream of the proposed Wanatango Falls GS) due to rapid reductions in outflows from the FHLD. Although the magnitude of water level fluctuations downstream of the Wanatango Falls GS will generally remain within existing conditions, the increased frequency of peaking raises the possibility that more frequent stranding events may occur if appropriate mitigation measures are not pursued.

As noted in Section 7.3.6, a pathway will be notched from the large pool at Zevery's Rapids in order to mitigate against fish stranding, and monitoring will be conducted to verify the effectiveness of this mitigation measure (see also Section 13.2). If needed, further mitigation will be developed in consultation with MNR and DFO.

With the proposed mitigation measure described above, it is not anticipated that operations at the Wanatango Falls GS will result in cumulative impacts to fish stranding.

Fragmentation of Fish Populations

The preferred option of constructing the Wanatango Falls GS without a fish passage structure will result in a barrier to upstream fish movement, as well as to downstream movement under most flow conditions (some passage may occur over the spillways during relatively high flow, run-of-river operations). This new barrier, in combination with the presence of the existing Frederick House Lake Dam, will result in fish being confined to a 10-km stretch of river between the two dams and separated from the subpopulations downstream of the proposed Wanatango Falls GS.

As noted in Section 7.3.6, Walleye, Sauger and Goldeye are prevalent in the Frederick House River both upstream and downstream of the proposed Wanatango Falls GS site, and sufficient habitat for these species exist for these species on either side of the GS to sustain each subpopulation. Therefore, while the Wanatango Falls GS would add to the existing fragmentation of fish populations, it is not anticipated that these species will be significantly impacted.

In contrast, the isolation of Lake Sturgeon within a 10-km length of river between the FHLD and the Wanatango Falls GS may adversely impact the affected individuals if appropriate mitigation measures are not applied. As such, a capture and relocation program will be implemented in the headpond of the Wanatango Falls GS, in order to ensure that the population of Lake Sturgeon below the FHLD is not further fragmented. With the implementation of the capture and relocation program, in combination with the provision of offsetting spawning habitat below the Wanatango Falls GS, it is not anticipated that the development of the GS will exacerbate the existing level of fragmentation of Lake Sturgeon in the river.

12. KEY REVISIONS TO THE PROPOSED PROJECT SINCE THE ISSUANCE OF THE DRAFT ER

For the convenience of readers who have reviewed the Draft ER for the proposed Wanatango Falls GS, issued in October 2012, the following is a brief overview of key revisions that have been made to the proposal in the past year. The changes were made according to feedback received from regulatory bodies and stakeholders on the proposed project.

Limited Turbine Flow (Q_{TL}) During Intermittent Operations

As noted in Section 5 (Proposed Operating Plan), the proposed Wanatango Falls GS would shut down at night when operating in intermittent mode, in order to accumulate water in the headpond for later release during on-peak periods. When shut down, only the minimum environmental flow (Q_{EA}) of 2 m³/s would be released downstream. In the Draft ER, a limited

turbine flow (Q_{TL}) of 32.5 m³/s was proposed, which would have allowed for outflows from the Wanatango Falls GS to fluctuate by up to 30.5 m³/s during intermittent operations.

With a Q_{TL} of 32.5 m³/s, the largest daily fluctuation in water levels were predicted to occur during typical August flow conditions, at a point approximately 1 km downstream of the facility (see the CPL (2014) report, “HEC-RAS Unsteady Flow Modelling”, in Annex I). At this location, water levels were predicted to fluctuate by 73 cm on a daily basis, while water levels shortly upstream of Neeland’s Rapids were predicted to fluctuate by 30 cm due to intermittent operations.

Subsequent to the release of the Draft ER, the proposed Q_{TL} was decreased to 20 m³/s in order to further reduce the magnitude of fluctuations in the river downstream of the Wanatango Falls GS. With a Q_{TL} of 20 m³/s, and during typical August flows, water levels are predicted to fluctuate by 47 cm on a daily basis at a point approximately 1 km downstream of the facility. Shortly upstream of Neeland’s Rapids, water levels are predicted to vary by 24 cm. In comparison, based on 15-minute interval level logger data (October 2010 to August 2011), the average 7-day fluctuation under *existing* conditions at the same location is 23 cm.

Ramping Rates and Daily Peaking

The ramping rates (ramp up and ramp down) were proposed to be 20 minutes in the Draft ER. Due to concerns relating to fish stranding and safety downstream of the facility, the ramping rates were increased to 60 minutes, as presented in Section 5.5.

Previous operating parameters would also have allowed the possibility of occasionally peaking more than once a day. The current operating plan, as presented in Annex I, sets the limit on daily peaking to a maximum of one peak per day.

Fishway and Bypass Reach

At the time of release of the Draft ER, a fishway was proposed at the Wanatango Falls GS to allow for the upstream and downstream passage of fish past the site. The Draft ER presented conceptual plans showing the proposed location of the fishway, though specifications on flow and design requirements were not yet developed.

During discussions with the proponent in 2013 and 2014, Taykwa Tagamou Nation (TTN) expressed concern regarding the potential impacts on Lake Sturgeon in the river and the proposed incorporation of a fishway into the project design. In particular, TTN noted that Lake Sturgeon as a species generally have difficulty negotiating fish passage structures, and were susceptible to injury when attempting the travel downstream through such structures. As the Frederick House River between the Frederick House Lake Dam and the proposed Wanatango Falls GS would contain little suitable habitat, it was argued that the effort required to provide upstream passage to relatively poor habitat should instead be directed to providing

compensatory habitat downstream. On April 25, 2014, Xeneca formally committed to adopting TTN's preferred approach. As such, the preferred option presented in this ER is to have no fishway and to focus habitat compensation efforts downstream of the dam; conversely, the inclusion of the fishway is presented as the alternate option.

13. MONITORING & FOLLOW-UP PROGRAMS

Proposed monitoring and follow-up programs are presented below. Additional programs may emerge through on-going consultation within the regulatory approvals stages of the development planning.

13.1 CONSTRUCTION MONITORING

Prior to construction, the Construction Management Plan presented in Annex II will be enhanced to incorporate any construction management strategies outlined in the ER and supporting annexes as well as any permit application or federal approval/authorization requirements. The proposed construction monitoring program is presented as Table 36 below.

A final Construction Management Plan will be submitted to the regulators as supporting documentation for construction permits and approvals.

