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Ontario Power Generation Inc.

PROPOSED CALABOGIE GENERATING STATION REDEVELOPMENT PROJECT

Socio-Economic Technical Support Document
Final

March 2020

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Socio-Economic
Technical Support Document – Final

Phil Shantz
Vice-President, EVP Lead, Environmental Planning (Canada)

Stephanie Dryden-Cripton
Project Environmental Assessment Planner

Prepared for:

Gillian MacLeod
Ontario Power Generation Inc.
700 University Avenue
Toronto, ON M5G 1X6

Prepared by:

Arcadis Canada Inc.
121 Granton Drive
Suite 12
Richmond Hill, Ontario L4B 3N4
Tel 905 764 9380

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EXECUTIVE SUMMARY

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). Constructed in 1917, the original station had an installed capacity of 5 megawatts (MW). The existing Calabogie GS is over one hundred years old and was at the end of its life prior to the tornado that hit the GS in September 2018. The GS has not operated since that time. OPG intends to redevelop the site and increase the station's capacity to approximately 11 MW.

The proposed Project is located in the Village of Calabogie, Township of Greater Madawaska, Renfrew County, Ontario. The Project involves the demolition of the existing powerhouse and forebay inlet structure and the construction of a new powerhouse with integral intake structure and tailrace. Other ancillary facilities will also be constructed. The Project may also involve the construction of additional sluiceway capacity. This Technical Support Document (TSD) assesses the potential social and economic effects of the Project, as well as effects on local land use and resource policy.

The proposed Project will result in an increase of slightly over 6 MW of power over the old station. In total 11 MW of power would provide energy for slightly over 11,000 homes in Ontario.

The proposed Project is expected to result in the creation of approximately 162 to 185 person years of work over an approximately two-year construction period. This employment will be distributed across a wide variety of professions and trades typically associated with a heavy construction project. Recent OPG experience in constructing hydroelectric projects in Northeastern Ontario demonstrated that approximately 60% of the total labour requirement for the on-site work was met by the labour market in northeastern Ontario. Given the greater labour pool and that the Design-Build Contractor (DB Contractor) includes a local/regional heavy construction firm it is anticipated that most of the labour would come from eastern Ontario.

Economic and business activity effects are associated with sub-contracting opportunities to the DB Contractor. This also includes the indirect and induced economic effect associated with the proposed Project on existing local businesses and the regional economy. These opportunities will develop via contracting work, as well as local project purchasing and expenditures by workers in the local and regional economy. OPG and its DB Contractor, a joint venture between SNC Lavalin and M. Sullivan & Son (SNC-Sullivan) are also facilitating economic opportunities for the Algonquins of Ontario and Pikwàkanagàn First Nation through training, employment and sub-contracting opportunities. Such opportunities would also be extended to Williams Treaty First Nation communities.

OPG anticipates that the re-developed GS will result in payment of $18 million (in 2019 dollars) to the Province in Gross Revenue Charges over the course of the proposed Project or $52.5 million (nominal dollars with inflation).

The proposed Project is consistent with the existing Official Plans for the Township and the County. OPG and SNC-Sullivan have been working co-operatively with the Township and the Region on issues of mutual interest including traffic management, heritage and the re-use of materials from the project. The Project has also received a letter of support from the Township.

As the proposed Project merely replaces the existing 100-year old GS it results in no changes to the character of the area or any nearby land and resource uses.

OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River Water Management Plan (WMP), including the summer conditions. Daily flow and water level conditions will remain unchanged from the existing situation. The new GS at Calabogie will have an increased flow capacity, which will allow OPG to produce more energy from the existing water. So additional water will be flowing through the GS rather than being spilled through the South Dam Sluiceway. This will not increase the daily flow. There will still be conditions and situations where a greater range at Stewartville GS is needed to meet Ontario grid requirements and maintain compliance with the other aspects of the WMP. However, there may be some conditions where the new Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations in the Calabogie to Stewartville reach of the River. This is an interest that has been expressed by some residents downstream of Calabogie. If this occurs, it will be done in compliance with the WMP. Overall, the proposed GS will not result in significant changes to recreational use upstream or downstream on the River.

1 INTRODUCTION

1.1 Regulatory Framework and Environmental Assessment Process

In Ontario, proposed waterpower facilities are subject to the *Environmental Assessment Act* (*EA Act*). The Ontario Waterpower Association (OWA, 2018) developed the Class Environmental Assessment for Waterpower Projects (OWA Class EA) process which was approved by the Ontario Minister of the Environment and the Lieutenant Governor in Council in 2008. The *EA Act* formally recognizes the OWA Class EA process which outlines the requirements for Environmental Assessment (EA) approval. The proposed Calabogie Station Re-Development Project (CSRP) is being carried out according to the eighth edition of the OWA Class EA.

Under the OWA Class EA, the proposed CSRP is classified as a "Project Associated with Existing Infrastructure". Provided the requirements of the OWA Class EA planning process are met and a Part II Order request for a "bump-up" to an Individual EA is not made (or denied), a project is considered approved under the *EA Act*.

1.2 Other Environmental Approvals

Other permits, approvals and clearances will be sought as the proposed Project moves into the construction stage. Section 7.2.4 and Table 7.2 of the Environmental Report (ER) identify a range of possible approvals required during construction and or operations; however, specific permits and approvals will likely be required under the provincial *Lakes and Rivers Improvement Act* (*LRIA*), *Environmental Protection Act* (*EPA*) and *Ontario Water Resources Act* (*OWRA*).

1.3 Overview of the Socio-Economic and Land-Use Technical Support Documents

This Socio-Economic Technical Support Document (TSD) is the product of close to two years of extensive study and consultation. The ER and the associated TSDs were prepared by Arcadis Canada Inc. with the assistance of Ontario Power Generation (OPG), KGS Group and SNC-Sullivan.

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

This Socio-Economic TSD is organized into five chapters:

- Chapter 1.0 – introduces the proposed Project, outlines the EA process and other environmental approvals, and lays out the various chapters;
- Chapter 2.0 – provides a detailed project description;
- Chapter 3.0 – provides a description of the existing socio-economic environment;

- Chapter 4.0 – provides an overview of socio-economic effects and mitigation measures during construction and operations, and discusses the significance of effects; and
- Chapter 5.0 – provides the References.

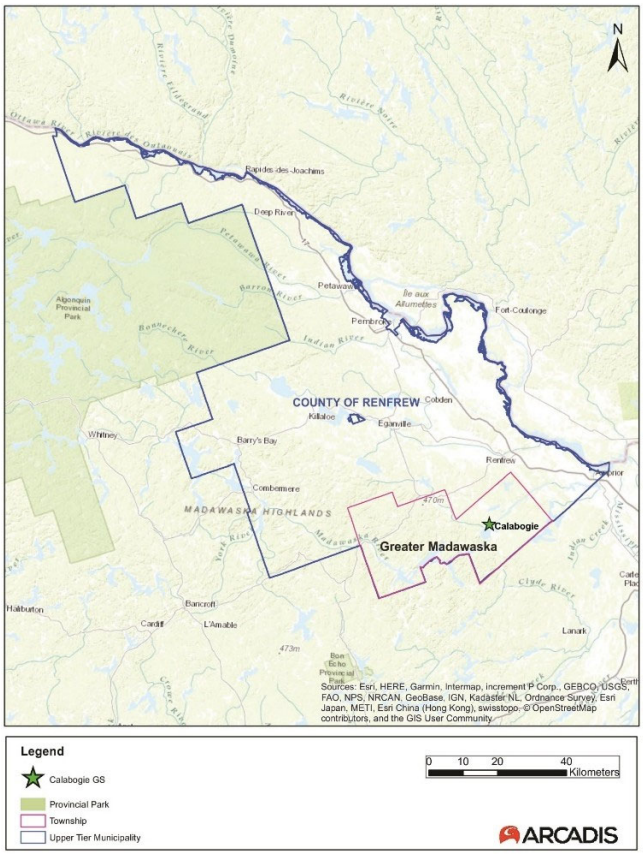
2 PROJECT DESCRIPTION

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). Constructed in 1917, the original station had an installed capacity of 5 megawatts (MW). The existing Calabogie GS is over one hundred years old and was at the end of its life prior to the tornado that hit the GS in September 2018. The GS has not operated since that time. OPG intends to redevelop the site and increase the station's capacity to approximately 11 MW. The Project involves the demolition and removal of the existing powerhouse and its structures including the forebay retaining walls and the forebay inlet structure and the subsequent construction of a new powerhouse and forebay embankment, with integral intake structure and tailrace. The Project will be constructed by a joint venture consisting of SNC-Lavalin and M. Sullivan and Son (the Contractor). OPG is advised by KGS Consultants (the Owner's Engineer) and Arcadis (the Environmental Consultant).

2.1 Project Location

The existing Calabogie GS is located within the Village of Calabogie, in the municipality of Greater Madawaska, Renfrew County, Ontario (Figure 2-1). It is located approximately 80 km northwest of Ottawa and 20 km southwest of Renfrew.

Figure 2-1. Location of the Calabogie Generating Station



The Calabogie GS, located on the Madawaska River is approximately 10 km downstream of Barrett Chute GS and 20 km upstream of Stewartville GS, both OPG-owned hydroelectric facilities. Calabogie GS is part of OPG's Eastern Operations Group. The location of Calabogie GS relative to OPG's hydroelectric facilities on the Madawaska, Ottawa and St. Lawrence Rivers is shown on Figure 2-2.

Figure 2-2. Calabogie Generating Station within OPG's Eastern Operations

Source: https://www.opg.com/building-strong-and-safe-communities/our-communities/eastern-ontario/

2.2 Existing Calabogie Generating Station

2.2.1 History and Operations

Calabogie Generating Station was constructed in 1917 with an installed capacity of 4 MW utilizing two quadruple-Francis horizontal turbines operating at a gross head of just under 9 metres. With a maximum total turbine outflow of 66 cubic metres per second (cms), and only limited storage available in Calabogie Lake, the plant is significantly undersized in comparison to either typical mean flows or to both the upstream and downstream hydroelectric stations on the river, which have daily peaking flows up to 458 cms. Over the last 50 years several studies have investigated redeveloping the site or increasing generation at the existing plant.

As noted in the 2009 Madawaska River Water Management Plan:

> *"The Calabogie GS operates as a peaking plant in conjunction with the four other OPG owned GS on the Madawaska River. Although the generating units at the station have limited flow capacity, the units and sluice gates are integrated with the rest of the peaking system on the Madawaska River. Calabogie is a generation bottleneck on the Madawaska River. The small turbine capacity results in frequent spill past the station.*
>
> *The operation of the GS is based on a daily/weekly cycle. The inflow is passed through the GS over a daily or weekly period. Operation of the GS takes into consideration energy demands, recreational opportunities as well as walleye spawning activities."*

The average historical inflow for the period between 1965 and 2017 at Calabogie is approximately 90 m^3/s with a median of 72 m^3/s. The flow duration curve and historic daily discharge record is presented below.

Figure 2-3. Calabogie Flow Duration Curve 1968 – 2018

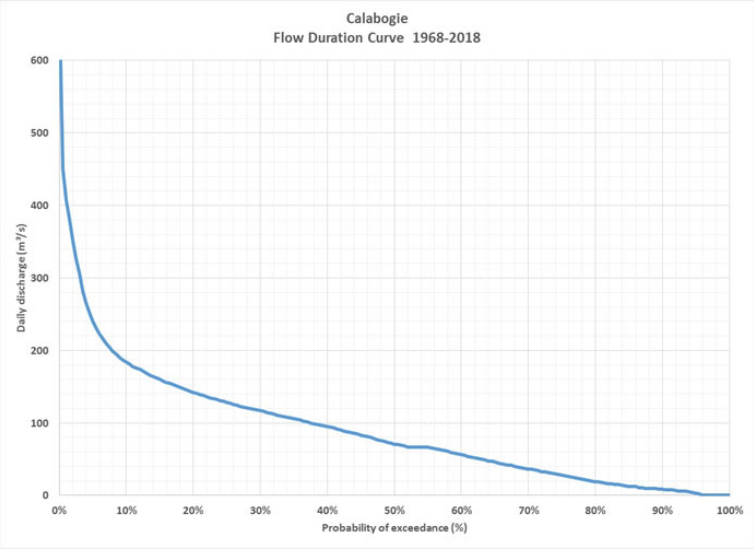
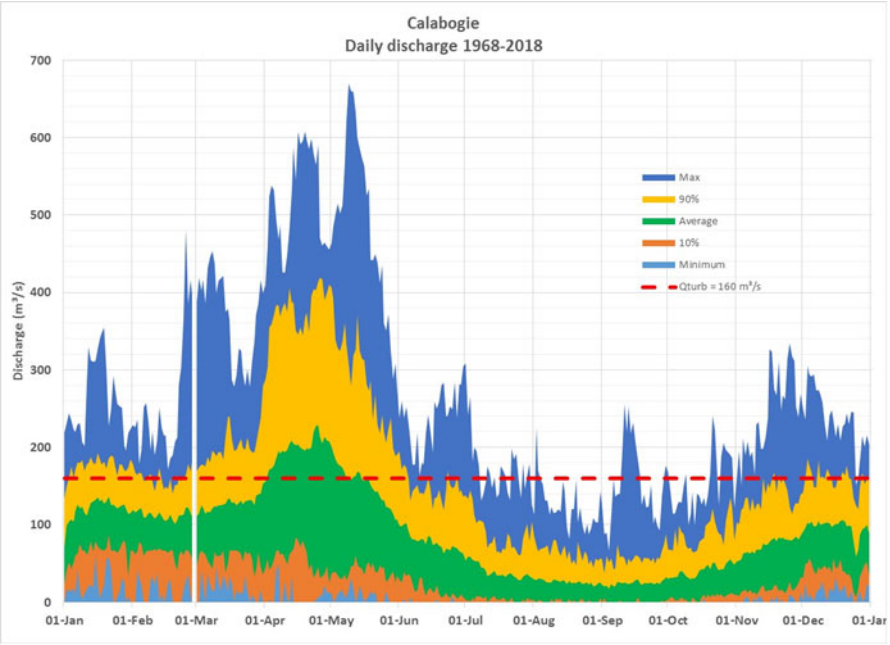


Figure 2-4. Calabogie Daily Discharge 1968 – 2018



The existing Calabogie GS is considered at end of life and OPG intends to redevelop the site with an increased capacity in order to take advantage of the existing water resources.

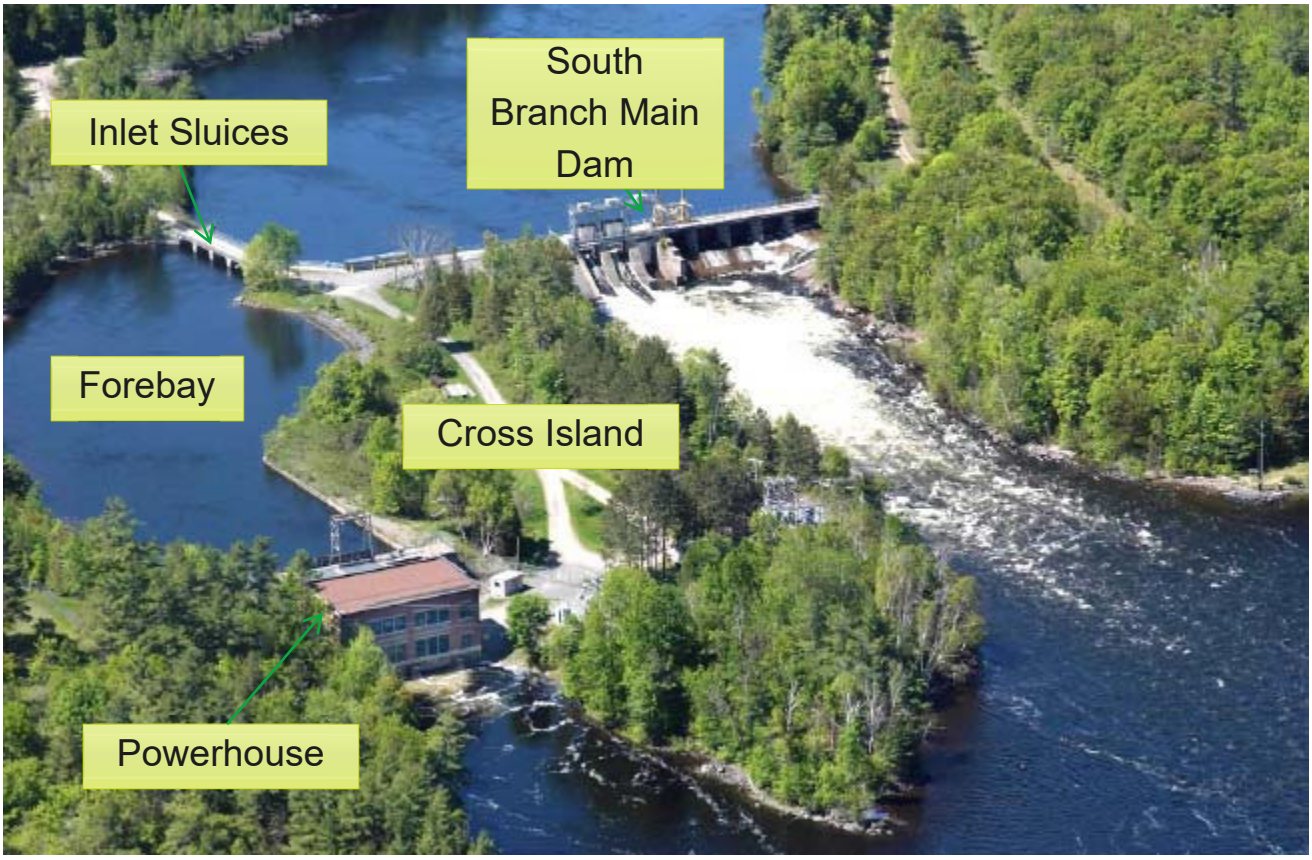
In September 2018, a tornado swept through the Calabogie area that resulted in significant damage to the GS. OPG began immediate repairs to the sluiceway to make it operable but the powerhouse roof was removed, rendering it unsafe. Calabogie GS has not operated since that time and will not be returning to services until completion of the redevelopment project.

