TECHNICAL SUPPORTING DOCUMENT

TERRESTRIAL ENVIRONMENT

PROPOSED NEW POST CREEK HYDROELECTRIC PROJECT

Submitted To:

Coral Rapids Power Inc.
and Ontario Power Generation Inc.

Prepared By:

SENES Consultants

November 2013

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Submitted to:

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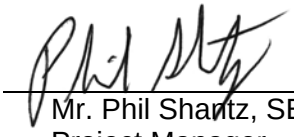

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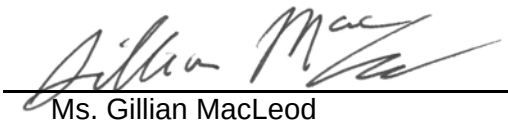

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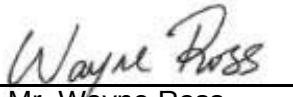

Accepted by: November 2013

Mr. Wayne Ross — Date
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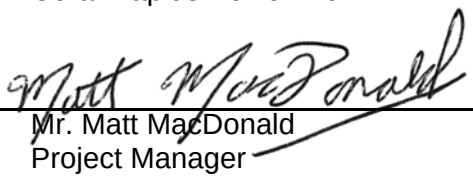

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EXECUTIVE SUMMARY

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

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

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

The proposed New Post Creek Project is subject to the "Class Environmental Assessment for Waterpower Projects" (OWA, 2012a) under the Ontario *Environmental Assessment Act*. This Terrestrial Environment Technical Support Document was undertaken as part of this Class Environmental Assessment process.

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

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

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

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

During operation, environmental protection will be achieved by adherence to the Spills Emergency Preparedness and Response Plan and the amended Abitibi River Water Management Plan, deployment of public safety measures and environmental monitoring.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