Table 36: Construction Monitoring Program

Environmental and Social Components	Rationale (Potential effects associated with construction activities)	Methods	Timing and Duration	Monitoring Responsibility	Reporting
Compliance with Plans	Compliance with approved drawings, protocols, tender, ER/ES and permit and approval specifications.	All site activities will be reviewed on an ongoing basis and meet with the contractor on a weekly basis to ensure that the contractor is in compliance with requirements.	On-going with one formal meeting per week throughout duration of construction period.	Construction Supervisor and/or Environmental Inspector	Weekly environmental inspection report to the project proponent
Erosion and sediment	Vegetation clearance, temporary or permanent stockpiling from earth-moving activities can change the topographic surface, increase runoff and sedimentation, and result in the water erosion from the inundation area, construction areas, water crossings for the access roads and power line corridors.	<p>Site inspection of water erosion control measures in the inundation area, construction areas, and water crossings on the access roads and in the power line corridors.</p> <p>Visual inspection of all silt fences to ensure they are properly constructed and to assess sediment accumulation behind the fence.</p> <p>River banks in immediate vicinity of each site will be visually monitored for stability.</p>	Weekly and after each heavy rainfall and snowmelt event	Site EHS Supervisor	Weekly report to the project proponent
Surface water quality	Surface water quality may be affected by sediment introduced from the dewatering water collected and treated in a settlement pond.	<p>Water quality will be monitored daily at the settlement pond discharge for pH, temperature, turbidity and TSS.</p> <p>TSS can be monitored weekly once a correlation is established between TSS and turbidity, and is reviewed by the MNR.</p>	Daily or Weekly	Site EHS Supervisor	Weekly report to the project proponent

Environmental and Social Components	Rationale (Potential effects associated with construction activities)	Methods	Timing and Duration	Monitoring Responsibility	Reporting
Wastewater	Improper collection, storage, transportation and offsite treatment of process wastewater in the concrete batch plant may generate impacts to the surface water quality.	Site inspection of the onsite process wastewater storage tank, offsite transportation and treatment records.	Monthly	Site EHS Supervisor	Monthly report to the project proponent
Construction waste	Improper transportation, storage and disposal of excavated construction wastes at the construction areas and stockpile areas can generate impacts to soil, surface water and groundwater quality.	Site inspection of excavated construction material stockpiles at construction sites and the stockpile area at each facility.	Monthly	Site EHS Supervisor	Monthly report to the project proponent
Hazardous waste	Improper transportation, storage and disposal of hazardous wastes at the fuel and chemical storage and handling locations can generate impacts to soil, surface water and groundwater quality.	Site inspection of hazardous wastes transportation, storage and offsite disposal records with a licensed hazardous waste hauler and facility.	Weekly	Site EHS Supervisor	Weekly report to the project proponent
Soil and groundwater	A spill or leakage of fuels or chemicals due to improper handling or storage may cause soil, surface water or groundwater contamination.	Site inspection of the secondary containment areas, spill control plan and materials at fuel and chemical storage and handling locations.	Weekly	Site EHS Supervisor	Weekly report to the project proponent

Environmental and Social Components	Rationale (Potential effects associated with construction activities)	Methods	Timing and Duration	Monitoring Responsibility	Reporting
<p>Natural Vegetation and Terrestrial wildlife</p>	<p>The plant communities at the footprint areas, temporary construction areas, access roads, power line corridors may provide nesting, foraging, breeding and wintering grounds for wildlife and bird species including bats, bald eagle and forest-nesting birds (Canada Warbler, Olive-Sided Fly Catcher, Common Nighthawk, Eastern Wood-Pewee & Rusty Blackbird).</p>	<p>Vegetation clearing in complex habitats (forest) during bird breeding season must be avoided. If limited vegetation clearing in simple habitats has to occur during birds breeding season, commission a third party consultant to conduct a bird survey prior to construction at the proposed vegetation clearing areas, covering Bald Eagle Nesting, Canada Warbler, Olive-Sided Fly Catcher, Common Nighthawk, Eastern Wood-Pewee & Rusty Blackbird.</p> <p>If nests are identified, a certain buffer zone from construction will be provided to protect the nests.</p> <p>Wherever possible, no tree removal will occur during the peak roosting period for bats. This will include the period of May 1 to August 31.</p> <p>If tree removal must occur during this time period, potential bat maternity roost habitat (cavity trees) will be identified and exit surveys will be conducted before removal occurs to confirm no active roosts are present. Exit surveys will follow the Bats and Bat Habitats guidelines authored by the OMNR (2012), which stipulate that a 1.5-hr visual survey should be conducted to confirm use. This survey will be completed within 24 hrs of the tree</p>	<p>Prior to clearing of construction areas</p> <p>- Spring and summer twice a year</p>	<p>Bird and bat survey consultant</p>	<p>Bird and bat survey report to the project proponent</p>

Environmental and Social Components	Rationale (Potential effects associated with construction activities)	Methods	Timing and Duration	Monitoring Responsibility	Reporting
		<p>being removed to limit the possibility of a roost establishing after the survey has been completed.</p> <p>This mitigation measure ensures there will not be an activity carried out in the area while it is being used by a member of the species to carry out a life process related to the hibernation or reproduction, including rearing.</p> <p>Re-vegetation areas will be visually monitored to determine the adequacy of vegetation growth of disturbed areas.</p>			
Aquatic biota	Improper in-stream construction may generate impacts to the aquatic biota.	<p>Monitoring construction works to ensure in-stream construction occur within allowable timing window.</p> <p>The environmental consultant will conduct a fish salvage once the coffer dams are installed. They will stay on-site and continue to salvage fish and any other wildlife as necessary during the dewatering period. This will be repeated for all in-water work areas that will be isolated and drawn down.</p>	<p>Continually through in-stream construction;</p> <p>-prior to final dewatering;</p>	Aquatic biology survey consultant	Aquatic biology survey report to the project proponent
Aquatic Habitat	The temporary construction and operation of cofferdams in the river may generate impacts to fish spawning habitat	All aquatic habitat mitigation measures will be monitored during and immediately following their installation to ensure they have been constructed in accordance with DFO/MNR requirements.	Once following construction of the mitigation measures.	Environmental consultant	Aquatic biology survey report to the project proponent