2.2.2 Description of the Existing Calabogie Generating Station

While OPG intends to re-develop the power production component of the Calabogie GS, most of the other features and equipment at the site pertaining to water management will remain as is. Figure 2-5 below shows an aerial image of the Calabogie GS and key surrounding features. Figure 2-6 is a colour air photo focusing on the south branches of the River including the South Branch Main Dam.

Figure 2-5. Calabogie Generating Station Site Map

Figure 2-6. Calabogie Generating Station Colour Air Photo: Inlet, South Dam and Powerhouse



As shown in Figure 2-5, the Madawaska River immediately downstream of Calabogie Lake is characterized by three separate channels.

The northernmost channel is the North Channel that connects directly to Calabogie Lake. The North Channel is a natural river channel with flows controlled by the North Channel Sluiceway (owned and operated by OPG). The North Channel is not used for regular water management operations, however there is a compliance minimum flow of 0.8 cms. This flow has not been measured since the replacement of the wooden stop logs with steel stop logs. The 0.8 cms is an estimated flow. During the walleye spawn and incubation period the minimum flow is 5 cms subject to temperature conditions (described in more detail in Table 9.16 of the Madawaska River Water Management Plan).

The middle channel of the Madawaska River is the South Channel Sluiceway. This is the channel used to control the water management operations along with the Calabogie GS. There is no minimum flow requirement in the South Channel Sluiceway.

The southernmost channel of the Madawaska River is the forebay, powerhouse and tailrace of the existing and proposed GS. It is believed that this channel was excavated at the time of the original GS construction.

The Calabogie GS powerhouse is situated about 800 metres downstream of the outlet at Calabogie Lake.

As shown in Figure 2-5, two islands were formed by the three channels in this reach of the Madawaska River, the southern island (Cross Island) which is shown in greater detail and in full in Figure 2-6 and the larger northern island (Calabogie Island).

Cross Island is the hub of the Calabogie GS. It is accessed via Generating Station Lane, a private OPG owned gravel road that is accessible from Lanark Road, which is also known as Renfrew County Road 511 (formerly Highway 511). This road follows the southern channel of the River and then crosses over the entrance to the forebay. The OPG Bridge/Inlet Structure in this location serves two purposes: it first acts as a bridge to Cross Island; and second, it also integrates the inlet structure to the forebay with several sluices that control water flowing to the existing powerhouse. Cross Island also includes a trailer that serves as an office and washroom facilities. A Hydro One Networks Distribution Station (Calabogie DS) is also located on the island and connects to the powerhouse. Except for the eastern tip, Cross Island is largely cleared of trees. Along with all the infrastructures mentioned above, Cross Island included a cul-de-sac type road with parking areas and grassed areas for storage of equipment and materials. The tornado of September 2018 snapped a large percentage of the remaining trees on the island, which were subsequently cleared by OPG.

As shown in Figures 2-5 and 2-6 the South Branch Main Dam connects Calabogie and Cross Islands. The South Branch Main Dam provides the primary water management function at the GS and water in excess of the powerhouse discharge is passed through the dam.

Calabogie Island was also impacted by the September 2018 tornado, but the Island remains largely forest covered. The Island can be accessed by foot across the South Branch Main Dam or by vehicle on an OPG owned private gravel road that is also accessible from County Road 511. Near the South Branch Main Dam, and south of it, the Island has been disturbed by the dam construction and on-going operations. Calabogie Island is also bisected by HONI's connection line to the Calabogie GS. OPG maintains a boat launch with access to the Madawaska River downstream of the South Branch Main Dam sluiceway. The boat launch allows for operations and maintenance activities that need to occur by water on the downstream side of the facility.

Figure 2-5 also shows safety booms placed and maintained by OPG on both the upstream and downstream sides of the River.

2.3 Alternatives Analysis

Over the last 50 years several studies have investigated redeveloping the site or increasing generation at the existing plant. Studies from 1960 through to 2016 considered refurbishment and expansion of the existing plant or complete replacement with generating capacities that ranged from approximately 6 MW to 15 MW.

The latest plant redevelopment options were optimized through a multi-stage refinement process, with an initial optimization by KGS Group for OPG, followed by more detailed project refinement by the Contractor. While numerous alternatives were considered through the re-development process, three primary alternatives emerged for final consideration. These were:

- Alternative #1 – Refurbishment of the existing powerhouse with minimal civil work.
- Alternative #2 – Refurbishment, expansion and redesign of the existing powerhouse.
- Alternative #3 – Construction of a new powerhouse.

Based on the analysis completed, Alternative #3 was selected as the preferred alternative to complete the Calabogie GS redevelopment. Alternative #3 will make best use of the available water resource at site and will result in the highest estimated annual energy generation. It also better addresses qualitative risk factors than the other alternatives.

Some of the qualitative benefits of this alternative over the other two included the following:

- Alternative #3 allows for the largest addition of green, carbon free capacity and energy to OPG's portfolio. This aligns with OPG's Strategic Direction.
- Alternative #3 is better equipped to manage the possibility of higher water quantities that are expected with future climate change.
- Alternative #3 allows for the safe removal of hazardous materials in the existing powerhouse, including, but not limited to, lead paint and asbestos. The new powerhouse will be free of these designated substances.
- Alternative #3 utilizes traditional turbine equipment, of which OPG has extensive operating experience.
- Alternative #3 with its larger plant flow capacity makes better use of available water in the Madawaska River to use more efficiently the resource and generate more energy and hydroelectric power.
- Alternative #3 with a new powerhouse allows the constructors to optimize design for constructability.
- Alternative #3 allows for optimal design to ensure accessibility and modern equipment. Alternative #3 will also be entirely new, leading to higher degree of reliability of operation with potentially less forced outages due to failures in the immediate future. Following the tornado of September 2018, significant damage occurred to the powerhouse rendering it inoperable and unsafe. Given that Alternative 3 will demolish the existing station, only minimal safe state investment is required to ensure safety and mitigate the risk of environmental spills/releases.

As the above analysis indicates, the preferred option is to construct a new powerhouse together with associated ancillary features. The existing water control facilities for both the north and south channels has been recently upgraded and is not considered part of this project.

2.4 General Layout and Description

2.4.1 General Layout

A new powerhouse will be constructed, approximately 50 metres upstream of the existing powerhouse within the existing forebay. The existing powerhouse will be demolished. The new station will have two horizontal-axis Kaplan type turbines and be rated at approximately 10.7 megawatts while both units are running. Implementation of this alternative will involve the following:

- Construction of a new powerhouse with all new turbine generator equipment.
- Removal of all existing power equipment and demolition of the existing powerhouse.
- Removal of the inlet structure to the forebay and widening of the inlet section, along with excavation in the forebay and tailrace, to allow for increased flow conditions.
- Construction of a new substation and interconnection to the existing transmission line.

The new powerhouse location was selected to be upstream of the existing powerhouse in the forebay to optimize the increased station flow and hydraulic conditions.

The re-developed GS will have the following characteristics:

- Effective Capacity of 10.7 MW;
- Estimated Annual Energy Generation with 98 % of availability – (on the order of 44 GWh to 47 GWh depending on operation);
- Number of Units – 2 horizontal turbines capable of producing approximately 5.4 MW each;
- Station Flow – 160 m^3/s;
- Minimum Operating Flow – 20 m^3/s;
- Average Annual Flow – 90.5 m^3/s; and
- Average head of 8.6 m (range of 6.6 m to 9.9 m).

The proposed site plan for the new GS is shown below in Figure 2-7, while the powerhouse arrangement is presented in Figure 2-8. As already described, the proposed new powerhouse will be located in the forebay approximately 50 metres upstream of the existing one. The proposed undertaking will remove the current bridge and inlet structure over the forebay with access to the new powerhouse and existing sluiceway provided on the east side of the forebay.

Figure 2-7. Proposed Site Plan for the Calabogie GS

Figure 2-8. Proposed Powerhouse Arrangement for Calabogie

2.4.2 Construction Sequencing

The construction of the new GS will be undertaken sequentially in the following stages as shown below.

Stage #1

In Stage #1 of the demolition and construction, the construction facilities and laydown areas will be set up, site trailers mobilized, access roads upgraded where necessary and the rock and overburn stockpile areas cleared. As of the fall of 2019, the existing inlet structure (located at the bridge) has been closed and the existing forebay channel de-watered. The following summer, the forebay sediment, soil and rock will be excavated in the dry for construction of the new intake forebay channel and new powerhouse substructure. During this time the existing powerhouse will be used as a downstream cofferdam.

While the existing powerhouse overburden is excavated out, hazardous material abatement will be completed within the existing powerhouse. The existing equipment will be removed, preparing for the powerhouse superstructure to be demolished. Throughout all stages of demolition, hazardous and recyclable materials will be separated from general waste and any potential waste requiring specialized treatment.

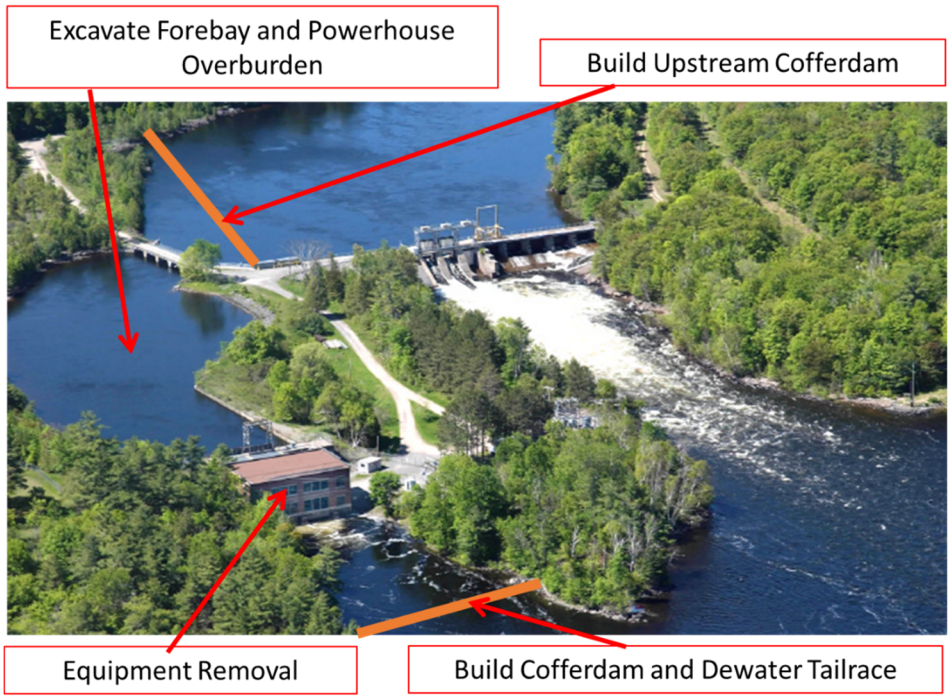
Prior to demolition of the existing Powerhouse, a cofferdam will be constructed downstream of the existing powerhouse and the existing tailrace de-watered. At the same time the downstream cofferdam is constructed, an upstream cofferdam will be constructed upstream of the inlet structure. The section between the upstream cofferdam and the inlet structure will be dewatered allowing overburden excavation to continue preparing for the rock excavation in Stage 2.

The existing inlet structure/sluices will allow the forebay to be isolated and excavation work to begin in the forebay at the start of construction. Following the July 15th fish window, the cofferdam will be constructed upstream of the inlet structure (as shown in Figure 2-9) to allow for removal of the existing inlet structure in the dry and rock excavation to continue. The upstream cofferdam will be constructed from blasted rock that has been excavated to accommodate the new powerhouse. Clean blast rock will be used to construct a 5.8 metres wide cofferdam, with a slope of 1.5H:1V up to elevation 155.17 masl. The upstream face of the cofferdam will be lined with a heavy-duty cofferdam membrane and sealed to the riverbed with a bentonite clay seal. Upon completion of the powerhouse, the liner, blasted rock and overburden will be removed, and the channel will be graded with rockfill.

The downstream cofferdam is required to isolate the downstream side of the construction and allow for the demolition of the existing powerhouse and construction of the new powerhouse and tailrace. The proposed cofferdam is a rockfill dam with an impervious geomembrane on the water side of the cofferdam. Seepage through the cofferdam will be collected and directed to a settling pond prior to discharge back into the river.

The bed material in the area where the downstream cofferdam will be constructed is primarily cobble/boulder/gravel across the main channel with some sand/gravel/cobble and bedrock/boulder/cobble distributed proximate to the river bank.

Figure 2-9. Work Sequence – Stage #1 – Excavation, Removals and Cofferdam Construction

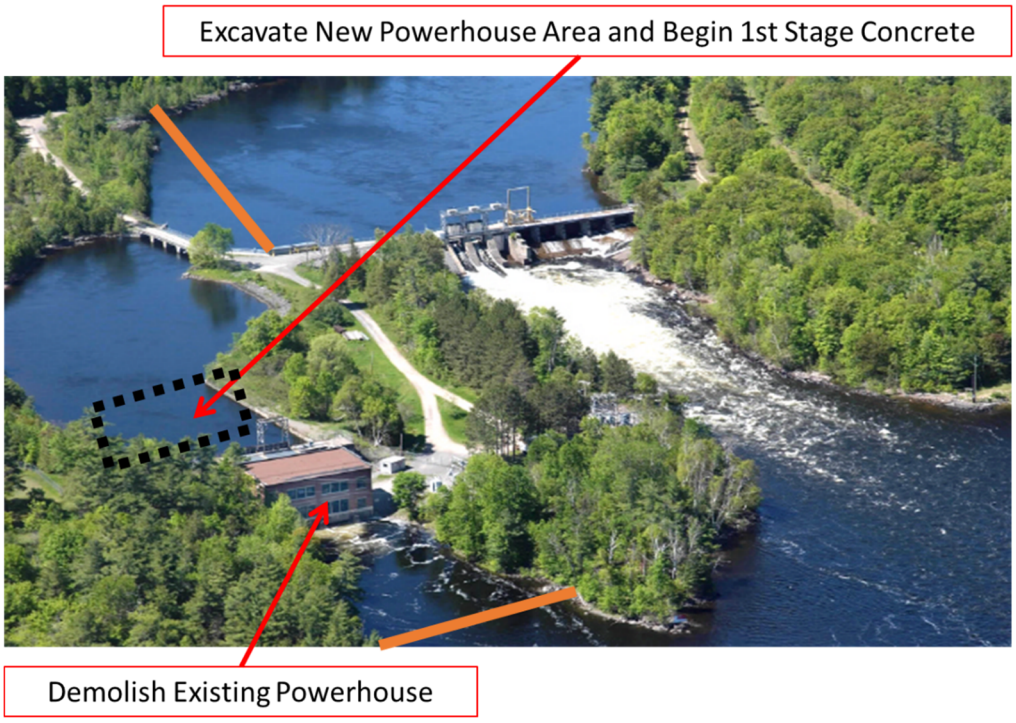


Stage #2

In Stage #2 the existing powerhouse superstructure will be demolished, followed by the existing powerhouse concrete substructure. Rock excavation for the foundation of the new powerhouse will be completed and the left embankment works will start.