1.0 INTRODUCTION

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

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

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

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

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

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

Figure 1.1 Proposed Project Location

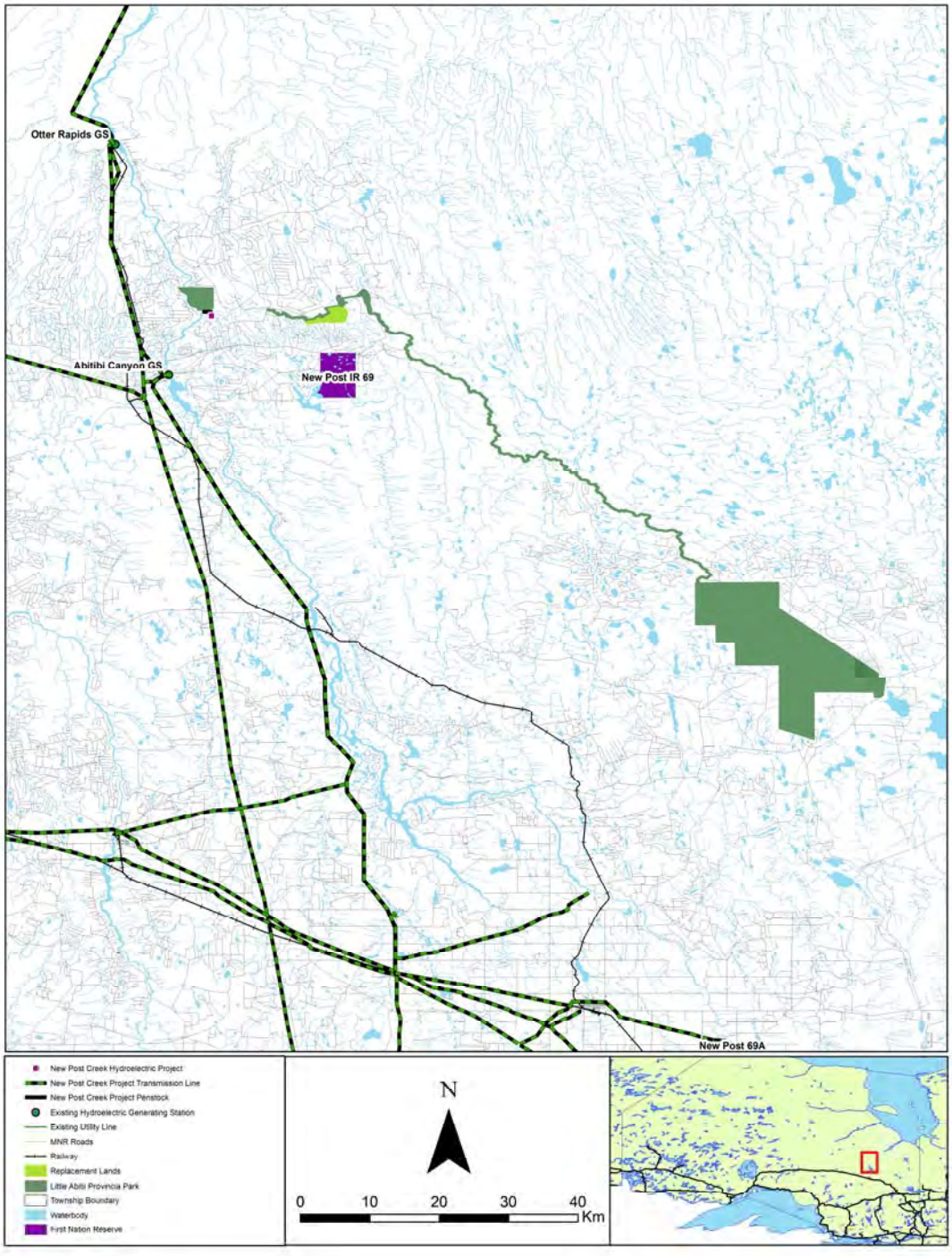
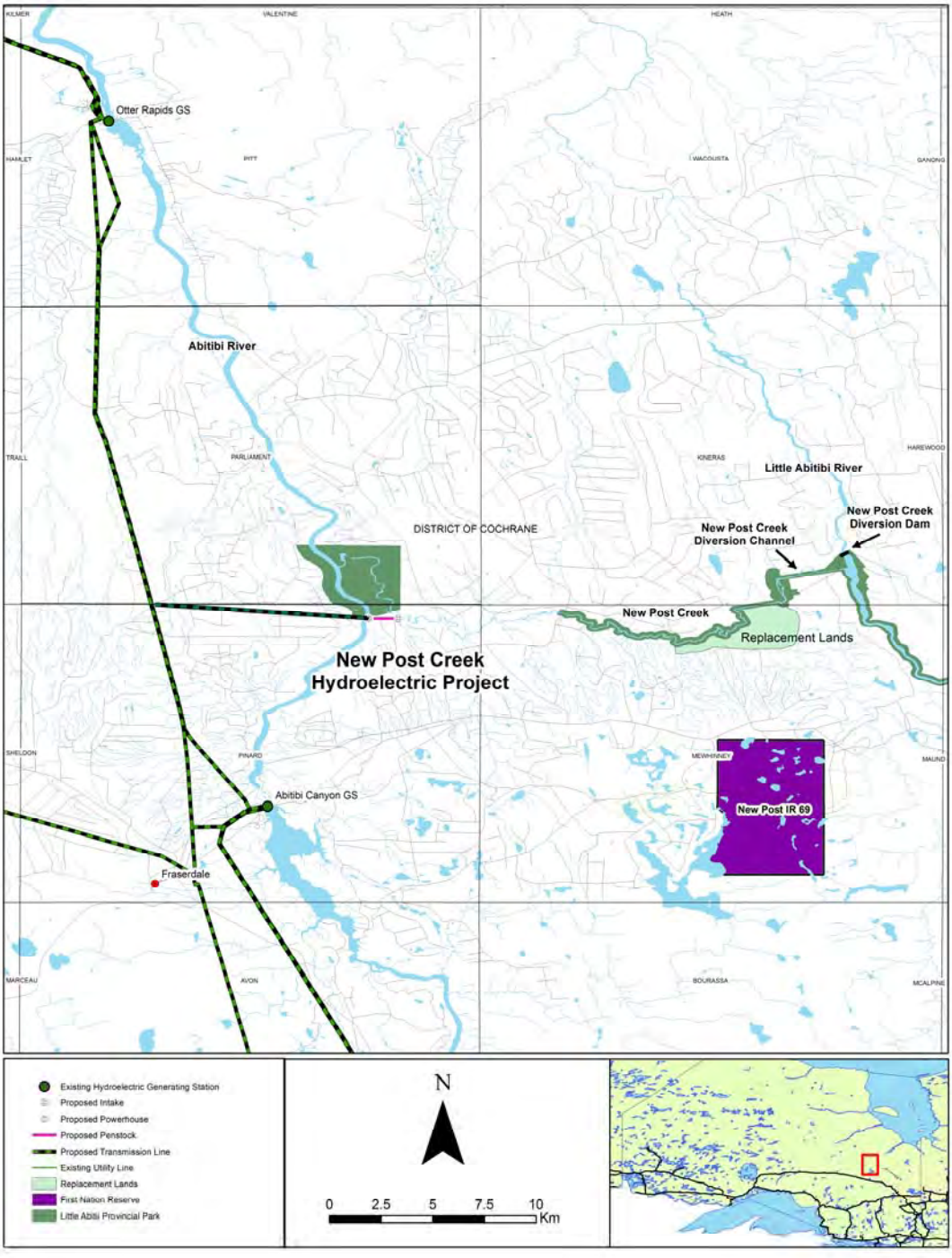