Environmental and Social Components	Rationale (Potential effects associated with construction activities)	Methods	Timing and Duration	Monitoring Responsibility	Reporting
Air	Construction dust will be generated from the land-clearing, earth works, site preparation and formation, construction activities and the movement of construction vehicles on unpaved construction sites, access roads power corridors, cement transportation, storage and handling in the cement batch plant.	Dust will be visually monitored to assess if excessively dusty conditions are present and dust suppression will be applied.	No specific monitoring frequency – continuous monitoring by the environmental inspector and construction supervisors.	Site EHS Supervisor	Monthly report to the project proponent
Noise	The blasting activities can generate high level noise impacts to the people, the birds and wildlife in the vicinity of facilities.	Noise monitoring at one closest location within 1000 m to the blasting area	During blasting periods	Site EHS Supervisor	Monthly report to the project proponent
Archaeological Areas	There are a few archaeological sites identified adjacent to the project area. They are located greater than 300 m from the construction zone.	Site contractor will be instructed to work within the construction zone. Site inspection will be conducted to ensure the archaeological sites remain undisturbed.	No specific monitoring frequency – continuous monitoring by the environmental inspector and construction supervisors.	Site EHS Supervisor	Monthly report to the project proponent
Access to the river	In-water construction and any terrestrial construction taking place on or adjacent to existing portage trails has the potential to affect enjoyment and use of this amenity by local people.	Site inspection of the access to existing and temporary new portage trails.	Monthly	Site EHS Supervisor	Monthly report to the project proponent

13.2 POST-CONSTRUCTION / OPERATION MONITORING

Xeneca has prepared a conceptual post-construction monitoring table detailing various aspects of monitoring that will be necessary following the completion of the facility. Table 37, below, was prepared based on the suggestions of the project team and the monitoring requirements identified by regulators through the course of the EA. The post-construction monitoring table will be further developed into a comprehensive post-construction monitoring plan through project permitting and approvals following the completion of the EA as detailed design details become available.

Table 37: Wanatango Falls GS Post-Construction Monitoring Plan

Environmental Component Parameter	Monitoring Methodology	Monitoring Frequency and Timing	Trigger for Action	Reporting
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Aquatic Biota and Habitat</p> <p style="text-align: center;">Fish Communities</p>	<p>Post construction fish community sampling is to compare with pre-construction conditions and determine whether fish community and abundance have changed.</p> <p>Fish community sampling will follow the RIN protocol. Nets will be set in the Frederick House River between Frederick House Lake Dam and the Wanatango Falls GS. Nets will also be set below the Wanatango Falls GS to the crest of Neeland’s Rapids in order to determine whether the fish community downstream has been impacted.</p> <p>(This sampling will provide specimens for analysis of fish tissue mercury concentration and structures for aging analysis.)</p>	<p>Fish community sampling will occur in years 3, 6 and 9 of facility operation.</p>	<p>Should the fish community monitoring results reveal substantial changes in the fish community that are of concern for the fisheries management objectives for the Frederick House River, Xeneca will discuss appropriate mitigation strategies with MNR. Appropriate mitigation strategies will be developed as appropriate in the context of the various aspects of resource use that affect the fish community in the Frederick House River.</p> <p>Possible mitigation strategies include reducing the rate of headpond level changes during specific months of the year, which can be achieved by increasing the minimum flow or decreasing the maximum flow. Another consideration would be whether changes to the fish community are caused by impacts on recruitment. In this case, modification to the offsetting fish habitat may be an option. Fish stocking could also be a viable management option for a valued species such as walleye.</p>	<p>The results will be submitted to MNR annually for each monitoring year.</p>



<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Aquatic Biota and Habitat</p>	<p>Benthic Invertebrates</p>	<p>Monitoring benthic invertebrates will provide a means of understanding the extent and nature of changes to the aquatic ecosystem. Benthic invertebrate sampling will be completed at all fast water habitats surveyed during baseline study including 8.5 and 8.1 km upstream of the GS, at Wanatango Falls proper, in the east and west channels at the proposed GS location and at Zevery's Rapids, and additional sampling at Neeland's Rapids.</p> <p>Sampling for benthic invertebrates will occur on one occasion during the monitoring year using Hester-Dendy artificial substrate samplers (H-D sampler).</p> <p>In addition to the sampling of benthic invertebrates, basic habitat information such as wetted width, depth and hydraulic head will be collected at the location of the H-D samplers. Sampling will also be coordinated with hydrologic monitoring to facilitate association of benthic results with the hydrology at the location of the H-D samplers.</p>	<p>Sampling will occur once in years 1, 3, 6 and 9 of facility operation.</p>	<p>Should results reveal changes in the benthic community that are of concern, Xeneca will discuss appropriate mitigation strategies with MNR. Possible mitigation strategies include reducing the rate of headpond level changes during specific months of the year, which can be achieved by increasing the minimum flow or decreasing the maximum flow. A different approach would be to alter the riffle habitat to maintain a greater wetted area during minimum flow conditions.</p>	<p>The results will be submitted to MNR annually for each monitoring year.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Aquatic Biota and Habitat</p>	<p>Upstream Lake Sturgeon capture and relocation program</p>	<p>Xeneca has agreed to avoid population fragmentation by removing the small population of Lake Sturgeon upstream of the proposed GS and relocating them to the downstream reach of the Frederick House River below the proposed GS location.</p> <p>RIN nets will be utilized to capture Lake Sturgeon between Frederickhouse Lake Dam and the Wanatango Falls GS in August. All captured sturgeon will be tagged and transported downstream of Zevery's Rapids.</p>	<p>First five years of facility operation.</p>	<p>If after the first 5 years of monitoring, there exists concern that Lake Sturgeon still remain upstream of the Wanatango Falls GS, Xeneca will continue the monitoring program for an additional year. Subsequent years of monitoring may be required if Lake Sturgeon are continuously being captured. Appropriate mitigation strategies will be discussed with Fisheries and Oceans Canada (DFO) and the Cochrane District MNR.</p>	<p>The results will be submitted to DFO and MNR annually for each monitoring year.</p>