Hazardous and recyclable materials will continue to be separated from general waste and any potential waste requiring specialized treatment. First stage concrete work will begin for the new powerhouse and the new embankments within the forebay and downstream of the existing forebay inlet structure will be constructed.

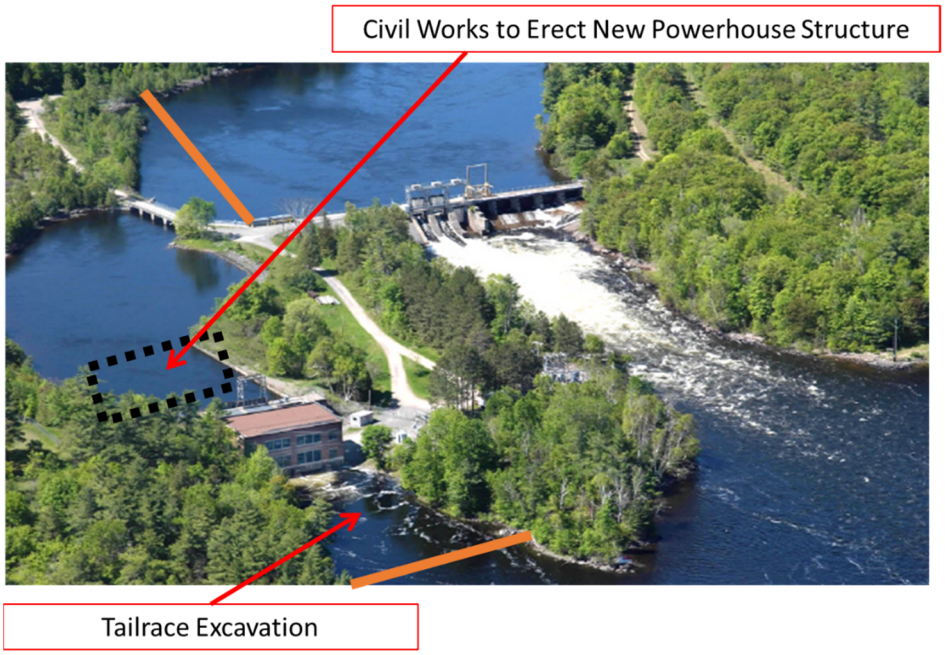
Figure 2-10. Work Sequence – Stage #2 – Powerhouse Demolition and Excavation of New Powerhouse



Stage #3

In Stage #3, the new powerhouse construction will include the remainder of 1st stage concrete works for the new powerhouse, installation of the embedded parts for hydro-mechanical equipment including gates and stoplogs, secondary concrete works, construction of the powerhouse superstructure, installation of the powerhouse crane and enclosure of the powerhouse. On the downstream side, the tailrace will be excavated down to the new elevation. The new substation equipment installation will commence, and the existing substation will be removed.

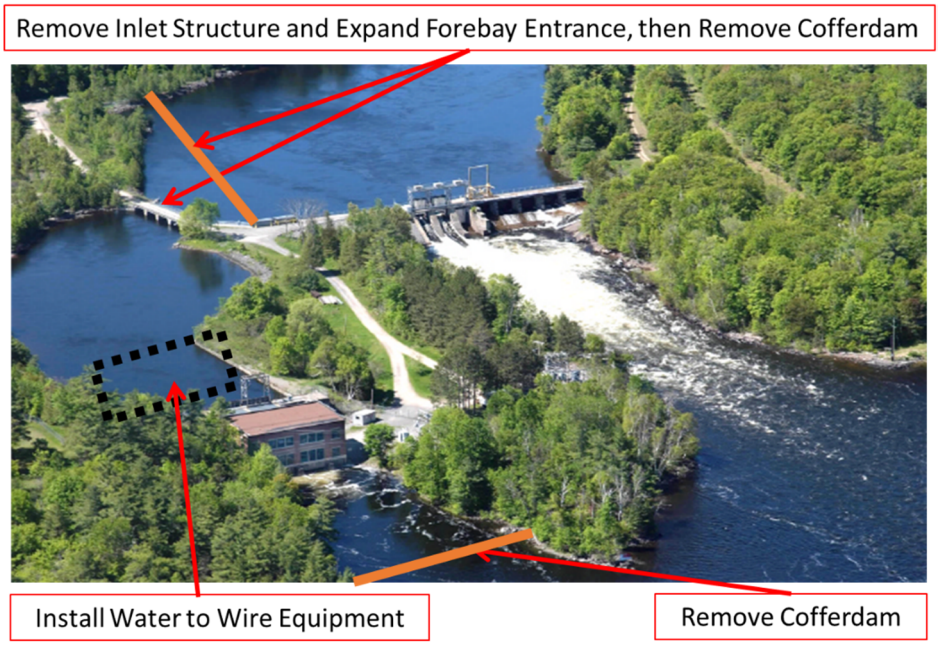
Figure 2-11. Work Sequence – Stage #3 – Construct Powerhouse and Excavate Tailrace



Stage #4

In Stage #4 the associated mechanical and electrical components for the Water to Wire turbines and generators will be installed as well as the balance of plant equipment. Sufficient work will have been completed in the new forebay and new tailrace. The entrance to the new forebay channel will have been widened to improve flow conditions to the new powerhouse and the tailrace will have been excavated as such to produce the required flow conditions specified. Once the existing forebay inlet structure is demolished and removed, the upstream and downstream cofferdams will be removed, and the systems commissioned.

Figure 2-12. Work Sequence – Stage #4 – Remove Inlet Structure and Cofferdams, Finish Powerhouse Installation



Stage #5

In Stage #5 the new units for the GS will be tested, commissioned and finally, put into commercial operation and transferred to OPG for operation.

Figure 2-13. Work Sequence – Stage #5 – Commission New Generating Station

2.4.3 Major Components

2.4.3.1 Forebay and Intake

Once the existing forebay inlet structure is removed, the forebay inlet will be slightly widened (by approximately 20 to 25 m) in order to improve the hydraulic conditions of the flow to the GS. The anticipated change to the forebay inlet is shown in Figure 2-8.

The existing forebay is shallow and contains simple fish habitat (this was defined as ‘simple’ due to the absence of shoreline features, bathymetric complexity, absence of aquatic macrophytes or coarse woody debris, and the absence of any unique or limiting habitat) and is shown in Figure 2-14 below.

Figure 2-14. Existing Forebay Substrate

Sediment, soil and excavated rock will be removed from the existing forebay to also improve flow and to allow for construction of the new GS. Forebay hydraulic optimization has dictated the extent of excavation upstream of the new powerhouse. Bedrock will be excavated in vertical cuts and overburden will be sloped and protected against erosion and sloughing. The new intake will have training walls on either side of it to contain the new embankments away from the intake structure. Upon completion of the forebay channel, the embankments will be provided with suitably sized rock protection to ensure bank stability against the forces of erosion and ice action.

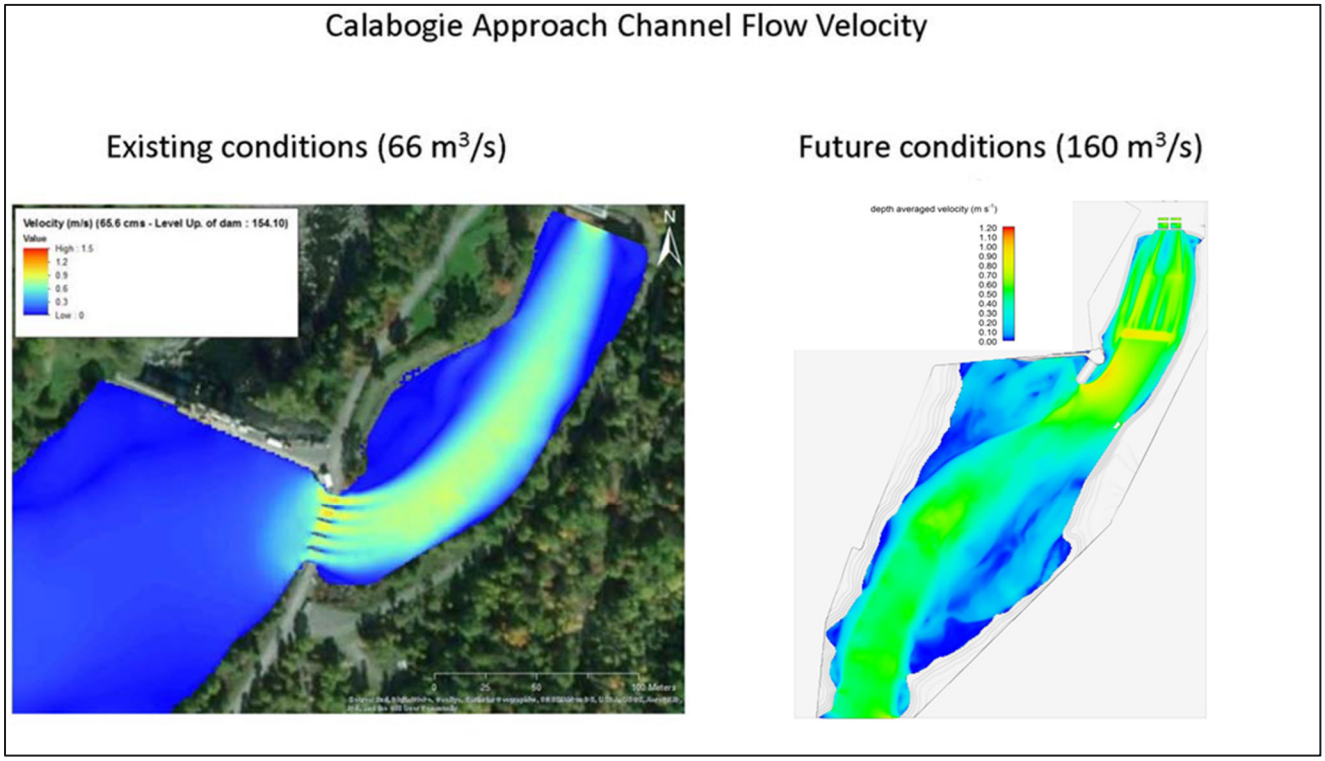
The new powerhouse intake will be integrated with the new powerhouse and will be constructed of reinforced concrete. The intake will be equipped with trashracks, suitably sized and with bar spacing to mitigate in as much as possible, fish entrainment. The trashracks will cover the complete area of the turbine water passage intakes. The new trashrack bar spacing will remain consistent with the trashrack spacing at the existing Calabogie GS, with 50 mm clear space between the trashrack bars.

The new trashracks will be periodically cleaned with rakes as well as using mobile crane, with space provided on the intake deck for a future trash rack cleaning machine, however, a trash rack cleaning machine will not be provided at this time. The trashrack slots will also be used interchangably for stoplogs, to provide a means to perform periodic inspections and eventual repairs and servicing of the downstream emergency closure gates in the future. The intake will also include emergency close vertical lift intake gates operated from the intake deck.

The intake and the trashrack of the new powerhouse have been designed to minimize potential entrainment of fish with a trashrack velocity of less than 0.9 m/s (at a distance of 75 mm in front of screen). While the future conditions will increase the plant flows through the new powerhouse from 66 m^3/s to 160 m^3/s, the

velocities in the approach channel will be similar with velocities under 1 m/s as demonstrated by numerical flow modelling and as shown in Figure 2-15.

Figure 2-15. Comparison of Velocities – Existing and Proposed GSs



As shown above the proposed velocities in the approach channel at full flow are generally under 1 m/s and will vary along and across the channel between 0.25 and 1.0 m/s.

2.4.3.2 Powerhouse

The proposed new powerhouse will be situated approximately 50 metres upstream of the existing one. The powerhouse will be approximately 25 metres by 45 meters structure and will be 28 metres tall from the invert of the excavation to the top of the superstructure roof. The powerhouse will be excavated to a depth of approximately 12 metres to allow for proper submergence settings of the turbines. Hydraulic passages, both upstream and downstream of the units, will be appropriately sized to maintain machine performance.

It is currently anticipated that the powerhouse structure will be comprised of a cast-in-place concrete substructure and a metal clad steel superstructure. The switchyard will be constructed in close proximity to the new powerhouse on the left side of the new structure. Parking and a laydown area will also be provided in the same general vicinity.

2.4.3.3 Turbines

As previously indicated, the powerhouse will include the installation of two horizontal-axis Kaplan type turbines. Specifically, the turbines will be installed in an open pit, direct drive configuration. Each turbine will be capable of producing approximately 5.4 MW for a combined total capacity of 10.7 MW. The station will be capable of passing a flow of 160 cms with a minimum operating flow of 20 cms. Each turbine runner will have four blades and will operate at 156.5 rpm.

2.4.3.4 Tailrace

The existing channel downstream of the new powerhouse will be excavated to form the new tailrace. This new tailrace will be similar in width to the existing one as shown in Figure 2-8. A series of Figures below portray the existing and proposed tailrace hydraulic conditions (i.e. velocities) under various flow conditions.

The new tailrace channel is anticipated to be in the order of 25 m wide and will connect the powerhouse within the downstream river reach. The upstream portion of the tailrace channel (between the new powerhouse and the existing powerhouse) will be excavated in overburden for the first 5 to 7 m and in bedrock below. The downstream portion of the channel (downstream of the new powerhouse) will be excavated mostly in rock. Limited overburden excavations are expected in this portion of the channel. Bedrock will be excavated in vertical cuts and overburden will be sloped and protected against erosion and sloughing. For the purpose, the area will be dewatered using a downstream cofferdam.

Figures 2-16 and 2-17 depict the existing and proposed Calabogie GS Tailrace hydraulic conditions with no flow (velocity scale (meters per second) is shown in the bottom right of each figure).

Figures 2-18 and 2-19 depict the existing and proposed Calabogie GS Tailrace hydraulic conditions at flows of 66 cms, which is the capacity of the existing powerhouse. These two figures demonstrate that at this flow rate the proposed new powerhouse will eliminate the areas of high velocity that occur under the existing situation and instead disperse more moderate velocities over a wider area.

A tailrace water level survey program will be completed during the detailed design phase of the project to further define the hydraulic conditions downstream of the Calabogie site.

Figure 2-16. Existing Calabogie GS Tailrace Hydraulic Conditions. No Flow

Figure 2-17. Future Calabogie GS Tailrace Hydraulic Conditions. No Flow

Figure 2-18. Existing Calabogie GS Tailrace Hydraulic Conditions. 66 cms Flow (no spill)

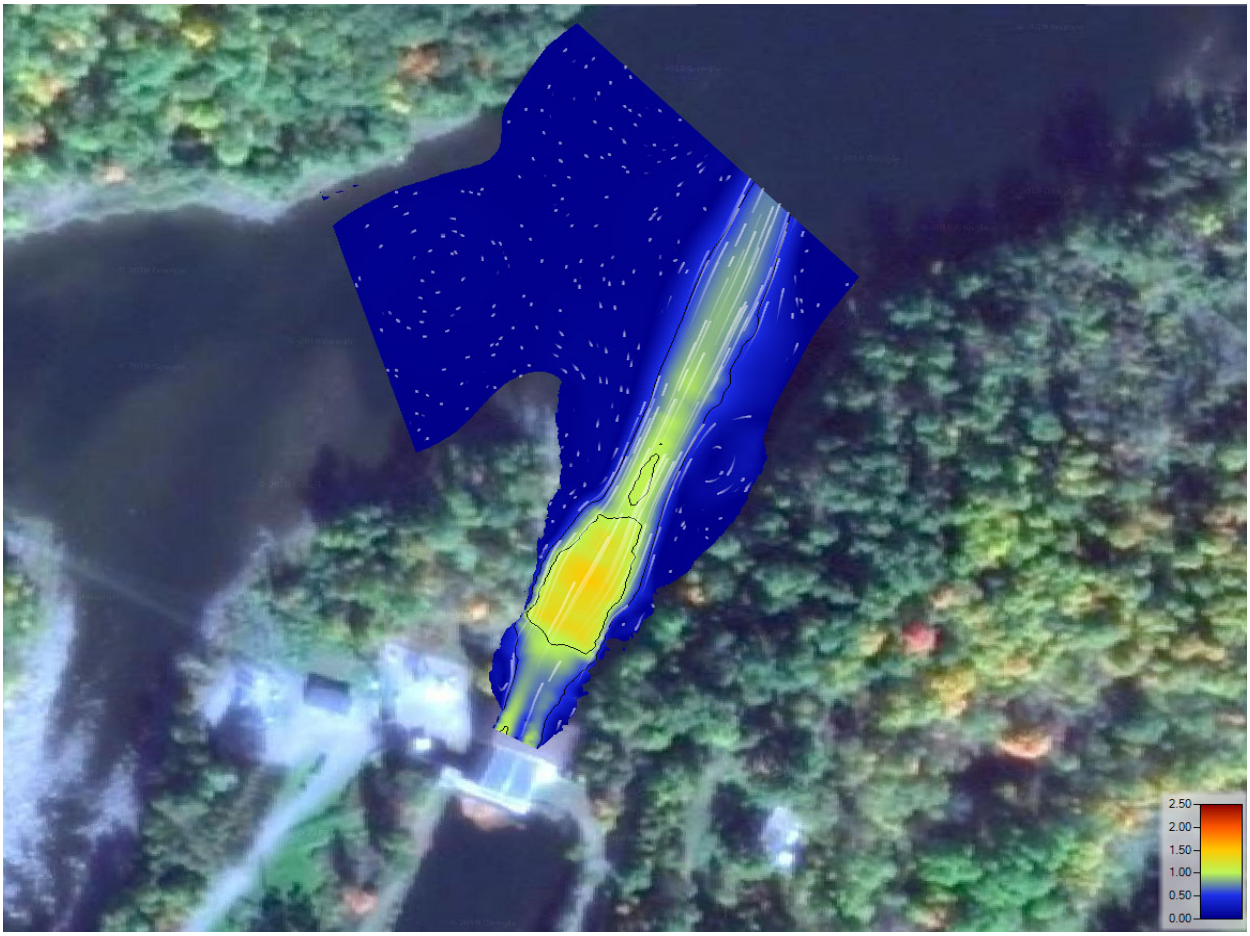


Figure 2-19. Future Calabogie GS Tailrace Hydraulic Conditions. 66 cms Flow (no spill)

Figures 2-20 and 2-21 depict the existing and proposed Calabogie GS Tailrace hydraulic conditions at flows of 160 cms, which is the capacity of the proposed powerhouse. Figure 2-20 representing the existing conditions shows moderate flows at both the tailrace and to a lesser extent through the South Branch Main Dam. Figure 2-21 shows higher velocities through the central portion of the tailrace.