	<p>Offsetting Fish Habitat)</p>	<p>Fish habitat will be constructed in the Frederick House River downstream of the Wanatango Falls GS at Zevery's Rapids as well as within the tailrace area below the Wanatango Falls GS. Monitoring is necessary to determine if the spawning habitats are functioning as intended by the design.</p> <p>Surveys will be completed during spawning periods for walleye, sauger and lake sturgeon. The protocol includes the use of methods such as gill netting and visual surveys for presence of spawners, collection of eggs through use of artificial substrates such as eggs mats and larval drift surveys. Walleye spawning surveys will follow methods outlined in the Natural Environment Characterization and Impact Assessment Report (NRSI 2014, in Annex III of this ER) and include similar protocols outlined for Lake Sturgeon.</p>	<p>First five years of facility operation.</p>	<p>If the compensation fish habitat is not functioning as intended, Xeneca will discuss appropriate mitigation strategies with DFO and MNR. There would be a variety of options to modify the habitat. For example, additional large boulders could be placed in order to provide more resting areas for spawning fish and/or to provide greater variety of water velocities. Similarly, additional large or small substrate material could be placed in order to change the substrate composition, initially in a portion of the spawning bed in order to test success.</p>	<p>The results will be submitted to DFO and MNR annually for each monitoring year.</p>
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<p>Aquatic Biota and Habitat</p>	<p>Offsetting Fish Habitat (With Fishway Option)</p>	<p>If DFO and MNR require that offsetting by located in the same reach of the river as it is being lost, for instance to replace habitat within the rapids at the Wanatango Falls GS location and at Wanatango Falls proper that is being inundated or impacted by footprint areas of the GS, fish habitat will be constructed in the Frederick House River upstream of the Wanatango Falls GS outside of the inundation area and downstream of the Frederick House Lake Dam as well as within the tailrace area below the Wanatango Falls GS. Monitoring the effectiveness of all aquatic compensation habitats constructed will occur in order to ensure that habitat is functioning as intended.</p> <p>Surveys will be completed during spawning periods for walleye, sauger and lake sturgeon. The protocol includes the use of methods such as gill netting and visual surveys for presence of spawners, collection of eggs through use of artificial substrates such as eggs mats and larval drift surveys. Walleye spawning surveys will follow methods outlined in the Natural Environment Characterization and Impact Assessment Report (NRSI 2014, in Annex III of this ER) and include similar protocols outlined for lake sturgeon.</p>	<p>First five years of facility operation.</p>	<p>Should results reveal that habitat is not functioning as intended or that identified objectives are not being realized Xeneca will discuss strategies with DFO and MNR to ensure that the desired habitat function is achieved and objectives are met.</p> <p>There would be a variety of options to modify the habitat. For example, additional large boulders could be placed in order to provide more resting areas for spawning fish and/or to provide greater variety of water velocities. Similarly, additional large or small substrate material could be placed in order to change the substrate composition, initially in a portion of the spawning bed in order to test success.</p>	<p>The results will be submitted to MNR and DFO annually for each monitoring year.</p>
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	<p>Fish Spawning</p>	<p>Monitoring of Walleye, Sauger and Lake Sturgeon spawning will occur throughout the Study Area in habitats where velocity and depth have been predicted to remain within the preferred range for spawning.</p> <p>The methods in “Lake Sturgeon and Waterpower: Data Collection and Sampling Protocols for Mitigation Effectiveness Monitoring” will be followed for lake sturgeon spawning surveys. Walleye and sauger spawning surveys will follow a similar protocol outlined in the Natural Environment Characterization and Impact Assessment Report (in Annex III of this ER). Methods described above for the monitoring of offsetting habitats will also be employed for the monitoring of existing spawning habitats.</p>	<p>First 5 years of operation.</p> <p>If lake sturgeon spawning is not observed in the first 5 years, spawning surveys will be completed for a 2 year period every 3 years.</p>	<p>If the spawning habitat is not functioning as expected, Xeneca will discuss appropriate mitigation strategies with DFO and MNR. There would be a variety of options to modify the habitat. For example, additional large boulders could be placed in order to provide more resting areas for spawning fish and/or to provide greater variety of water velocities. Similarly, additional large or small substrate material could be placed in order to change the substrate composition, initially in a portion of the spawning bed in order to test success.</p>	<p>The results will be submitted to MNR and DFO annually for each monitoring year.</p>
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Aquatic Biota and Habitat</p>	<p>Nursery Habitat</p>	<p>Monitoring of vegetation both upstream and downstream of the GS is not only required to determine that vegetation is re-establishing in the upstream and persisting in the downstream. It will also determine whether nursery habitat will be present for larval fish.</p> <p>Sampling for YOY and juvenile fish within the nursery habitat will be completed in conjunction with aquatic vegetation surveys to confirm its use. Minnow traps will be set overnight, in areas where aquatic vegetation has been identified along the margins and within backbays and tributary mouths.</p>	<p>Between July 15 and August 15 in years 1, 3 and 6 of facility operation.</p>	<p>If it is determined that vegetation is not re-establishing or persisting and that nursery habitat is being impacted, Xeneca will discuss appropriate mitigation strategies with DFO and the Cochrane District MNR. There exists the potential to offset the loss of nursery habitat. This can be done through the strategic placement of additional cover such as woody debris or cobbles along the margins of the river. It is also recommended that vegetation clearing within the back bay and wetland areas within the headpond be minimized in strategic areas. Areas recommended to not be cleared would be small back bay or wetland areas.</p>	<p>The results will be submitted to DFO and MNR annually for each monitoring year.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Aquatic Biota and Habitat</p>	<p>Fish Passage (If required)</p>	<p>In the event that, following additional consultation between Xeneca, TTN, DFO and MNR in regards to the fishway structure, Xeneca is required to construct both a fishway and a fish slide in the design for the purpose of allowing for the maintenance of upstream and downstream fish passage. Monitoring of upstream and downstream movement of fish species after dam construction is to determine the effectiveness of fish passage.</p> <p>Fish passage will be monitored both upstream and downstream of the Wanatango Falls GS. Radio telemetry method will be used for tracking both upstream and downstream movement of fish to ensure passage is occurring in both directions. Radio tagged fish will be tracked using radio receiving base stations strategically placed both upstream and downstream of the Wanatango Falls GS. The fishway will also require routine monitoring to determine the maintenance of the riffle pool structure.</p>	<p>First 5 years of operation.</p>	<p>If the fish passage provision is not functioning as intended, Xeneca will discuss appropriate mitigation strategies with DFO and the Cochrane District MNR. For example, there are specific techniques that can be employed to attract fish to the fishway entrance and similarly deter fish from approaching other areas. Different methods that have been used with mixed success at other facilities include the use of lights and sounds. Xeneca is committed to experimenting with a variety of such methods with the objective of providing successful passage. Maintenance will be performed if erosion or destruction of any part of the fishway occurs. This may involve replacing lost substrates or rebuilding side walls and slopes.</p>	<p>The results will be submitted to DFO and MNR annually for each monitoring year.</p>



Aquatic Biota and Habitat	Fish Stranding	<p>Fish stranding will be monitored at Zevery's Rapids to determine whether the mitigation measure by notching out the bedrock pool to create drainage of this pool back into the main channel is functioning effectively and whether fish stranding is continuing to occur in other isolated pools at Zevery's Rapids.</p> <p>Monitoring at Neeland's Rapids will be conducted as well to determine whether or not isolated pools form during rapid draw downs and if fish are in fact being stranded in those pools.</p> <p>Visual observation of fish stranding will be conducted during the ramping down period of daily operations for all fish species.</p>	Year 1 of operation, and continue in year 2 if stranding is found in year 1.	Should fish stranding be identified as an issue, possible mitigation measures include habitat adjustments at problem areas to provide a pathway for stranded fish to reach the flowing water. Another option would be to adjust the operations such that flow is reduced at a slower rate to provide more time for fish to escape areas being dewatered.	All occurrences of fish stranding will be reported to MNR annually for each monitoring year.
	Fish Entrainment and Impingement	<p>Fish mortality from entrainment and impingement will be monitored to determine whether entrance velocity and trash rack spacing is adequate to mitigate fish mortality from entrainment and impingement.</p> <p>Entrainment and impingement will be monitored on a regular basis through the set-up of cameras. Cameras will be directed towards the area below the tailrace to visually inspect fish mortality from entrainment. The trash racks should be inspected routinely for impingement. This will be done when staff are onsite for other maintenance or monitoring activities.</p>	Should occur in the first year following construction.	<p>Should a significant number of dead or injured fish be observed as result of turbine mortality, operations should be modified or ceased immediately and both MNR and DFO notified. This will ensure that no further mortality or injury occurs while a thorough investigation is conducted by the proponent in cooperation with MNR and DFO. Once the cause of injury or death is determined an appropriate response can then be determined in consultation with the agencies.</p> <p>Should entrainment or impingement prove to be a threat to species such as walleye, northern pike or lake sturgeon, potential modifications such as lighting, electrical barriers, air bubbling and sound barriers can be made.</p>	The results will be submitted to MNR immediately when fish mortality is observed.



Vegetation and Significant Wildlife Habitat	Aquatic Vegetation Surveys	<p>Within the headpond it is anticipated that water tolerant and emergent species will establish at the Normal Operating Level of 259.0 m and extend into the headpond down to 258.75 m. The biologist has identified a number of locations within the headpond area that may establish marsh habitats along the NOL post-construction. These areas along with the margins of the existing wetland communities will be monitored to verify the prediction that a comparable amount of wetland habitat may establish post-construction.</p> <p>The areas that will be monitored in downstream are the existing four wetlands between Neeland’s Rapids and the proposed Wanatango Falls GS and two back channels that were characterized by an abundance of aquatic vegetation to verify the prediction that two wetlands may be impacted.</p>	One year pre construction study within the upstream and downstream identified wetlands, and subsequently during years 1, 3 and 6 of operations.	Should monitoring determine that the EA predictions are incorrect, Xeneca will discuss the findings with MNR and determine whether appropriate mitigation strategies is required at that time.	The results will be submitted to MNR annually for each monitoring year.
	Significant Wildlife Habitat for River Otter	<p>Post-construction monitoring of River Otter Denning Site SWH will be conducted to determine if river otters continue to use the headpond area post-construction. Presence/absence survey will be conducted in the headpond area for first five years of facility operation. All observed individuals will be followed to their den site, if possible, to confirm the location of a den site. In the absence of any river otter observations in years 1 through 5, the MNR and local trappers will be contacted to see if they have any records of otters from the headpond area.</p>	First five years of facility operation.	Should surveys identify that river otter denning habitats are being adversely impacted, Xeneca will discuss appropriate mitigation strategies with the MNR. Possible strategies include further constraining the daily water level fluctuations, and possible mitigation strategies to those river otter prey species being adversely impacted.	Results will be reported to MNR after years 1, 3 and 5 of post-construction data collection.



Operation	Water Levels	<p>The headpond water level will be monitored from a water level gauge located on the upstream side of the powerhouse. The gauge will be connected via real-time Supervisory Control And Data Acquisition (SCADA) system so that compliance can be checked at real time and operation be adjusted accordingly if the facility is outside of the compliance bounds. Instantaneous flows at these locations will be monitored at 15 minute intervals.</p> <p>(See ER document Section 5.7 Compliance Considerations)</p>	<p>At 15 minute intervals for duration of facility lifetime.</p>	<p>An operating system will be designed to include an alarm to notify the operator when water level deviates outside the target operating range. The facility inflow and outflow will be adjusted until the level returns to the target operating range. An Incident Report following standard compliance procedures outlined by MNR will be submitted.</p>	<p>The results will be submitted to MOE and MNR annually.</p>
		<p>One water level monitoring station will be installed at the downstream limit of the downstream zone of influence (DZOI) which is just upstream of Neeland’s Rapids. Downstream daily water level fluctuation will be monitored at this location to ensure it will not exceed ± 10 cm at this location during the modified run of river operation of the project.</p>	<p>At 15 minute intervals for duration of facility lifetime.</p>	<p>This information will be closely monitored and evaluated during the first few years of operation, which will help to calibrate and understand the magnitude of water level fluctuation during the intermittent operation of the generating station. After this information is calibrated and verified, data will be downloaded and evaluated annually to make sure that the level fluctuation does not exceed the commitment.</p>	<p>The results will be submitted to MOE and MNR annually.</p>
		<p>One water level monitoring station will be installed at Hwy 11 west of the Town of Cochrane, as MNR requested.</p>	<p>At 15-minute intervals for duration of facility lifetime.</p>	<p>Not applicable. This is additional information that will be collected as per MNR request.</p>	<p>The results will be submitted to MNR annually.</p>