Figure 2-20. Existing Calabogie GS Tailrace Hydraulic Conditions. 160 cms Total Flow: 66 cms Flow through Powerhouse and 94 cms through the South Branch Main Dam

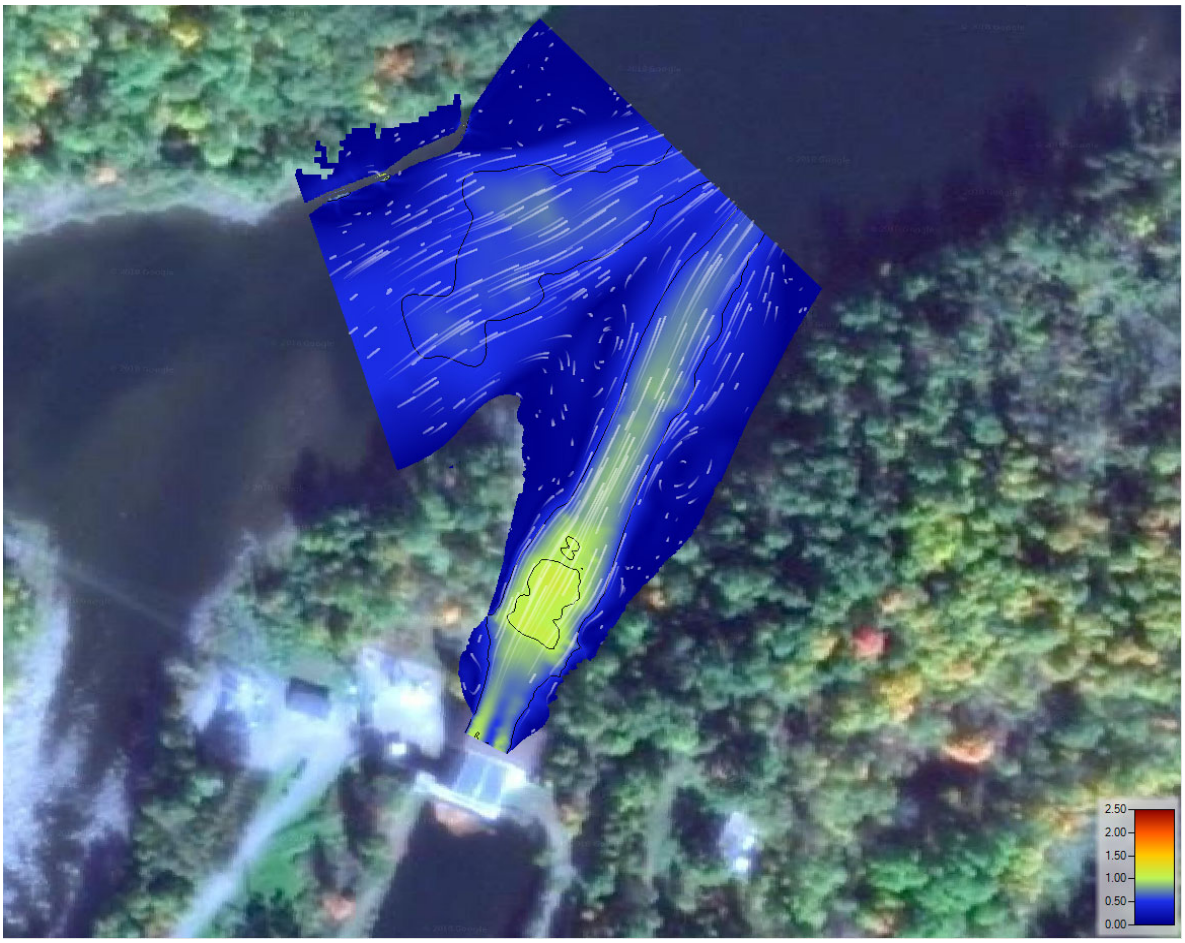
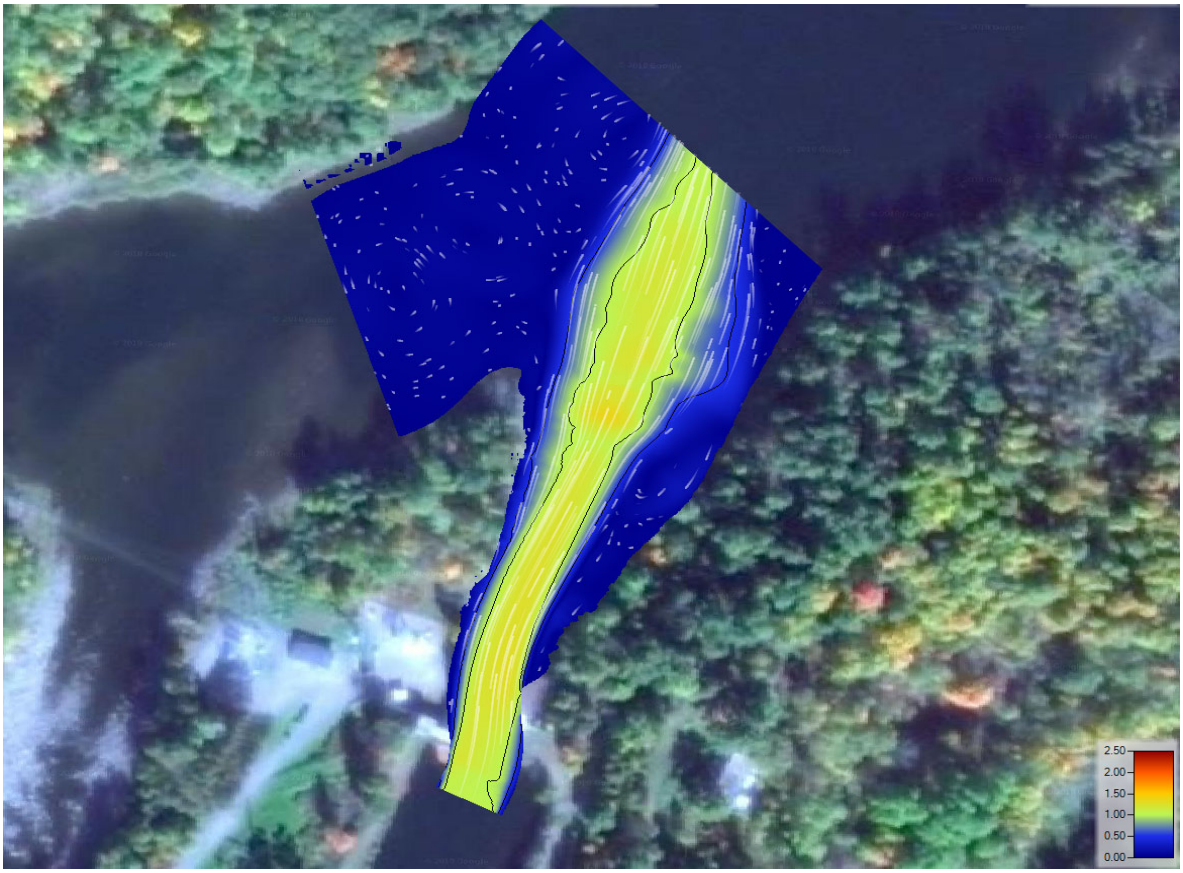


**Figure 2-21. Future Calabogie GS Tailrace Hydraulic Conditions.
160 cms Total Flow, all Through the Powerhouse**



The construction of much of the new tailrace will be undertaken in the “dry” by using a cofferdam. The tailrace area may require riprap to locally protect against erosion and sloughing of the overburden encountered, however, it is currently envisaged that the bulk of the tailrace excavation will be rock. Portions of the Madawaska River riverbank in the immediate vicinity of the tailrace area may also require erosion protection.

The shift of moving the powerhouse 50 meters upstream will increase the amount of tailrace habitat while reducing the amount of forebay habitat.

OPG will pursue more in-depth discussions with DFO as part of the request for review process and provide all information DFO requires to determine whether an Authorization is required and if so, what off-setting measures would be considered.

2.4.3.5 Structures for the American Eel

OPG is committed to supporting the recovery of American eel in consultation with Indigenous People and in accordance with provincial recovery strategies and policy direction. On the Madawaska River, there are no known occurrences of American Eel, including at or in the immediate area of Arnprior GS, Stewartville GS and Calabogie GS. As such, these facilities are currently compliant with the ESA.

Over time and as recovery strategies advance and succeed, the Madawaska River may become a focus of interest. This will signal that recovery strategies are working. OPG is using this redevelopment project to make the redeveloped Calabogie GS "eel ready".

Eel ready means that the redevelopment will be planned, designed and executed in anticipation of adaptive management strategies that can be applied as circumstances change around the presence of American eel in the vicinity of the station.

Specific measures have been scoped into the design of the station to accommodate potential future needs for upstream and downstream passage, including:

- designing attractive flow at an eel trap/ladder at the plant tailrace;
- including a temporary trap and transport system at the plant tailrace to help monitor for early signs of eels showing up below the station;
- leaving room for permanent upstream and downstream passage infrastructure to be retrofitted on a long-term basis (OPG's research suggests that upstream passage should likely occur in the plant tailrace and that is the proposed location for the temporary trap and transport system. Should eels return to the Madawaska River in this reach of the River, consideration could be given for another location);
- intake velocities and bar exclusion screen layouts designed to facilitate implementation of future effective safe passage of eels downstream through the GS;
- provision for future inclined screen and downstream flow bypass for downstream passage with bar spacing in the screen at a maximum of 19 mm during periods of downstream movement; and,
- early consideration of the pros and cons of operational variations that may support eel passage.

An adaptive management approach will be applied during operations to determine the best course of action to implement or install specific measures to support recovery as circumstances change.

2.4.3.6 Transmission Line

The existing GS is connected to Hydro One's transmission network via a 44 kV transmission line that is connected to the Calabogie GS to the north. The existing transformer yard was extensively damaged during the 2018 tornado.

A new switchyard for the main step-up transformer will be constructed in close vicinity to the new powerhouse and will connect to the HONI transmission line at a pre-determined location.

2.4.3.7 Off-Site Communication

The new Calabogie GS will require a communication link with Stewartville TS for tele-protection signals and with Eastern Operation Control Center [EOCC] for remote SCADA.

To achieve this, a new microwave link between Calabogie GS and Stewartville GS will be constructed. The link will consist of two 150ft Microwave towers, one at each end. The location of the two towers will require the construction of new access roads. Wood poles to carry the power cables and Fiber Optic cables will be constructed to connect the MW towers to their respective Generating stations.

2.4.3.8 Water Control Features

The Ontario Ministry of Natural Resources and Forestry (MNRF) has in place Lakes and Rivers Improvement Act Technical Bulletins that detail the Ministry requirements for the safe operations of dams. The Technical Bulletins were initially issued in 2011. Based on the "Classification and Inflow Design Flood Criteria" Technical Bulletin, Ontario Power Generation (OPG) is evaluating whether additional spill capacity is required at Calabogie GS. While no decision has yet been made on whether any spill capacity alterations will be required for the site, OPG anticipates additional spill capacity will be required and achieved through a combination of channel improvements and constructing additional sluices.

OPG is only at the early stages of assessing the potential additional spill capacity requirements and options. As such, the review of environmental effects associated with the construction of additional spill capacity has not yet been initiated and are not discussed in this Report.

Environmental approval for the work could be considered per Section 8.8 of the OWA Class EA Process, "Addendum Provisions for Environmental Reports." That assessment work could be carried out as modification to the project or Addendum provision. Alternatively, the approval could be undertaken through a separate process.

2.4.3.9 Other Features

Other features of the Calabogie GS that will remain unchanged from the current situation. Safety devices such as buoys, signage and booms will remain unchanged from the current situation. The existing office and washroom in the trailer are expected to remain but may be re-located closer to the new powerhouse.

2.5 Construction

Figure 2-7 shows the Calabogie site with a variety of construction stage features. These are each described below.

2.5.1 Site Access, Roads and Parking Areas

The primary access road to the site will remain as Generating Station Lane, a gravel road that is sufficiently wide to accommodate passing passenger vehicles. The Lane provides access to Lanark Road/County Road 511.

At this point no modifications are anticipated to the site entrance at County Road 511 (Lanark Road). However, should modifications be required these would be subject to review and approval by the County's Public Works Department. The Department has indicated that a traffic management plan will be required to describe the proposed traffic and how any impacts can be mitigated. The plan will likely need to ensure that signs are erected on the County Road to advise the other road users of turning traffic and a traffic control person may be needed during periods of high turning movements to/from the site.

A secondary access road currently exists from County Road 511 to Calabogie Island that is labelled as "Calabogie Island Road" on Figure 2-7. This is an existing single lane gravel road that provides access to the north side of OPG's South Branch Main Dam and to an OPG boat launch that is situated slightly further downstream. This road will be used for two purposes during construction. First, it is anticipated that some or most of the workers will park their vehicles on the island and access the main construction site by walking across the South Branch Main Dam. A parking lot is proposed in close proximity to the South Branch Main Dam to allow for this. This parking lot would be capable of accommodating approximately 50 vehicles. Second, excess rock and sediment are proposed to be placed on Calabogie Island so dump (or tipper) trucks will utilize the road. Imported engineered aggregates will be used to improve the roads should they be considered acceptable.

OPG, SNC-Sullivan and the Township of Greater Madawaska have entered into a Memorandum of Understanding to provide excavated rock from the project and deposit this on adjacent Township lands. This is described in more detail in 2.5.4 and 2.5.5. That arrangement will require SNC-Sullivan to construct a 200 to 300 meter length road on to the adjacent Township lands and also temporarily use the Township access to County Road 511 for the project (see Section 2.5.5).

2.5.2 Laydown and Storage Areas

During construction laydown and storage areas are required in order to facilitate demolition, excavation and construction. Most of Cross Island will be available at various times for temporary laydown and storage areas. Cross Island has historically had large cleared and flat areas that are suitable for such work. With the 2018 tornado the cleared area has expanded. Figure 2-7 shows one laydown area slightly west of the proposed powerhouse, however another large cleared area south of the powerhouse will be used to: allow equipment to work and turn around; park vehicles; store materials and equipment in an environmentally safe fashion; place trailers for worker use; etc.

2.5.3 Cofferdams and In-Water Works

The existing inlet structure/sluices will allow the forebay to be isolated and excavation work to begin in the forebay at the start of construction. Following the July 15th fish window, a cofferdam will be constructed upstream of the inlet structure to allow for removal of the existing inlet structure in the dry and rock excavation to continue. The upstream cofferdam will be constructed from blasted rock that has been excavated to accommodate the new powerhouse. Blast rock will be used to construct a 5.8 metres wide cofferdam, with a slope of 1.5H:1V up to elevation 155.17 masl. The upstream face of the cofferdam will be lined with a heavy-duty cofferdam membrane and sealed to the riverbed with a bentonite clay seal. Upon completion of the powerhouse, the liner, blasted rock and overburden will be removed, and the channel will be graded with rockfill.