Operation	Flow Rates	Total instantaneous discharge readings would be a combination of gauged/ measured flows through the facility and calculated discharge from the spillways, and if required, fishway and fish slide pipe (see also Section 5.8 Compliance Considerations).	At 15-minute intervals for duration of facility lifetime.	An operating system will be designed to include an alarm to notify the operator when the flow rate deviates outside the target operating range. The facility inflow and outflow will be adjusted until the flow rate returns to the target operating range. An Incident Report following standard compliance procedures outlined by MNR will be submitted.	The results will be submitted to MOE and MNR annually.
	Surface Water	Water temperature and dissolved oxygen	Water temperature in the headpond will be monitored on an hourly basis and this data will be reported with the flow and water level reading data (see also Section 5.8 Compliance Considerations).	Hourly data will be monitored for duration of facility lifetime.	If thermal condition changes, the results will be reviewed with MOE/MNR to develop an adaptive management plan.
		A temperature and dissolved oxygen profile with measurements taken every meter of depth will be conducted three times a year at the impoundment to identify if thermal stratification and decreased dissolved oxygen is occurring in the impoundment if sufficient water depths permit such an assessment. (See also Section 4.2 of the “Pre-Development Water Quality and Mercury in Fish Tissue” report in Annex IV of this ER)	First three years of operation.	If thermal stratification and decreased dissolved oxygen occurs as a result of the facilities, an adaptive management plan will be discussed with MOE and MNR where mitigation measures could include bottom drawer from multi-level draw systems or increased headpond flushing rates. Facility affected vs. natural changes in water quality will be assessed with upstream reference water quality samples during facility operation.	The results will be submitted to MOE and MNR annually for each monitoring year.

Surface Water	Surface Water Quality	<p>Samples will be collected from the upstream reference, impoundment, and immediately downstream of the facility. Parameters below will be measured:</p> <ul style="list-style-type: none"> • pH, conductivity, alkalinity; • Total Suspended Solids (TSS) and Total Dissolved Solids (TDS); • Cations (Mg, Na, Ca, K); • Anions (Cl, SO₄); • Dissolved Organic Carbon (DOC); • Total phosphorus; • Nitrate, nitrite, ammonia and total Kjeldahl nitrogen (TKN); • Total metals; • Low level total mercury (0.1 ng/L detection limit); and, • Low level methyl mercury (0.02 ng/L detection limit). <p>Water temperature, dissolved oxygen, pH and conductivity and turbidity will be measured in the field using YSI model 650 TDS multi-meter.</p> <p>(See also Section 4.2 of the “Pre-Development Water Quality and Mercury in Fish Tissue” report in Annex IV of this ER)</p>	<p>Post-development water quality samples will be collected three times a year during the spring freshet, the summer low-flow period and the fall mid-flow periods in years 1, 2 and 3 following development, as recommended by MOE 2012.</p>	<p>Should monitoring identify that water quality including dissolved oxygen is impacted, Xeneca will discuss the matter with MOE to determine if additional sampling or investigation into the source of the changes is necessary and develop appropriate mitigation strategies.</p>	<p>The results of the post-development monitoring will be compared to pre-construction conditions and reported to MOE annually for each monitoring year.</p>
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Mercury</p>	<p>Fish Tissue Mercury Concentrations</p>	<p>Fish sampling will be conducted according to the MNR RIN protocol and recommendations of MOE Permit To Take Water Guideline 2012.</p> <p>Large fish: total mercury – 10 samples; methyl mercury – 5 samples, of at least 25 to 55 cm length;</p> <p>Forage fish: total mercury and methyl mercury – 5 composite samples, of 5 to 10 individuals of yearling perch or other cyprinid species.</p> <p>Fish will be sampled from immediately downstream of the OPG dam, the impoundment, and downstream of the Wanatango Falls facility to assess project impacts.</p> <p>(See Section 4.3 of the Surface Water Quality Report Fish Sampling in Annex IV)</p>	<p>Sampling will be conducted in years 1, 2, 3, 6 and 9 of facility operation (forage fish) and 3, 6 and 9 (large fish) to assess mercury accumulation in fish tissue.</p>	<p>Fish tissue mercury is anticipated to increase for a number of years post-development. The monitored results will be provided to the MOE mercury consumption advising program. If the mercury level is not attenuated to background levels after 9 years, the monitoring program will be extended.</p>	<p>The results of the post-development sampling will be compared to baseline results and reported to MOE annually for each monitoring year.</p>
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Erosion and Sedimentation Control</p>	<p>A comprehensive monitoring plan has been developed focusing primarily on channel adjustments and sediment movement within the zone of influence in order to detect any accelerated erosion that may potentially occur due to dam operations.</p> <p>Two benchmarked cross-sections will be placed within the backwater reach of the proposed facility, and two will be in the transition zone downstream of the dam.</p> <ul style="list-style-type: none"> • Pebble counts will be collected at each of the control sections, where possible. In deeper sections of the headpond, grab samples of bed sediment should be collected at 3 locations along the cross-section. • Photography stations will be established for photographically monitoring key slopes and erosion sites over time. <p>Additionally, a series of erosion pins will be installed on the banks at each station. TSS will be measured as well for direct measure of suspended sediment movement.</p> <p>(See the Geomorphology Report in Annex I)</p>	<p>First 5 years of operation, and then year 7 and year 10.</p>	<p>Should the monitoring program identify that significant erosion or sedimentation is occurring, a detailed study will be carried out to determine the cause. If it is due to facility operation, an adaptive management plan will be developed with agencies to modify operations or provide physical shoreline protection measures.</p>	<p>The results of the post-development monitoring will be compared to pre-construction conditions and reported to MOE and MNR annually for each monitoring year.</p>
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<p style="text-align: center;">Ice Scour</p>	<p>The proposed Wanatango Falls GS Project has some potential for ice scour and resulting erosion and sedimentation due to the prevalence of clay/silt substrate along most shorelines.</p> <p>Post-construction monitoring will be conducted for areas which are most susceptible to adverse ice scour impacts and potential ice dam locations (bends in the river, islands, promontories) to examine whether the Wanatango Falls GS Project results in additional damming and/or scour events.</p> <p>Visual inspection of ice scouring at the headpond and downstream ZOI will be documented with photographs taken to determine if and how much ice breakage and wedging occurs.</p>	<p>Years 1, 3, 5, 7 and 10 of operation.</p>	<p>Based on the results of the assessment, the operating plan will be adjusted to mitigate where a significant adverse effect is determined to occur as a result of modified run-of-river operations.</p>	<p>The results will be submitted to MOE annually for each monitoring year.</p>
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14. REGULATORY APPROVALS AND PERMITS

Following the successful completion of the EA and the completion of detailed engineering design, the proponent will make application to various federal, provincial and municipal agencies for regulatory permits, approvals and authorizations. These permits, approvals and authorizations are required before site preparation or construction, or prior to the commissioning of the facility. A list of the regulatory permits that may be required for this undertaking is presented below in Table 38.