A downstream cofferdam is required to isolate the downstream side of the construction and allow for the demolition of the existing powerhouse and construction of the new powerhouse and tailrace. The proposed cofferdam is a rockfill dam with an impervious geomembrane on the water side of the cofferdam. Seepage through the cofferdam will be collected and directed to a settling pond prior to discharge back into the river.

A small amount of tree and vegetation clearing is required on the east end of Cross Island to allow for access to construct this cofferdam. Similar to the upstream cofferdam, the downstream cofferdam will be constructed from blasted rock that has been excavated to accommodate the new powerhouse. Blast rock will be used to construct a 5.8 metres wide cofferdam across the width of the tailrace, with a slope of 1.5H:1V up to elevation 148.00 masl. The downstream face of the cofferdam will be lined with a heavy-duty cofferdam membrane and sealed to the riverbed with a bentonite clay seal. Upon completion of the powerhouse, the liner and blasted rock will be removed, and the area will be graded to align with the tailrace channel profile.

Should any in-water construction activities be required, they will be timed to avoid the spawning and egg incubation period of spring spawning fishes, such as Walleye. The exclusion period is from March 15 to July 15.

2.5.4 Excavation

The construction of the new powerhouse will require a significant amount of sediment and rock to be removed from the construction area. It is estimated that approximately 60,000 cubic meters of sediment/overburden and 66,800 cubic meters of rock would need to be removed. The sediment and rock have been tested. The rock can be re-used and the sediment/overburden will be disposed of on OPG property.

Blasting will be required to remove the rock for the new powerhouse, in the forebay and in the tailrace. A third-party firm will be hired to implement a vibration monitoring program, provide engineered blast designs, and consult in all blasting operations as required.

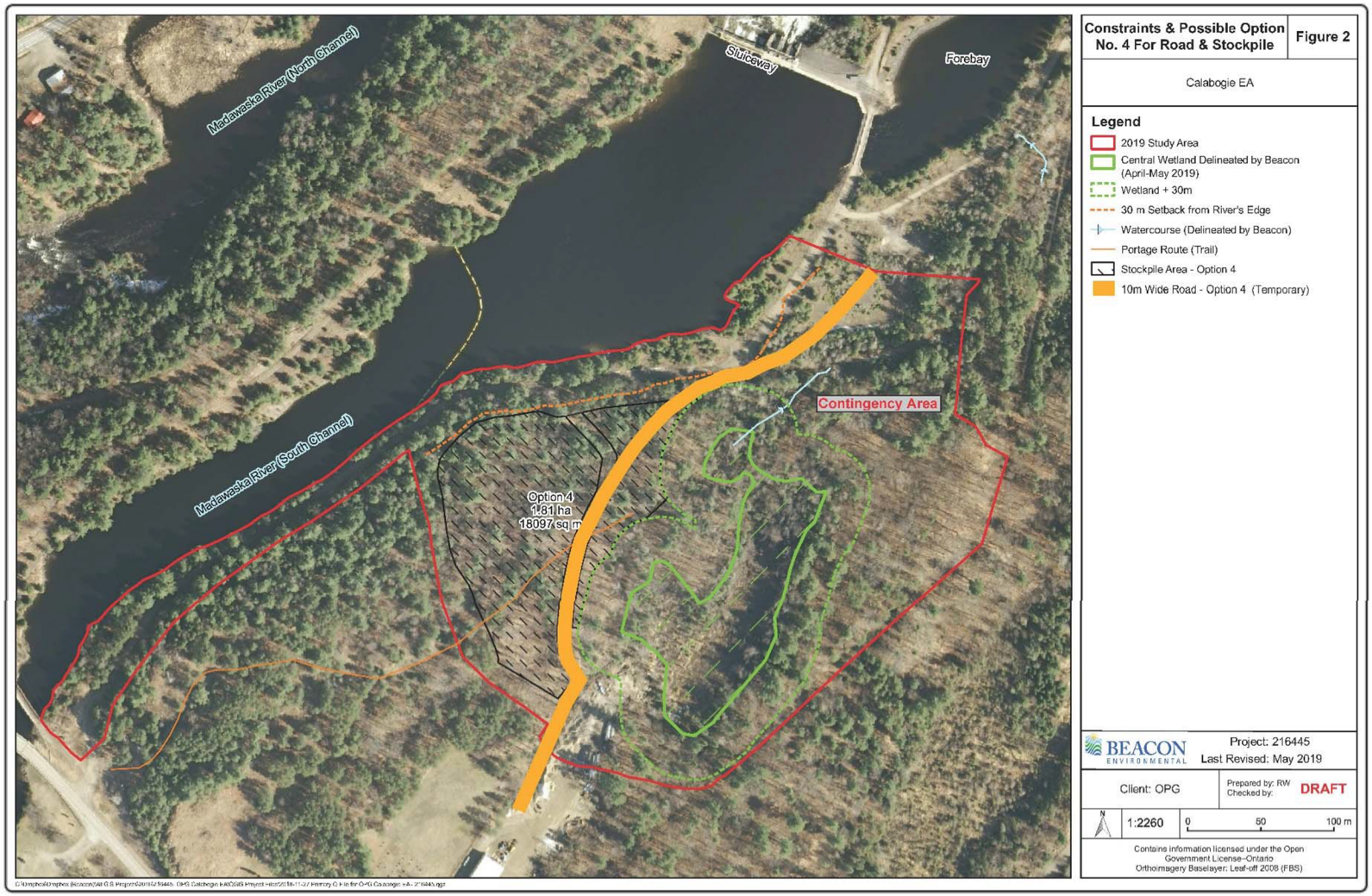
Prior to any blasting or rock excavation, the sediment in the forebay will be excavated down to either rock or the required hydraulic elevations and disposed of on OPG Property. Once the sediment has been removed and blasting is underway, excavation of the rock will begin. The rock will either be used as cofferdam material, stockpiled for later use as embankment treatment, or disposed of on Township Property (see section 2.5.5 Rock and Soil Deposition Areas where this is further discussed).

It is expected that groundwater infiltration or surface water runoff (including cofferdam leakage) could require pre-treatment prior to discharge. To collect water infiltration, sumps will be excavated at key locations of the excavation and pumps will be installed to dewater the area. If necessary, the water will be pumped into settling pond(s), silt treatment bags, and vegetated areas to mitigate any environmental issues that may arise from the dewatering. Should the water require secondary treatment for dissolved metals, proper measures will be taken including necessary permits and approvals.

2.5.5 Rock and Soil Deposition Areas

As previously indicated, an Agreement has been entered into among the Township of Greater Madawaska, OPG and SNC-Sullivan for the latter two to provide the Township with excavated rock for its future use. Excavated rock would be delivered to the rear of the Township's Works Yard which is situated approximately 200 metres away from the excavated area (see Figure 2-22 below). The Township has also indicated that it can take the demolished powerhouse (save for the exterior structure that has lead paint on it) as well. This Project will require Sullivan to construct an approximately 200-meter long temporary road spanning from OPG to Township property creating a direct access to a storage area at the back of the Township's lands. The Project would also involve decommissioning of this road following completion of the transfer of the rock. Figure 2-22 shows the likely area of rock placement based on archaeological, biological and engineering investigations and consultation with the Township. This area may be slightly further refined. This area is also shown as Area #3 on Figure 2-7.

Figure 2-22. Proposed Road and Possible Rock Placement Areas



As previously indicated, the Township has agreed to take most of the rock associated with the structure along with the demolished powerhouse. However, the Township is only interested in the rock and is not interested in the soil, sediment or co-mingled rock and soil. As such, OPG will still have extra material it will need to deposit on site.

As such, two different areas have been proposed on site to place the remaining excavated rock and soil. The two proposed areas are shown in Figure 2-7. These areas were selected based on their location and physical and environmental conditions. In general, the emphasis has been made to place the material close to the original excavation and/or use and in sites that have been historically disturbed.

Area #1 is located on the northeastern tip of Cross Island. This Area would be used to place the material left over from the downstream cofferdam. This will eliminate most of the need for truck traffic for this material. It is possible that some of the cofferdam material might be used for fish habitat pending further discussions with the DFO. Area #2 is located on Calabogie Island immediately adjacent and northeast of the South Branch Main Dam. This area was previously disturbed by the original construction of the Calabogie GS and is a lower lying area. Given that this is a lower area, excavated material can be placed here with fewer potential concerns with respect to visual effects from residents located on the north side of the North Channel. A section of this area may also be potentially used for parking or other purposes during construction. Both of these areas are considered to be of lower ecological value. The placement of the rock and sediment will occur above the high-water mark to ensure there is no loss of riparian habitat.

OPG has been in recent discussions with the AOO and AOP about minor adjustments to the sediment and rock pile stockpile areas (Areas #2 and #3 in Figure 2-7) to address AOO and AOP questions and concerns. This may include placing the sediment pile beyond 30 meters from the high-water mark.

Following construction, the areas will be revegetated to suit the surrounding environment. This may involve seeding, planting or natural re-generation by placement of topsoil and with an appropriate seeding or planting. Discussions could be held with the AOO and AOP as to possible plantings.

2.5.6 Construction Schedule and Strategy

Construction will be initiated in early 2020 with the intention of the GS being operational in 2023. Vegetation clearing at the site is anticipated to occur in the early months of 2020 ahead of the spring breeding bird season. The placement of cofferdams will adhere to any fisheries windows.

2.6 Proposed Calabogie GS Operations

As outlined in the 2009 Madawaska River Water Management Plan, Calabogie GS operated (prior to the September 2018 tornado) to support the peaking operations of the four other OPG owned GSs on the Madawaska River. The generating units at the station had limited flow capacity (66 m^3/s), but the operation of the units and sluice gates are integrated with the rest of the system on the Madawaska River. Calabogie was a generation bottleneck on the Madawaska River, and the small turbine capacity results in frequent spill past the station.

The operation of the existing plant is based on a daily/weekly cycle, with the inflow passed through the plant over a daily or weekly period. The 2009 WMP notes that operation of the plant takes into consideration energy demands, recreational opportunities as well as walleye spawning activities.

OPG does not propose to alter the existing water management compliance requirements associated with this facility. The redevelopment of Calabogie GS will continue to be operated in full accordance with all of the flow and water level targets and compliance conditions identified in the WMP. Daily flows will remain unchanged, but additional portion of river flow will pass through the plant to generate electricity rather than just passing through the spillway gates.

In terms of mandatory and conditional water level targets, for Calabogie G.S. Table 9.15 of the 2009 WMP defines the following:

Table 2-1. Water Management Plan – Calabogie GS Mandatory and Condition Level Limits

Table 9.15: Calabogie GS Mandatory and Conditional Level Limits

Parameter	Limit Type, Conditions and Notes
Absolute Maximum 154.17 m	Type: Mandatory Maximum level
Absolute Minimum 153.56 m	Type: Mandatory Minimum level
Summer Minimum 153.80 m	Type: Conditional Requirement The specified minimum level is the applicable limit provided the following condition outlined below is fulfilled. 1.The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an "Emergency Operating State" by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a "3% Voltage Reduction" by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. Walleye spawn/incubation flow limits at Calabogie are not active. 6. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used.
Walleye Spawn & Incubation Maximum 154.05 m	Type: Conditional Requirement The maximum level is applicable provided all the four conditions outlined below are fulfilled. The maximum level is to protect spawning grounds in Constant Creek. 1.The water temperature measured in the Barrett Chute tailrace or an agreed-upon location has reached 6 °C. 2.MNR has confirmed significant walleye activity at the Barrett Chute spawning shoal. 3.MNR has provided 24 hours notice of the start of the walleye spawning period. 4.The water temperature degree days since the start of the incubation period is less than 205 °C.
Walleye Spawn & Incubation Minimum 153.80 m	Type: Conditional Requirement The minimum level is applicable provided all the four conditions outlined below have been met. 1. The water temperature measured in the Barrett Chute tailrace or an agreed-upon location has reached 6 °C. 2. MNR has confirmed significant walleye activity at the Barrett Chute spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period. 4. The water temperature degree days since the start of the incubation period is less than 205 °C.

In terms of mandatory and conditional water flow targets, for Calabogie G.S. Table 9.16 of the 2009 WMP defines the following:

Table 2-2. Water Management Plan – Calabogie GS Mandatory and Condition Flow Limits

Table 9.16: Calabogie GS Mandatory and Conditional Flow Limits

Parameter	Limit Type, Conditions and Notes
Minimum Flow 0.8 m^3/s	Type: Mandatory Minimum Level Note:This flow has not been measured since the replacement of the wooden stop logs with steel stop logs. The 0.8 m^3/s is an estimated flow.
Walleye Spawn & Incubation 5 m^3/s.	Type: Conditional Requirement The minimum walleye spawn flow is applicable provided all the three conditions outlined below are fulfilled. 1. The water temperature measured in the North Channel at Calabogie or an agreed-upon location has reached 6 °C. 2. MNR has provided 24 hours notice of the start of the walleye spawning period. 3. The water temperature degree days since the start of the incubation period is less than 205 °C.This flow limit is an instantaneous flow that must be maintained throughout the walleye spawning period.

The annual variation of the mandatory and conditional limits are shown in Figure 9.08.

OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River Water Management Plan.

The Calabogie GS is a generating station on the Madawaska River, located between Barrett Chute GS and Stewartville GS. The existing turbine capacity of Calabogie is lower than the other stations on the Madawaska River, which becomes a constraint in the operation of the system. The present discharge capacity at Calabogie GS is 66 m³/s, but the upstream and downstream capacity at Barrett Chute GS and Stewartville GS is exceeding 450 m³/s. Under these conditions, Calabogie Lake is used as a daily reservoir to regulate the discharge and to maximize the energy production.

The average historical inflow for the period between 1965 and 2017 at Calabogie is approximately 90 m^3/s with a median of 72 m^3/s. The Barrett Chute and Stewartville GS are peaking plants whereas the existing Calabogie GS was used to support these operations with combinations of continuous turbine flow and gate operations. These operations modes can cause daily fluctuations of the water elevation at Calabogie Lake and Stewartville headpond. This form of operations for Calabogie GS has existed since peaking plants with larger discharge capacity than Calabogie were commissioned on the river.

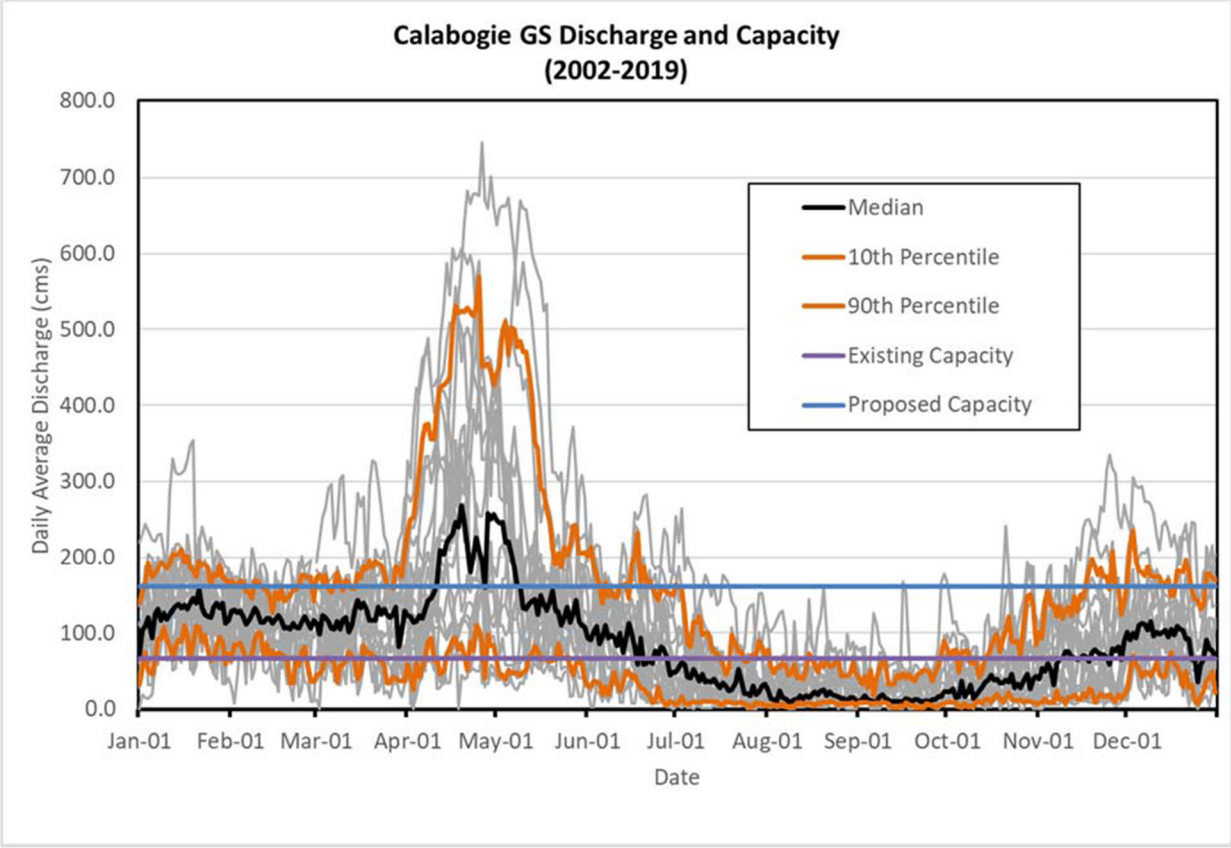
With the redevelopment of the Calabogie GS site and the increase of the generating and discharge capacity, there is the opportunity to more accurately shape the daily discharge from the facility. Regardless of the mode of operation, the turbine discharge capacity at Calabogie GS will remain lower than the discharge capacity at the other adjacent stations on the Madawaska River. Therefore, the priority in the operation of the hydro system will be for the Calabogie GS to continue to support the peaking operation of the downstream power plant at Stewartville with the possibility to minimize the fluctuations in the headpond to the extent practicable.