Table 38: List of Potential Regulatory Approvals

Permit and Legislative Requirement	Agency
Federal	
Authorization to conduct a Work, Undertaking or Activity resulting in the serious harm of fish - <i>Fisheries Act</i> [Section 35]	Fisheries and Oceans Canada
<i>Species at Risk Act</i> (SARA) – authorizations, as applicable	Fisheries and Oceans Canada; Environment Canada
<i>Explosives Act</i> - Temporary Magazine Licence	Natural Resource Canada (NRCan)
<i>Navigation Protection Act</i>	Transport Canada
Provincial	
<i>Lakes and Rivers Improvement Act</i> (LRIA) – Section 14 - Location Approval and Plans and Specifications Approval	Ministry of Natural Resources
<i>Lakes and Rivers Improvement Act</i> (LRIA) – Section 23.1 - Water Management Plan amendment	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Work Permits (Parts 1-5, as required).	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Land Use Permit or Licence to Construct	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Licence of Occupation	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Water Power Lease Agreement	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Grants of Easements (Policy PL 4.11.04)	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Crown Lease	Ministry of Natural Resources
<i>Fish and Wildlife Conservation Act</i>	Ministry of Natural Resources
Scientific Collection Permit	Ministry of Natural Resources
<i>Endangered Species Act</i> (ESA) – permits and agreements, as applicable	Ministry of Natural Resources
<i>Crown Forest and Sustainability Act</i> (CFSA) - Forest Resource Licence and	Ministry of Natural

Overlapping Licence Agreement	Resources
<i>Crown Forest and Sustainability Act (CFSa) – Use/maintenance agreement</i>	Ministry of Natural Resources
<i>Forest Fires Prevention Act (FFPA) - Burn permit on Crown Land</i>	Ministry of Natural Resources
<i>Aggregate Resources Act (ARA) – Aggregate Permit</i>	Ministry of Natural Resources
Permit to Take Water – <i>Ontario Water Resources Act</i> (Section 34)	Ministry of the Environment
Environmental Compliance Approval (ECA) (<i>Environmental Protection Act</i> - Industrial Sewage, Section 53; Air and Noise, Section 9; Waste Generator Registration, Section 18(1), Ontario Regulation 347)	Ministry of the Environment
Waste Generator Registration – <i>Environmental Protection Act</i> [Section 18(1)], Ontario Regulation 347	Ministry of the Environment
Notice of Project and Registration of Contractors – Construction Regulation 213/91	Ministry of Labour
<i>Ontario Energy Board Act (OEBA) - Electricity Generation Licence Potentially leave to construct (section 92) and Wholesaler license if power connected. Note would also require market authorization from the IESO if power connected.</i>	Ontario Energy Board
Municipal	
Road Use Agreement	Municipality
Building Permit	Municipality
<i>Fire Protection and Prevention Act (FPPA) - Burn Permit</i>	Municipality

15. COMMITMENTS

The following commitments are made by the proponent, Xeneca Power Development Inc. in order to ensure the development of a sustainable waterpower project;

General

- The proponent is committed to ensuring compliance with the ER as a contract with the people of Ontario.
- The proponent is committed to the adoption and application of the mitigation measures outlined within this document for both the construction and operation of the proposed undertaking according to applicable legislation (i.e. adherence to Construction Management Plan and best management practices, such as applicable DFO Ontario Operational Statements as listed at <http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territoires-territoires/on/index-eng.htm>). This may be achieved through the hiring of an environmental inspector for the duration of the construction program and through operator training on environmental issues within the operational phase of the project.
- The proponent will apply the mitigation measures for erosion and sedimentation presented in the Preliminary Erosion and Sediment Control Plan (see Annex II). Such mitigation measures include phasing construction to minimize the duration of soil exposure, maximizing the retention of existing vegetation cover, installing silt fences around stockpiles of erodible material, and monitoring the effectiveness of the mitigation measures throughout the construction period. The proponent will develop a detailed Erosion and Sediment Control Plan before the start of the construction phase for the proposed undertaking.
- The proponent is committed to designing offsetting habitat for fish spawning in cooperation with the Agencies/Departments once the engineering details for the project have been advanced during the permitting phase of the project.
- The proponent is committed to the development and implementation of a regular reporting process including a Project Implementation Report.
- A long term fish tissue mercury monitoring program will be implemented to ensure that consumption advisories on sport fish are published, if necessary.
- The proponent will be responsible for the repair of roads and water crossings that may be damaged as a result of the proposed project.
- The proponent is committed to installing a monitoring station at Neeland's Rapids to ensure compliance.
- The proponent is committed to statements made in the Construction Monitoring Program (Table 36) and the Post-Construction monitoring plan (Table 37) above.

Facility Operations

- The proponent is committed to verifying the specific operational parameters in consultation with regulators and to documenting any updates in the operational plan for the facility.
- Effects of fluctuating flows on the downstream aquatic ecosystem will be monitored, and ramping rates adjusted if deemed necessary.
- Special operating restrictions will be implemented during key life stages of walleye and lake sturgeon (see the proposed Operating Plan in Annex I).
- Daily water level fluctuation due to operation will not exceed a magnitude of ± 10 cm of the daily average 24 km downstream of the facility. Compliance with this commitment will be demonstrated through ongoing monitoring.
- When drought is declared by the Province, the facility will go into run-of-river operation.
- The operation of the facility will be aligned with the existing Abitibi River WMP following construction of the dam. The approved Operating Plan will become part of the Abitibi River WMP through a *Lakes and Rivers Improvement Act*, Section 23.1, Water Management Plan amendment. After the approval of the amendment by the Minister, Xeneca will participate in the Abitibi River WMP process.
- The proponent will hire a qualified third party to assess safety at the project site; additionally, during safety review and audit, the proponent will consult with stakeholders on access and resource use.

Consultation

- The proponent is committed to continuing to engage specific stakeholders on relevant issues after the issuance of the Notice of Completion and Statement of Completion.
- The proponent is committed to sharing all information from studies as well as the operational strategy proposed for the site with interested First Nation, Aboriginal and other communities.