Figure 2-23 shows the historic total daily discharge (turbine flow & main control dam sluice flow) since the opening of the energy market, where each grey line is one year of data. The discharge past the Calabogie facility often exceeded the existing stations turbine capacity in the November to July period and was passed through sluiceways. The redevelopment will allow a greater amount of water to be passed through the turbines, which will allow OPG to produce more renewable energy from the existing water. The North Channel Control Dam sluiceway conditions will be maintained in accordance with the existing water management plan.

There will still be conditions and situations where a greater range at Stewartville GS is needed to meet Ontario grid requirements and maintain compliance with the other aspects of the Water Management Plan (WMP). However, there may be some conditions where the redeveloped Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations. If this occurs it will be done in compliance with the WMP. As a result, the redeveloped generating station will allow OPG to reduce the fluctuations in water level in Calabogie Lake and Stewartville more often than the current situation, but the impact will not be substantial.

Given the above, OPG does not plan to propose any formal changes to the compliance requirements in the WMP, however a Minor Amendment will be required to make administrative updates.

Figure 2-23. Calabogie GS Discharge and Capacity 2002 – 2019



There will be no permanent operating staff at the new station. Normal operation of the station and sluiceways will be carried out remotely by OPG. Normal maintenance activities at Calabogie GS will be carried out by OPG staff on an "as-required" basis. They will visit the station regularly.

Annual maintenance and overhauls for the redeveloped plant may require shut down of the units and will normally be scheduled when the flows are lowest and the loss of generation can be minimized. Minor overhauls require the units to be out of service for a minimum of 1 to 2 months and would likely only be required every 10 to 15 years. Major overhauls every 25 to 30 years could require a unit to be out of service for approximately 8 to 12 months. Unlike with the existing station, dewatering of the forebay will not be required to conduct maintenance on the new powerhouse.

2.7 Proposed Decommissioning

Decommissioning involves the permanent removal of the hydroelectric facilities, with the resultant loss of the site as a renewable source of electricity generation. Rather than decommissioning, redevelopment of a facility that is at the end of its designed service life could be a viable option. A number of OPG owned hydroelectric facilities that were built in the early 1900s have been redeveloped in the last 10 years, e.g., Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS on the Upper Mattagami River, and Hound Chute GS on the Montreal River.

Once the Calabogie GS Redevelopment Project has reached the end of its service life in 90 years or more, additional redevelopment, rather than decommissioning, would be an option that should be considered again to further extend the life of this plant.

3 DESCRIPTION OF THE EXISTING SOCIO-ECONOMIC ENVIRONMENT

This chapter describes the existing socio-economic environment around the proposed Project.

3.1 Location and Municipal Organization

The Calabogie Generating Station (Calabogie GS) is located within village of Calabogie, which is part of the Township of Greater Madawaska. The Township of Greater Madawaska is a lower tier municipality within the regional government of Renfrew Country located in eastern Ontario (see Figure 2-1).

As depicted in the map, Renfrew County represents a large land area on the eastern edge of Ontario with land to the east and south of Algonquin Provincial Park.

The Strategic Plan for Township of Greater Madawaska (2017) identified that the Mission of the Township is: “to provide a health, safe community for all residents, businesses and visitors by providing services in a cost effective manner to encourage our future growth and success” (p. 3).

The Township of Greater Madawaska is represented by a Mayor and three Ward Councilors.

3.2 Local and Regional Socio-Economic Composition

Information on the population, demographic, identity, housing, employment and income characteristics of the populations of both the Township of Greater Madawaska and Renfrew County are provided in order to gain a better understanding of the local and regional populations.

Table 3-1 provides population and demographic information on the Greater Madawaska and Renfrew County based on the 2016 Census of the Population.

Table 3-1. Population and Demographic Characteristics of Greater Madawaska and Renfrew County

Population and Demographic Characteristics	Greater Madawaska	Renfrew County	Ontario
Population			
2016 Total Population	2518	102394	
2011 Total Population	2485	101326	
Percent Change	1.3%	1.1%	4.6%
Age of the Population			
Average Age of the Population	51.6	43.2	41.9
Median Age of the Population	57.5	44.8	42.4
Household and Family Characteristics			
Average Household Size	2.1	2.3	2.6
Average Size of Census Families	2.5	2.8	2.9
Aboriginal Identity			
Aboriginal Identity	110	8460	
Non-Aboriginal Identity	2380	90805	
Percent Aboriginal Identity	4%	9%	

Source: Statistics Canada, Census of the Population, 2016.

Table 3-1 identifies the total population of Greater Madawaska in 2016 as 2,518 representing a 1.3% increase from the 2011 population. Renfrew County showed a similar minor increase in population of 1.1%.

The demographic characteristic that is most unique about Greater Madawaska is the age of the population. In 2016 the average and median ages of the population were 51.6 and 57.5 respectively. These figures are noticeably higher than average and median ages for the populations of Renfrew County (43.2 and 44.8) and the Province of Ontario (41.9 and 42.4). As the data indicates, the population of Greater Madawaska is significantly older than it is for Renfrew County and the Province of Ontario. In consultation with local stakeholders it has been indicated that there are a large number of individuals that have retired to their residences in the Township. The census data would support this assertion. Whether there is also a trend for younger families to move out or not locate in Greater Madawaska because of a lack of economic opportunities and social services is uncertain.

Information on household and family characteristics in Greater Madawaska indicate slightly smaller household and family sizes, which suggests that the households and families in the Township are characterized by an older population.

The percentage of the populations that identify themselves as Aboriginal are 4% in Greater Madawaska and 9% in Renfrew County.

Table 3-2 provides housing information on the Greater Madawaska and Renfrew County based on the 2016 Census of the Population.

Table 3-2. Housing Characteristics of Greater Madawaska and Renfrew County

Housing Characteristics	Greater Madawaska	Renfrew County	Ontario
Total Private Dwellings	2170	49860	5598391
Private Dwellings Occupied by Usual Residents	1178	42779	5169174
Percent of Dwellings not Regularly Occupied (i.e. seasonal, recreational)	46%	14%	8%
Year Round Dwellings by Housing Type	1180	42775	
Single Detached House	1150	33240	
Other	30	9535	
Private Households by Tenure			
Owned	1175	32415	
Rented	70	10360	
Average Number of Rooms per Dwelling	6.8	6.7	6.3

Source: Statistics Canada, Census of the Population, 2016.

As indicated, in Table 3-2, the total number of private dwellings in Greater Madawaska is 2,170. What is unique about Greater Madawaska in relation to Renfrew County and Ontario is the large proportion of dwellings that are “not regularly occupied”. Of the 2,170 total private dwellings, 1,178 were identified as usually occupied indicating 992 are not regularly occupied. This represents 46% of the Township’s dwelling stock in comparison to 14% for Renfrew County as a whole and 8% throughout Ontario. The high proportion of dwellings not usually occupied is a reflection of the large number of seasonal cottages, cabins and other housing stock in the Township. This large proportion does demonstrate the likely economic importance of the cottaging, recreational and tourism industry in Greater Madawaska.

With respect to the housing type and stock, almost all of the year-round dwellings are identified as single detached homes with almost all of them being owned (versus rented). This is typical of a predominantly rural area in Ontario.

The average number of rooms per dwelling is 6.8 which is slightly higher than the average in Ontario.

Table 3-3 provides income and economic information on Greater Madawaska and Renfrew County based on the 2016 Census of the Population.

Table 3-3. Income and Economic Characteristics of Greater Madawaska and Renfrew County

Census Variable	Greater Madawaska	Renfrew County	Ontario
Income Characteristics			
Median Total Income in 2015 Among Recipients	$32,096.00	$34,319.00	$33,539.00
Average Employment Income in 2015 for Full-Time Workers	$65,417.00	$58,038.00	$68,628.00
Median Total Income of Households	$64,768.00	$67,683.00	$74,287.00
Composition of Total Income			
Market Income	83%	85%	89%
Employment Income	56%	71%	73%
Government Transfers	17%	12%	11%
Participation in the Economy			
Participation Rate	50.8%	61.2%	60.6%
Employment Rate	46.3%	56.8%	56.1%
Unemployment Rate	8.8%	7.2%	7.4%

Source: Statistics Canada, Census of the Population, 2016.

With respect to income, the income characteristics for Greater Madawaska are generally in the same range as Renfrew County and Ontario. Perhaps the broadest measure of income is the median total income of households where for Greater Madawaska it was $64,768 in contrast to $67,683 for Renfrew County and $74,287 for Ontario. In contrast the average employment income for full-time workers in Greater Madawaska is higher than in Renfrew County and only slightly below the provincial average. The slight contrast in those two figures may be that the household income is a bit lower than Renfrew and Ontario because of the older population in Greater Madawaska. Generally, the incomes of seniors in retirement is below the working year incomes.

With respect to the composition of total income, the main difference between Greater Madawaska in contrast to Renfrew County and Ontario is the slightly higher reliance on government transfers at 17% for Greater Madawaska versus 12% and 11% respectively for Renfrew County and Ontario. This slightly higher reliance on government transfers may be a result of specific government transfer payments available for senior citizens.

In a similar fashion the participation rate in the economy is slightly lower (50.8%) in Greater Madawaska than it is in Renfrew County (61.2%) and Ontario (60.6%). This is also likely a result of the older population in Greater Madawaska. The unemployment rate at the time of the census in 2016 was higher in Greater Madawaska (8.8%) than in Renfrew County (7.2%) and Ontario (7.4%).

In summary, the key characteristic unique to the Township of Greater Madawaska is population that is approximately ten years older than the provincial average and noticeably higher than in Renfrew County generally. The other main characteristic is that the population only grew 1.3% from 2011 to 2016, which is similar to Renfrew County but significantly below the provincial growth rate. However, limited population growth is typical of more northern and rural areas of Ontario.

3.3 Local and Regional Economy

Major employers in Renfrew County are diverse but include: large public sector employers such as Garrison Petawawa, Renfrew County, Renfrew County School Board, Algonquin Provincial Park and the various hospitals and health services institutions in the region; and, major private sector employers such as Canadian Nuclear Laboratories, aerospace industry firms, call centres and various medium and small sized forest products mills and woodland operations (Renfrew County Economic Development Department, 2018). Along with these major employers, Renfrew County is comprised of a diverse mixture of small cities, towns, villages, rural land and large expanses of public forested crown land, particularly in the northern part of the County. The mixed urban, rural and forested landscape promote various resource-based industries such as the forest industry, aggregate resources, agriculture, tourism and cottaging.

As previously mentioned, the Township of Greater Madawaska in which the Calabogie GS is located primarily a rural and forested landscape with a large number of homes and cottages concentrated around Calabogie Lake and village and other homes and cottages scattered throughout the township. Agriculture is generally limited and small-scale in the Township. While no economic assessment reports were identified for the Township it is clear that its economy is heavily tied to servicing its permanent and seasonal residents in the Township. In short, the Township's economy is quite dependent on the cottaging, recreational and tourism amenities in the area specifically, resources such as Calabogie Peaks Resort, Calabogie Lake, Madawaska River, etc.

3.4 Land and Resource Use

This section of the Report describes relevant land and resource use in the area as well as describe provincial and local policy with respect to land use in the area.

3.4.1 General Description of the Area

Renfrew County is comprised of a diverse mixture of small cities, towns, villages, rural land and large expanses of public forested crown land, particularly in the northern part of the County. Some of the larger communities within Renfrew County include the City of Pembroke and towns such as Renfrew, Arnprior, Chalk River, Deep River, Eganville, Barry's Bay, etc. The mixed urban, rural and forested landscape

promote resource-based industries such as the forest industry, aggregate resources, agriculture, tourism and cottaging.

The Township of Greater Madawaska is comprised of a mix of forested crown and private land with agricultural, residential and recreational properties scattered throughout the Township. The village of Calabogie is the commercial and municipal government centre for the Township.

The population densities of both the Township of Greater Madawaska and Renfrew County are low with densities of 2.4 and 13.7 persons per square km (Statistics Canada, 2018).

3.4.2 Provincial Policy Direction

Provincial policy was also considered when examining the proposed Calabogie GS Redevelopment Project. The Provincial Policy Statement (PPS) (OMMAH, 2005) was examined.

Section 1.6.11 of the PPS (OMMAH, 2014) encourage increased energy supply from waterpower resources:

> *"1.6.11.1 Planning authorities should provide opportunities for the development of energy supply including electricity generation facilities and transmission and distribution systems, to accommodate current and projected needs.*
>
> *1.6.11.2 Planning authorities should promote* renewable energy systems *and* alternative energy systems*, where feasible, in accordance with* provincial and federal requirements*."*

In summary, provincial policy currently encourages projects, such as the proposed Project.

3.4.3 Water Management Plan

A Water Management Plan for the Madawaska River System was initially approved in 2000. The current version (2009) of the Water Management Plan (WMP) was signed for approval in 2010. The WMP was the culmination of several years of planning and input from a wide variety of stakeholders.

In Ontario, a water management plan sets out legally enforceable provisions for the management of flows and levels on river within the values and conditions identified within the water management plan. In instances where, due to emergency energy shortages, the Independent Electricity System Operator requests that owners of the waterpower facilities and associated water control structures seek relief from certain provisions of the WMP, the Ministry of Natural Resources will consider those requests expeditiously and, after consultation with the Independent Electricity System Operator (IESO), may allow short-term relief from certain provisions. The mandatory provisions of the water management plan will be waived, as appropriate, when the dam owners (which may include other dam owners, such as the Ministry of Natural Resources and Forestry (MNRF) are requested to do so by a police service or other emergency organization. In instances of unscheduled facility imperatives (e.g. emergency maintenance etc.), MNRF will consider requests from the owner for temporary relief from the plan expeditiously with consideration to the relative priorities of both MNRF and the owner (OPG, 2009).

As outlined in the Madawaska River WMP (OPG, 2009), Calabogie GS presently operates as a peaking plant in conjunction with the four other OPG owned GSs on the Madawaska River. The generating units at the station have limited flow capacity (66 m^3/s), but the operation of the units and sluice gates are integrated with the rest of the peaking system on the Madawaska River. Calabogie is a generation bottleneck on the Madawaska River, and the small turbine capacity results in frequent spill past the station.

The operation of the existing plant is based on a daily/weekly cycle, with the inflow passed through the plant over a daily or weekly period. The 2009 WMP notes that operation of the plant takes into consideration energy demands, recreational opportunities as well as walleye spawning activities.

The Calabogie GS including the reaches from Barrett Chute GS to Calabogie and Calabogie to Stewartville GS operate according to a series of compliance requirements established in the WMP. These were previously discussed in Chapter 2 of this Report.

It is important to note that there has historically been concern with respect to the fluctuation of water levels in the Calabogie-Stewartville Reach. This was expressed in the WMP in Section 5.2.8.1. OPG already operates this reach of the River with a more narrow compliance range during the summer from the May long weekend to the Thanksgiving Day weekend but it has been suggested in that past by members of the public that this more narrow reach be extended. As a result, OPG prepared Information Need 7.2.8.9 in October 2012 named the Stewartville Flow to Rule Curve. This Information need was carried out to assess the impact of a Rule Curve for Stewartville on the operations of the Madawaska River. The proposed Rule Curve was put forward by a member of the Standing Advisory Committee. The Rule Curve was developed to improve recreational opportunities on the Stewartville Reach. The assessment of the impact of the Rule Curve includes changes to the operating flexibility, revenue and compliance administration. In that Report, OPG recommended against adopting a new rule curve for the reasons outlined below (pp. 17 – 19):

> *"At OPG facilities the existing summer range covers the May long weekend to the Thanksgiving weekend. Non-OPG facilities on the river use a summer range for recreational use only in the months of July and August. OPG will not consider any extension of the summer range outside of the period between the May long weekend and the Thanksgiving weekend. The significant reduction in revenue, compliance administration associated with extending the summer season would result in a significant negative impact to operations on the Madawaska River and thus is not a viable change to the MRWMP.*
>
> *The reduction in the operating flexibility with the proposed Rule Curve further reduces the already limited flexibility that exists between Calabogie, Stewartville and Arnprior. The reductions in the operating flexibility and more specifically the inability to limit generation to the on peak periods at Stewartville are significant. There is also a reasonable reduction in revenue and increased compliance administration associated with the proposed Rule Curve. OPG can not recommend adopting the proposed Rule Curve because of the reduction in operating flexibility, annual reduction in revenue and the increased compliance administration. However, OPG will review the existing study data and explore other alternatives for the users of the reach to consider.*

OPG has reviewed the proposed Stewartville Rule Curve. The implementation of the proposed Rule Curve would reduce operating flexibility at Calabogie, Stewartville as well as Arnprior, reduce revenue and requires a significant amount of additional effort to monitor and ensure regulatory compliance. OPG can not recommend adopting the proposed Rule Curve. OPG will review the existing study data and explore other alternatives for the users of the reach to consider. However, OPG will not be considering increasing the length of the Summer period."

3.4.4 Existing Land Use

The existing Calabogie GS is over 100 years old and the facility pre-dated any form of municipal land use plan for the area.

The most recent version of the Country of Renfrew Official Plan went into force as of April 25, 2018.

According the Official Plan of Renfrew County (see "COUNTY OF RENFREW SCHEDULE "A" Township of Greater Madawaska Enlargement) the OPG lands associated with the Calabogie GS are designated as "Rural". Most of the lands immediately adjacent to the facility have the same designation except for the Village of Calabogie which is designated as "Village Community". This same Schedule demonstrates the patchwork tenure of both crown and private rural land throughout much of the Township.

According to the "COUNTY OF RENFREW OFFICIAL PLAN – SCHEDULE "B" – Map 1 Hazards Map" most the Calabogie property is identified in yellow as "Wildland Hazard Pine – Needs Evaluation". It appears this label may be associated with section 9C (page 32) of the Official Plan about areas susceptible to Wildland Fire.[1]

The Zoning By-Law for the Township of Greater Madawaska is Zoning By-Law No. 22-2003. The By-Law was adopted by the Township in 2003 and approved by the Ontario Municipal Board in 2004. According to the Township of Greater Madawaska Zoning By-Law, the Calabogie GS is to be considered as a "Public Service" under section 3.24, where it states:

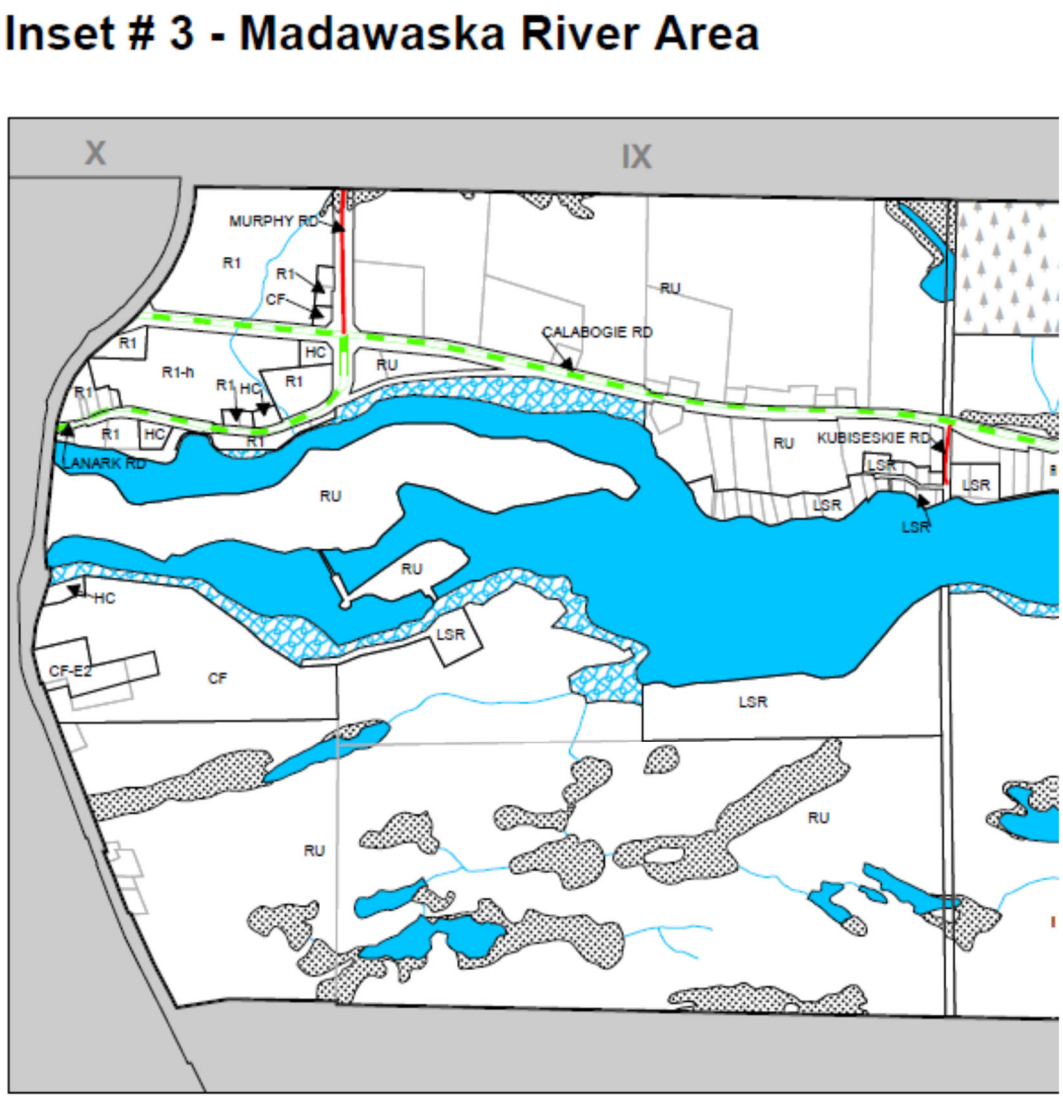
"The provisions of this By-law shall not apply to the use of any land or to the erection or use of any building or structure for the purpose of a public service by the Municipality or any local board thereof defined by the Municipal Affairs Act (R.S.O. 1980), by any telephone, gas, electrical generating or distribution company, communications company, or by any department or agent of the Government of Ontario or Canada, provided that: (a) With the exception of a public utility, the lot coverage, parking and loading, setback and yard requirements prescribed for the Zone in which such land, building or structure is located shall be complied with; and (b) No goods, material, or equipment shall be stored in the open in a Residential Zone; and (c) Any building erected in a Residential Zone or in a Zone

[1] These regional multipliers are taken from Arcadis Canada Inc. estimates of OPG hydroelectric projects in Northeastern Ontario and were derived form the use of an economic impact model used in Timmins and Kapuskasing.

which permits residential uses under the authority of this paragraph shall be designed and maintained in general harmony with residential buildings of the type permitted in the Zone."

The Calabogie GS would be defined as a building for the purpose of electrical generating and therefore the by-law would not apply. It should be noted that Schedule D of the Zoning By-Law designates the land as "Rural" and "Flooded".

Figure 3-1. Schedule D of the Zoning By-Law



Source: County of Renfrew. Corporation of the Township of Greater Madawaska Zoning By-Law No. 22-2003. 2003.

3.4.5 Local Socio-Economic Features and Uses

A variety of local socio-economic features and uses occur within relative close proximity to the Calabogie GS and our described here in order to better understand the potential for impact on them.

3.4.5.1 Roads and Access

The Calabogie GS is located just outside the Village of Calabogie and is accessed by County Road 511 (also known as Highway 511). An OPG private road (Generating Station Lane) connects the GS to Highway 511. That road is about 0.5 km in length and is gated at a point along the road.

OPG also has an unnamed road immediately north of Generating Station Lane that accesses Calabogie Island and the north side of the existing spillway.

3.4.5.2 Municipal Fire Supply and Access

The Municipality of Greater Madawaska has a winter dry hydrant located between the Inlet Sluices and the South Branch Main Dam of the Calabogie GS that they use to fill up the water pumper trucks in the winter. The hydrant is in this location because the municipality's fire department requires access to open water in the winter.

No other municipal infrastructure is located near the Calabogie GS.

3.4.5.3 Source Water Protection Areas and Municipal Intakes and Outflows

There is no Conservation Authority for the Madawaska River watershed.

Examination of the Ministry of Environment, Conservation and Parks' (MECP) Source Protection Information Atlas website (https://www.gisapplication.lrc.gov.on.ca/SourceWaterProtection/Index.html?viewer=SourceWaterProtection.SWPViewer&locale=en-US) identified that the Calabogie GS is not located within a source water protection area near Calabogie GS (retrieved July 10, 2018). It appears the closest one is near Almonte to the southeast by over 20 km.

OPG is not aware of any water treatment plants or sewage treatment plants in the Calabogie GS to Stewartville GS reach.

3.4.5.4 K & P Trail

A regional trail, known as the K & P Trail has its southern terminus located just east of the intersection of Highway 511 and OPG's access Road, "Generating Station Lane". The Trail is located on the former railbed of the former Kingston & Pembroke Rail Line. The K & P Trail in this location connects Calabogie to Renfrew and various stakeholders have and are developing the trail on other segments of the former rail right-of-way.

There is some parking in this area for trail users, although it is not clearly delineated on the ground. A photo of this area is provided below. The County has requested that the trail and parking area be kept clear at all times.

In winter, the K & P Trail also serves as a snowmobile trail (referred to as E105A) and connects to the broader network of snowmobile trails in the Province. The snowmobile trail was formerly co-located along Generating Station Lane but the licence has not been renewed by OPG. The snowmobile trail now crosses the adjacent Township Works yard.

Photograph 3-1. K & P Trailhead and Parking at the Madawaska River

3.4.5.5 Water-Based Recreational Uses

A large variety of water-based recreational uses occur along the Madawaska River, upstream and downstream of the Calabogie GS. These uses are described below. Owing to the somewhat different environments, these have been organized according to upstream and downstream recreational uses.

3.4.5.5.1 Upstream Recreational Use

Upstream of the Calabogie GS is Calabogie Lake, a large recreational lake. The majority of the perimeter of Calabogie Lake is rimmed by cottages, homes and other recreational properties. Similar to other major cottaging lakes in Ontario, the lake is used for a diverse mix of water based recreational uses such as fishing, boating, water skiing, jet skiing, etc.

Water levels on Calabogie Lake are regulated within a fairly tight operating band, 153.80 -154.17 m (37 cm), through the summer period, to accommodate boating and other recreational concerns.

3.4.5.5.2 Downstream Recreational Use

Downstream of the Calabogie GS is the Madawaska River. Most of the north bank of the Madawaska River from the Calabogie GS to the Burnstown Bridge is populated with cottages and homes, while most of the south bank remains largely undeveloped. Recreational use on the River includes fishing, boating, water skiing, canoeing, jet skiing, etc. A portage around the GS is located on the north side of the North Channel and would be unaffected by the proposed undertaking.

Water levels in this stretch of the River are impacted by the combined operations of Calabogie GS and Stewartville GS. Water levels in the summer period from the Victoria Day Weekend to Thanksgiving are constrained to a more narrow operating range than the balance of the year.

A canoe route currently exists at the Calabogie GS and is located on the south side of the Generating Station. The canoe route will not be impacted by the proposed undertaking.

The issues and concerns with respect to the fluctuation of water levels in the Calabogie to Stewartville Reach were discussed in Section 3.4.3.

4 SOCIO-ECONOMIC EFFECTS ASSESSMENT

The socio-economic effects of the proposed undertaking with respect to regional and local effects are presented in this chapter.

4.1 Regional Socio-Economic Effect

4.1.1 Construction Phase

The proposed Project will have a positive economic impact on the Province, eastern Ontario and Renfrew County.

The proposed Project is expected to result in the creation of approximately 162 to 185 person years of work over an approximately two-year construction period. This employment will be distributed across a wide variety of professions and trades typically associated with a heavy construction project. Large labour needs will include: engineers; equipment operators, labourers, drillers, cement workers, ironworkers/rodmen, electricians, welders, carpenters, etc.

Recent OPG experience in constructing hydroelectric projects in Northeastern Ontario demonstrated that approximately 60% of the total labour requirement for the on-site work was met by the labour market in northeastern Ontario. Given the greater labour pool in eastern Ontario and that the Design-Build Contractor (DB Contractor) includes participation from a local/regional heavy construction firm, it is anticipated that most of the labour would come from eastern Ontario.

For a construction project, OPG requires that all labour associated with the proposed Project be members of the unions which it has collective agreements in place. The Electrical Power Systems Construction Association (EPSCA) negotiates and administers collective agreements with the Building Trades for OPG and all contractors performing trades work on OPG projects.

The unions covered under the EPSCA agreement vary from highly specialized workers such as electricians to more generalist trades such as labourers. Local individuals who are qualified to do work but are not union members would be required to join the union that represents their trade.

As part of the ongoing commitment to work closely with local Indigenous Communities, and building on OPG's past experience in this area, it has developed a strategy with the AOO and the AOP to encourage community members and businesses to capitalize on employment opportunities on the Project, should it receive the necessary approvals to proceed to the construction phase. OPG has already hired a Front End Engineering and Design (FEED) Phase Design Build (DB) contractor who will be responsible for the construction of the Project. This DB contractor is aware of the importance of Indigenous employment and is working with the AOO, AOP and any interested Williams Treaty First Nations to facilitate the hiring of individuals and businesses. In addition, the DB contractor is working with the local Unions to ensure that all parties are collaboratively promoting employment of Indigenous individuals and business.

In addition to AOO and AOP, Mississaugas of Scugog Island and Alderville First Nations have also indicated interest in employment opportunities and OPG is committed to working with their employment representative to facilitate similar employment opportunities during construction. Once Hiawatha and Curve Lake respond to the request to meet with the Project, they too will be provided employment information as described above. To date Information on anticipated jobs during construction has been provided to AOP, AOO, Alderville and to the Mississaugas of Scugog Island FN, to help their relevant employment officer work with their community members to get them ready to compete for positions. As well, individuals and business interested in immediate employment opportunities (non-Project opportunities) as well as Project construction opportunities can work directly with a Sullivan contact on the Calabogie team who can introduce community members to Union contact etc.

The Project team will work cooperatively with the relevant Indigenous communities after the EA and into the Construction period should the Project receive its necessary approvals to move forward.

Additional indirect and induced employment will also be created as a result of the proposed Project, particularly in sectors associated with the supply of construction materials and the recent provision of goods and services to the Project and associated workforce. Based on other recent OPG hydroelectric projects in northern Ontario, for every direct job associated with the Project another 0.65 person years of employment will be generated elsewhere in northeastern Ontario.[2] This multiplier is likely higher in eastern Ontario because of the more extensive economic base of the region.

Economic and business activity effects are all the economic effects associated with sub-contracting opportunities on the proposed Project to the DB Contractor and also the indirect and induced economic effects associated with the Project on the regional economy. Opportunities for existing local businesses and the regional economy will come via contracting work, as well as local project purchasing and expenditures by workers in the local and regional economy.

Some of the more common businesses or sectors in the local and regional economies that will benefit from the proposed Project include:

- Other construction and construction supply (e.g., building or aggregate supply) companies;
- Local accommodation suppliers (e.g., motels) as short-term workers on the Project visit the area;
- Business, professional and personal services companies that are likely going to experience increased levels of activity;
- Transportation related companies that are likely to experience an increased level of business; and,
- Local and regional retail (e.g., convenience stores, grocery stores, drug stores) and food services industries (e.g., restaurants, grocery stores) that will benefit from worker expenditures at these at these businesses.