Work Progress Updates

- The proponent will further refine the Construction Management Plan after advanced project design.
- The proponent has planned to undertake a Stage 3 Archaeological Assessment as required by the *Heritage Act*, and the proponent's archaeologist will follow all guidelines and standards issued by the MTCS with respect to Aboriginal consultation. The completion of the Stage 3 (and if required, Stage 4) assessment is planned to be completed in the Spring of 2015. This may occur prior to construction activities as approved by the MTCS.

- The proponent will assess geotechnical drilling cores for ARD potential as part of the construction testing program and provide these results to the MOE and Environment Canada.

Mercury Monitoring

The pre- and post-construction water quality and mercury-in-fish monitoring programs (see Section 13.2) for the Project will provide information to warn and safeguard the public from possible mercury increases and provide data to inform future mercury models. Again, it is emphasized that mercury in the environment is ubiquitous and most sources of mercury, i.e. from coal generation or steel production or mining are not associated with local water power generation and represent a significant portion of background mercury levels in biota and fauna in Northern Ontario. The cycle of mercury increase, stabilization and decrease in surface water and fish in the area of the Project will be monitored as described by Hutchinson Environmental Sciences Ltd. (Annex IV). Conditions after development will be regularly compared to pre-development conditions to measure change. The water quality in the Project area will also be compared to upstream reference conditions just below the OPG dam to differentiate natural variation from project-related changes. The monitoring program includes an early warning component that identifies if forage fish low in the food chain are showing signs of increasing or decreasing mercury, providing information on the trend(s) of the change so that mitigating action such as changes to fish consumption guidelines can be implemented in a timely fashion.

16. CONCLUSIONS

Xeneca proposes to construct and operate the Wanatango Falls GS on the Frederick House River. This document describes the EA carried out as part of the planning process for the proposed project.

Throughout the environmental planning process, Xeneca has endeavoured to understand the environment in which the project would be built by undertaking an extensive information and data collection program. Data on areas of the environmental setting of the project was collected by discipline experts including:

- Stage 1 and 2 archaeological assessments (Stage 3 Assessment at planning phase at the time of writing of this report);
- A natural environment characterization and impact assessment;
- Erosion study on the riverine system in the zone of influence;
- Database analysis, mapping exercise and wetland assessment and flyover to route the power line and access roads;
- A statistical analysis of historical hydrological data;

- A hydraulic model study analysis;
- Conceptual engineering design; and
- Baseline surface water quality investigation.

A comprehensive agency and public consultation program also contributed key information towards the identification of the potential adverse and positive environmental effects of the project. While Xeneca is committed to continuing the discussion with local groups, it is anticipated that any identified issues can be resolved. Agency/Department approval for the proposed operating strategy and permitting and authorizations in support of construction will be sought following consultation with regulators and incorporated into the final design of the facility and its components.

Aboriginal and FN engagement was undertaken with each community's leadership as part of the business-to-business Aboriginal consultation initiative by the proponent. A comprehensive engagement initiative with each community located within, or having traditionally used the project area has been underway since issue of the Notice of Commencement and will continue beyond Notice of Completion and into project implementation.

The Stage 1 archaeological assessment of the project determined the potential for archaeological resources to be present in the project area. The Stage 2 Assessment confirmed the presence of archaeological/cultural resources, but as these are located more than 300 m away from the proposed construction areas, a partial clearance for the construction at the Wanatango Falls GS was granted by the MTCS. Aboriginal consultation required under the Stage 3 provincial standards has been initiated. The Stage 3 Assessment will be initiated in the spring of 2015.

Throughout this document, management strategies have been developed and applied to known impacts in order to avoid, prevent or minimize any identified adverse environmental effects of the project. It is the conclusion of this environmental assessment that the planned undertaking will result in residual adverse effects. An analysis of the identified residual adverse environmental effects was undertaken to determine their significance, and commitments for any required additional measures for the further management of these potential residual effects have been made.

The majority of the identified adverse effects were determined to be "not significant", meaning that they are not likely to cause unacceptable harm to environmental quality, productive capacity of the affected environment, or the socio-economic and cultural attributes of the area.

It is acknowledged that the construction of the Wanatango Falls GS has the potential to result in the Serious Harm to fish related to project activities, and it is therefore likely that an authorization under the *Fisheries Act* will be required.

The proposed offsetting for these anticipated impacts will be developed and discussed with DFO once the engineering details for the project have been advanced during the permitting phase of the project. It is expected that with the proposed mitigation measures and the provision of offsetting habitat, the significance of residual effects associated with the project will be reduced to a non-significant level.

There are also many positive environmental effects associated with the project which are considered to off-set the adverse environmental effects associated with the project, these include:

- Tangible Economic Outcomes for the Local Communities and the Regional / Provincial Economy:
 - Benefit to the local SFL holder by sale/processing of merchantable timber along the power line and access road ROWs, and the merchantable timber to be harvested from the area of inundation.
 - Job creation during construction both directly and indirectly in the Northeastern Region of Ontario. Direct employment (construction only) for waterpower projects is estimated at 10,000 person hours per MW; indirect jobs multiply by 1.5; and up to two part time jobs will be available in the operation and maintenance of the facility.
 - An increase in economic activity (direct and indirect) to build the project procuring everything from consulting and legal services to concrete, steel, trucking and other services such as lodging, food and fuel. The majority of this activity will be created within the local/regional economy.
- Employment and training opportunities (planning, construction and operation phases of the project);
- Creation of reliable and secure green energy for the province and reduced Greenhouse Gas emissions:
 - The project will reduce CO₂ emissions by eliminating the need for an equivalent amount of electricity to be produced through the combustion of fossil fuels.
 - Benefits to the population, commerce and industries of Ontario by providing more reliable and consistent renewable power to the provincial grid for many years to come. Many power plants built in the early 1900s are still in operation and with regular maintenance and upgrades can last for generations to come.
 - The operation of the facility in the existing power grid will be compatible with the overall power system reliability and power quality (voltage and frequency) objectives while improving distribution customer service reliability in this area, from a sustainable and consistent power source.
- The generation of electricity through a renewable energy supply in support of the province's *GEA*.

Preliminary planning discussions towards the development of various management strategies are outlined in this document, and the proponent will continue to work with the regulators and other interested parties in support of securing approvals for this undertaking. The application of the recommended management strategies and adherence to the identified commitments by the proponent will help to realize a sustainable renewable energy development project.

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