[2] These regional multiplier are taken from Arcadis estimates of OPG hydroelectric projects in Northeastern Ontario and were derived from the use of an economic impact model use in Timmins and Kapuskasing.

For other socio-economic studies on hydroelectric projects in northern Ontario, it was estimated that the sales multiplier associated with the proposed Project was $1.50, i.e., for every dollar expended on the Project and additional $0.50 would have be spent in northern Ontario. Similar to the employment multiplier, it is anticipated that this multiplier will be greater in eastern Ontario because of the more extensive economic base of the region.

Little to no effect is excepted on the population, demographic or social composition of local communities such as Calabogie. This is because OPG does not anticipate a large number of workers moving into the region for this temporary work. It is likely most workers will just commute from their existing residences in eastern Ontario. It is possible or likely that the employment opportunities created by the proposed Project might allow some people within one hour's drive of the Project to secure some employment. Therefore, if anything the Project may somewhat enhance the social stability of some communities near the Project.

4.1.2 Operations Phase

As OPG already operates the Calabogie GS, OPG does not anticipate any major changes with respect to staffing for the Plant Group that oversees Calabogie GS.

OPG anticipates that the re-developed GS will result in payment of $18 million (in 2019 dollars) to the Province in Gross Revenue Charges over the course of the proposed Project or $52.5 million (nominal dollars with inflation).

4.2 Local Socio-Economic Effects

4.2.1 Land Use

OPG is planning on using the Calabogie GS, for the same purpose of which it has been used for the last one hundred plus years. As indicated previously, the Township of Greater Madawaska's Zoning By-Law includes a provision for "Public Uses" including those that generate electricity. According to section 3.24 of the by-law, that exempts such use from the by-law.

As the Calabogie GS has been in place for one hundred plus years surrounding land uses and landowners recognize the GS as part of the land use character of the area. No public concerns have been raised with respect to its compatibility.

The Township has in place a Noise By-Law that will need to be adhered to.

A Demolition Permit and a Building Permit will also be required for the proposed Project, with fees paid to the Township.

4.2.2 Access and Transportation

As indicated in Chapter 3, the Calabogie GS is accessed from County Road 511, a provincial secondary two lane paved highway.

OPG anticipates that on average there would be approximately 40 to 75 workers on site on an average day with a peak of 100 workers. SNC-Sullivan is proposing that most of the workers will access the site and park on Calabogie Island and walk across the dam/spillway to access the site. This will allow Generating Station Lane (the main road to the Calabogie GS) to be devoted to construction traffic.

Other than worker traffic, OPG anticipates that there will be fewer than 25 trips into the site per day. There will also be a few large ("oversize") deliveries into the site such as for the turbines. The majority of construction traffic involving tri-axles will only be hauling from the site over to the island. This falls under worker traffic and not considered as trips into the site.

Discussions have been held with the County of Renfrew and the Township Greater Madawaska with respect to access and transportation issues and these are discussed below.

SNC-Sullivan have proposed a traffic management plan that is intended to result in the fewest number of construction vehicle trips on the County Road 511 as possible. This will not only reduce traffic but will lower greenhouse gas emissions and reduce the likelihood of any traffic incidents. As indicated in the Project Description in Chapter 2, SNC-Sullivan are working with the Township for one-way large construction traffic to enter the Township Works Yard and travel to the Calabogie GS and then exist via Generating Station Lane. This will occur for a few months while excavation is underway at the site. Once rock, sediment and soil have been excavated a two-way flow of traffic will occur on Generating Station Lane again.

The County has indicated that any modifications to the site entrance at County Road 511 (Lanark Road) are subject to review and approval by the County's Public Works Department. In this regard the entrance must comply with the County's Entrance By-law and policies that are in effect at the time of construction. All costs associated with any work required at the entrance will be the responsibility of OPG/SNC-Sullivan.

Any loads that are oversize or overweight will require the issuance of a special vehicle permit from the County's Roads Public Works and Engineering Department.

The County and SNC-Sullivan will also be reviewing the load levels for the bridge that crosses the Madawaska River near the entrance to the site.

The County's Public Works and Engineering Department has indicated that a traffic management plan will be required to accommodate the construction traffic entering/exiting the site. The traffic management plan should have considerations for: truck turning signs, turning radiuses, turns on to the bridge, signage, and vegetation clearing. In particular they have indicated that such a plan will need to ensure that signs are erected on the Highway to advise the other road users of turning traffic. In addition, they also indicated that

there may be a need to have Traffic Control Person on site during periods of high turning movements to/from the site (Kuiack, 2019).

The County also indicated that any gates at the access to the site shall be setback a sufficient distance from the County Road 511 roadway so as not to interfere with the traffic movements on the roadway. It is recommended that the DB Contractor ensure that entrance (i.e. gate, traffic control persons) into the construction site be specifically designed so that County Road 511 is not blocked.

The County has also asked that any damage to the County's infrastructure as a result of the proposed works shall be repaired to the satisfaction of the County. It is suggested that the DB Contractor may want to take video or photographs of areas of the 511 that are already in poor condition so as not to have such defects attributed to the Project.

During the construction period, OPG's DBC has also agreed to agree to include in their environmental management plan a process for communicating with Indigenous communities and the public. Part of this would include information on how complaints are managed.

4.2.3 Social and Economic Uses

4.2.3.1 Upstream and Downstream Recreational Use

Given the large number of property holders on Calabogie Lake and on the Madawaska River, OPG considered it a pre-condition of the proposed Project that it would not alter the level and flow requirements in the existing Madawaska River WMP and continue to operate the Calabogie GS in largely a similar fashion as it does now.

In general, there have historically been very few concerns with how Calabogie Lake is managed. As was discussed in Section 3.4.3 there has been previous public concern about the water level fluctuations in the Calabogie-Stewartville Reach and some interest in having the more narrow summer range extended. As indicated, OPG has not recommended this owing to a variety of other water management considerations.

The redeveloped GS at Calabogie will have an increased flow capacity, which will allow OPG to produce more energy from the existing water. So additional water will be flowing through the GS rather than through the South Dam Sluiceway but this will not increase the daily flow. The north sluiceway conditions will be maintained in accordance with the existing WMP.

There will still be conditions and situations where a greater range at Stewartville GS is needed to meet Ontario grid requirements and maintain compliance with the other aspects of the WMP. However, there may be some conditions where the new Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations. If this occurs it will be done in compliance with the WMP. Given the above, OPG does not plan to propose any formal changes to the compliance requirements in the

WMP, however a Minor Amendment will be required to the WMP to reflect the fact that a new GS has been constructed.

Therefore, OPG is of the opinion that the proposed GS will represent a minor improvement in the existing situation for those riparian landowners concerned about fluctuating water levels in the Calabogie-Stewartville Reach. This will also introduce slightly different conditions than some River users may have experienced in the past. Overall, the opinion is that this will not represent any significant change to recreational use on the River.

4.2.3.2 K & P Trail and Snowmobile Trail

As discussed in Chapter 3, the K & P Trail has its southern terminus located just east of the intersection of Highway 511 and OPG's access Road, "Generating Station Lane". There is some parking in this area for trail users, although it is not clearly delineated on the ground. The County has requested that the trail and parking area be kept clear at all times.

The road to access Calabogie Island crosses the start of the K&P Trail. If Calabogie Island is to be used for worker parking it is recommended that signage be placed both on the road and the trail to inform workers and trail users of potential traffic. It is also suggested that some of the vegetation be cut back at this corner to improve sight lines.

The County has also requested that OPG consider providing any surplus materials left over from the construction of the proposed Project for trail maintenance. The County specifically asked for fencing and stonedust/M-gravel. It is unlikely that any fencing will be required for the Project but there may be some excess gravel materials.

As previously indicated, the K & P Trail also serves as a snowmobile trail (referred to as E105A). South of the K & P Trail, the snowmobile trail was previously located on Generating Station Lane. But OPG recognized the public safety concern with having the trail being co-located on its access road and in extremely close proximity to the Madawaska River. As such, OPG no longer provides a licence to the snowmobile club to utilize this area. The snowmobile route continues slightly further south and east on the adjacent municipal land.

At the terminus of the K & P Trail, the snowmobile trail still crosses Generating Station Lane and therefore it is recommended that additional signage or other such safety measures be provided during construction to warn snowmobilers of construction related equipment. Other safety measures may need to be put in place.

As the snowmobile trail is located on the Township's Works Yard where the surplus rock is to be moved there is a need to consider a re-route of the snowmobile trail pending the final placement of rock.

4.2.3.3 Municipal Services, Issues and Infrastructure

As indicated in Chapter 3, the Municipality of Greater Madawaska has a winter dry hydrant located between the Inlet Slucies and the South Branch Main Dam of the Calabogie GS that they use to fill up the water pumper trucks in the winter. The hydrant is in this location because the municipality's fire department requires access to open water in the winter.

While the hydrant itself is unlikely to be directly impacted by the proposed Project, access to it could be potentially constricted because of the construction. OPG will need to maintain access to the sluicegate structure for stoplog operations during the execution phase, therefore OPG will ensure the township will have access to the fire hydrant for the duration of the project.

As explained in Chapter 2, the Township of Greater Madawaska, OPG and SNC-Sullivan have entered into a Memorandum of Understanding with respect to the transfer of excavated rock from the OPG property to the Township's Works yard. This has turned out to be a win-win-win agreement with the following benefits:

- Township will receive at no cost the clean rock and the demolished building that can be used for future road works projects in the Township.
- OPG/SNC-Sullivan will not need to dispose of the rock off-site or on-site.
- Re-use of rock is encouraged by the government and all stakeholders, especially Algonquins of Ontario.
- Will reduce risks associated with movement of this material on to public roads and highways.
- Will reduce emissions associated with additional truck traffic associated with the haul.
- Will reduce the amount of material OPG has to place on site which may be of an aesthetic concern to local residents.

OPG is of the opinion that this is a great initiative that benefits all parties and reduces the overall environmental impact of the proposed Project.

On September 16, 2019, the Township of Greater Madawaska passed a Resolution indicating its support for the proposed project. That Resolution appears as Appendix A of this Report.

4.3 Summary of Mitigation, Enhancement and Monitoring Measures

Table 4-1 summarizes potential construction and operation effects, the recommended mitigation/remedial measures to minimize or obviate these effects and the net effects of the proposed Calabogie Re-Development Project.

Table 4-1. Potential Construction and Operation Effects

Effect/Activity	Recommended Mitigation/Remedial/ Enhancement Measures	Net Effect
Construction		
Positive Economic and Employment Impacts	• Project team is working with Indigenous communities to maximize employment and economic opportunities. • Project will work with local suppliers to create opportunities wherever possible.	Positive
Positive Gross Revenue Charges	• Project will result in significant gross revenue charges for the Province.	Positive
Noise	• Adherence to noise by-law • Use of well-maintained equipment and noise silencers (as required) from Terrestrial Environment TSD.	Negligible
Traffic, Access and Transportation	• Design of internal traffic circulation system to reduce potential for incidents. • Compliance with Renfrew County's Entrance By-law and policies. • Oversize or overweight loads will require the issuance of a special vehicle permit from Renfrew County. • Renfrew County and SNC-Sullivan to review the load levels for the bridge that crosses the Madawaska River. • Traffic management plan will be required to accommodate the construction traffic entering/exiting the site. • Any damage to the County's roads as a result of the proposed works shall be repaired to the satisfaction of the County. It is suggested that the DB Contractor may want to take video or photographs of areas of the 511 that are already in poor condition so as not to have such defects attributed to the Project.	Negligible
Complaints	• DBC has also agreed to agree to include in their environmental management plan a process for communicating with Indigenous communities and the public. Part of this would include information on how complaints are managed.	Negligible
Positive Recreational Use	• No proposed measures but there may be some conditions where the new Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations. This should represent a minor improvement in the existing situation for those riparian landowners concerned about fluctuating water levels in the Calabogie-Stewartville Reach.	Upstream No Change Downstream – Minor Positive Change

Table 4-1. Potential Construction and Operation Effects (Cont'd)

Effect/Activity	Recommended Mitigation/Remedial/ Enhancement Measures	Net Effect
Construction (Cont'd)		
K&P Snowmobile Trail	• OPG is working with the Township on re-routing the snowmobile trail.	No adverse residual effect
Fire Dry Hydrant	• Access to be maintained.	No adverse residual effect
Surplus Rock	• Agreement developed with Township to give surplus rock to Township for use in roads, etc.	Positive effect

4.4 Conclusions

The proposed Project represents an excellent opportunity to re-develop the existing Calabogie GS using the already existing water resource that has not been historically utilized to its fullest potential. The Project will involve construction of an approximately 11 MW GS, representing an increase of over 6 MW. This will result in approximately 46,030 MWh of renewable energy produced every year. At full capacity the GS will produce enough energy for over 11,000 homes in Ontario.

The proposed Project is expected to result in the creation of approximately 162 to 185 person years of work over an approximately two-year construction period. This employment will be distributed across a wide variety of professions and trades typically associated with a remote heavy construction project. Most of the on-site employment is expected to be drawn from eastern Ontario. Additionally, there are potential training, employment and sub-contracting opportunities for the Algonquins of Ontario and Pikwàkanagàn First Nation.

Economic and business activity effects are all the economic effects associated with sub-contracting opportunities on the proposed Project to the DB Contractor and also the indirect and induced economic effects associated with the Project on the regional economy. Opportunities for existing local business will exist through the spending of the DB Contractor and its employees and by OPG itself. It should also be noted that OPG anticipates that the re-developed GS will result in payment of $18 million (in 2019 dollars) to the Province in Gross Revenue Charges over the course of the proposed Project or $52.5 million (nominal dollars with inflation).

The proposed Project is consistent with the existing Official Plans for the Township and the County. OPG and SNC-Sullivan have been working co-operatively on issues of mutual including traffic management, heritage and the re-use of materials from the Project.

As the proposed Project merely replaces the existing 100-year-old GS it results in no changes to the character of the area or any nearby land and resource uses.

OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River (WMP), including the summer conditions. Daily flow and water level conditions will remain unchanged from the existing situation. The new GS at Calabogie will have an increased flow capacity, which will allow OPG to produce more energy from the existing water. So additional water will be flowing through the GS rather than through the South Dam Sluiceway but this will not increase the daily flow. There will still be conditions and situations where a greater range at Stewartville GS is needed to meet Ontario grid requirements and maintain compliance with the other aspects of the WMP. However, there may be some conditions where the new Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations. This is an interest that has been expressed by some residents downstream of Calabogie. If this occurs it will be done in compliance with the WMP. Overall, the proposed GS will not result in any significant changes to recreational use upstream or downstream.

5 REFERENCES

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6 ACRONYMS AND ABBREVIATIONS

Calabogie Generating Station	Calabogie GS
Calabogie Station Re-Development Project	CSRP
Design-Build Contractor	DB Contractor
Electrical Power Systems Construction Association	EPSCA
Environmental Assessment	EA
Environmental Assessment Act	*EA Act*
Environmental Protection Act	*EPA*
Environmental Report	ER
Generating Station	GS
Independent Electricity System Operator	IESO
Kingston & Pembroke Rail Line	K & P
Lakes and Rivers Improvement Act	*LRIA*
Megawatt	MW
Megawatt Hours	MWh
Ministry of Environment, Conservation and Parks	MECP
Ministry of Natural Resources	MNR
Madawaska River Water Management Plan	MRWMP
Ontario Power Generation	OPG
Ontario Water Resources Act	*OWRA*
Ontario Waterpower Association	OWA
Technical Support Document	TSD
Water Management Plan	WMP

APPENDIX A

Township of Greater Madawaska, Council Resolution

THE TOWNSHIP OF
GREATER MADAWASKA

Council Resolution Form

Date:	16 Sep 2019	No:	Resolution No.224-19
Moved By:	Councillor Frost Seconded by Councillor Perrier	Disposition:	CARRIED.
		Item No:	8.09.6

Description: Calabogie Generating Station redevelopment

RESOLUTION:

That Council supports the Calabogie Generating Station redevelopment project as presented by Ontario Power Generation.

Recorded Vote Requested by:

.....

	Yea	Nay
B. Hunt	____	____
L. Perrier	____	____
C. Rigelhof	____	____
J. Frost	____	____
G. MacPherson	____	____

MAYOR

Declaration of Pecuniary Interest:

.....

Disclosed his/her/their interest(s), vacated he/her/their seat(s), abstained from discussion and did not vote

Arcadis Canada Inc.

121 Granton Drive

Suite 12

Richmond Hill, Ontario L4B 3N4

Tel 905 764 9380

Arcadis.com