Figure 1.2 Proposed Project Site Location



1.1 REGULATORY FRAMEWORK

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

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

This Terrestrial Environment Technical Support Document (TSD) for the proposed Project Environmental Report (ER) was prepared as part of this OWA Class EA process.

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

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

CRP and TTN had been working with MNR and Ontario Parks since 2006 to (i) discuss mechanisms for allowing the hydroelectric facility to be built on lands currently within LAPP, and (ii) discuss the required site release process since the existing MNR Site Release Process does not allow for this. OPG, CRP and TTN came to an agreement with MNR and Ontario Parks for a coordinated process to deregulate a small portion out of LAPP and regulate the proposed Replacement Lands into LAPP. This required that the OWA Class EA for the proposed New Post Creek Project be coordinated with the MNR (2005a) "Class Environmental Assessment for Provincial Parks and Conservation Reserves". Figure 1.3 shows the location of the Replacement Lands.

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

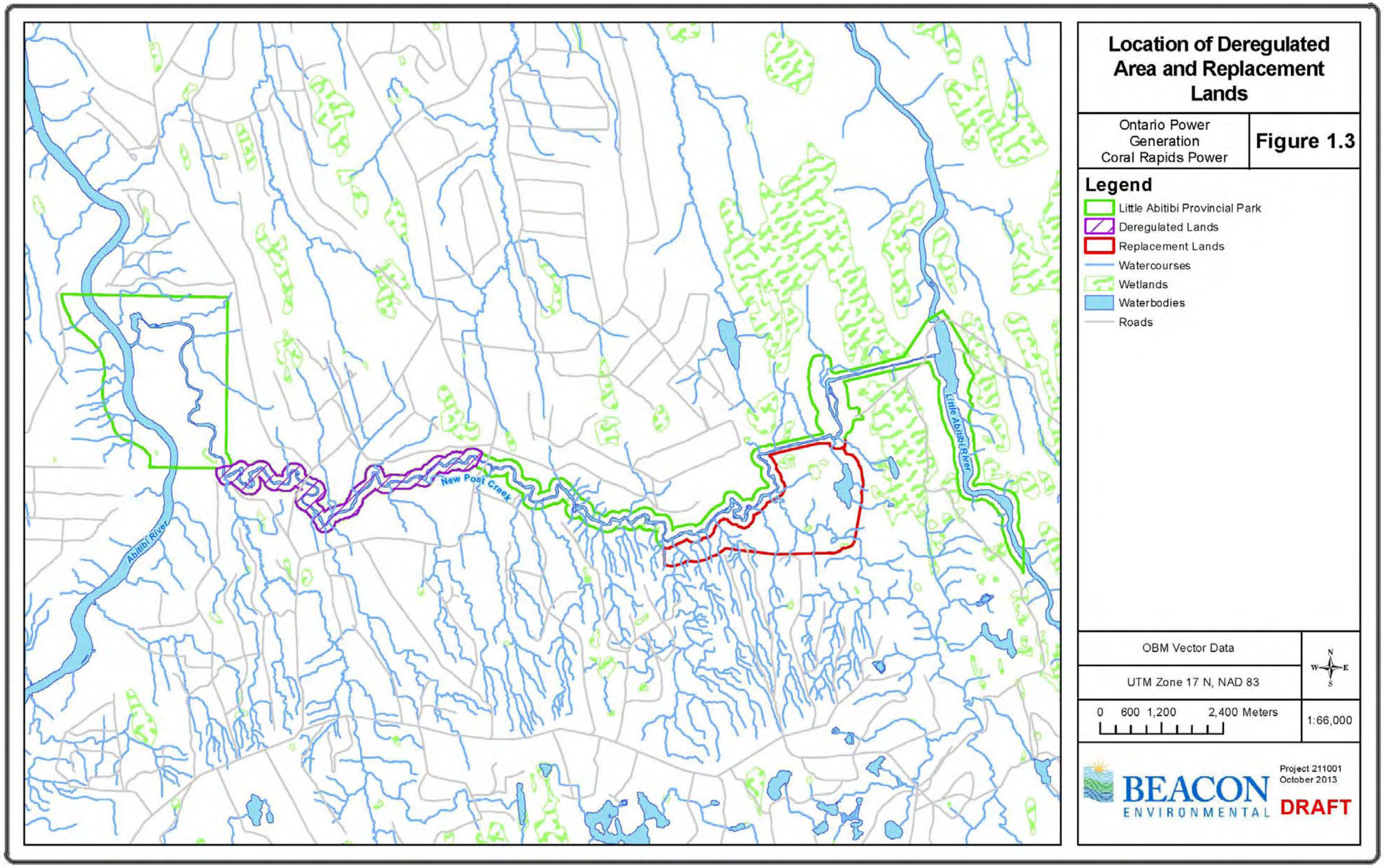
On November 21, 2011, MNR posted a policy proposal on the Environmental Registry for a major land use amendment to re-designate portions of LAPP and the adjacent Northern Resource and Commercial Recreation General Use Area to enable a boundary regulation change. Provincial, regional and local stakeholders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

1.2 PROJECT DESCRIPTION

1.2.1 Alternatives Analysis

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

Figure 1.3 Location of Deregulated Area and Replacement Lands



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

In 2006, following the signing of the MoU between OPG and TTN to jointly explore hydroelectric development opportunities within the Abitibi River drainage basin, a concept study was performed for four potential hydroelectric development options (alternatives) on New Post Creek near the waterfalls and within LAPP (KGS Group, 2006). The previous studies maximized the available head by going to local topographic maximums using dykes up to 8 m in height, altering a portion (<1 km^2) of the watershed and shoreline. The 2006 concept study reduced the proposed forebay elevation to minimize flooding of the existing creek shoreline and the flooded shore area within LAPP, thereby also reducing potential impacts on those portions of the creek with erodible silt and sand banks. The locations of the four alternatives assessed by KGS Group (2006) are presented in Figure 1.4.

A summary description for each alternative is provided below:

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

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

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

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

Figure 1.4 Alternative Hydroelectric Development Locations on New Post Creek

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

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

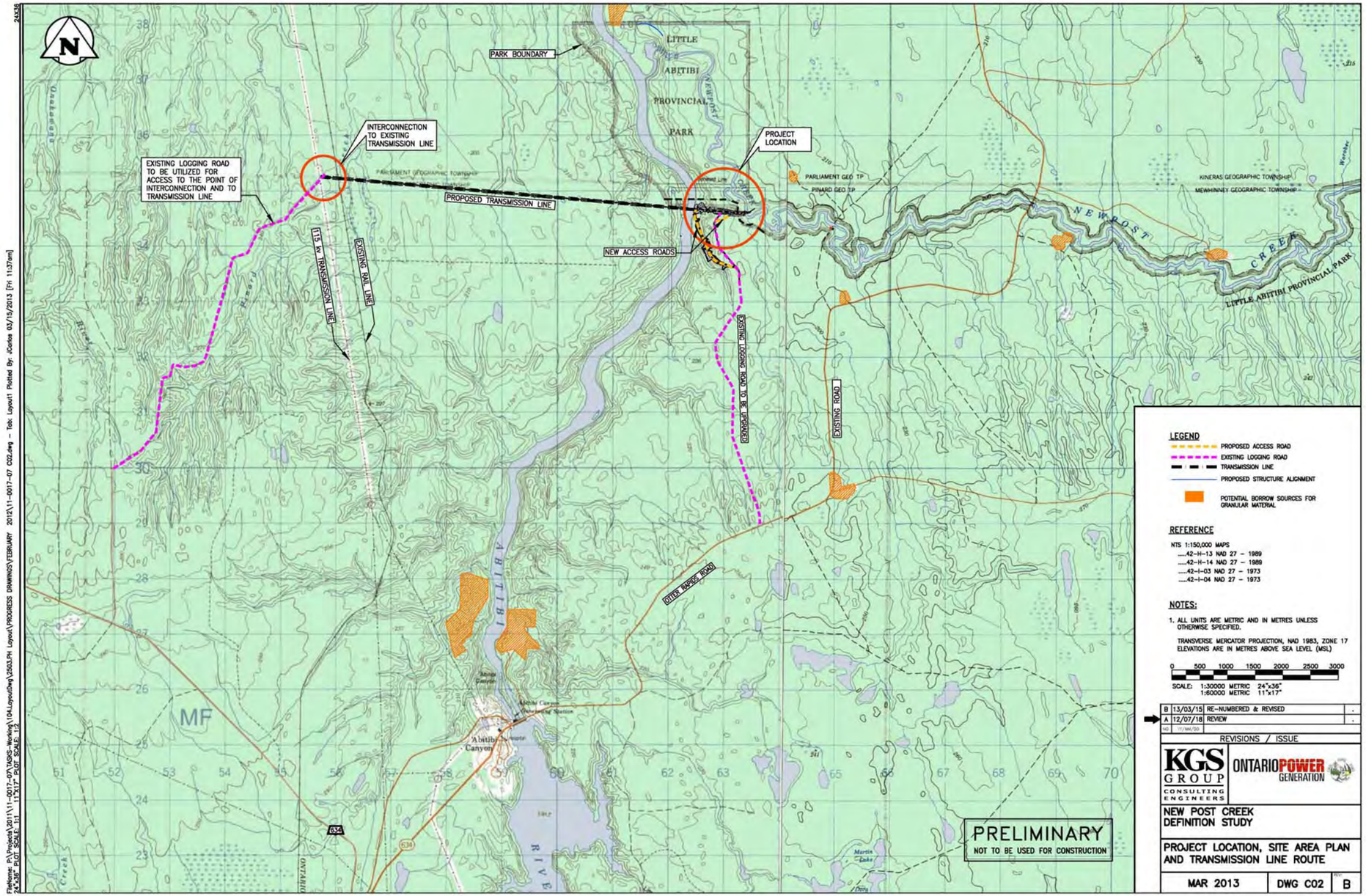
1.2.2 Preferred Alternative

As indicated in Section 1.2.1, Alternative 1 is the preferred alternative. The proposed New Post Creek Project is a 25 MW facility utilizing historic flows diverted from the Little Abitibi River into New Post Creek by the New Post Creek Diversion Dam constructed in 1963 to augment hydroelectric generation at Otter Rapids GS, as well as the natural inflow originating within the New Post Creek catchment area. A small portion of the proposed Project was located within LAPP; however, with subsequent land deregulation and incorporation of Replacement Lands, all of the proposed Project is located outside of LAPP (see Section 1.1), A transmission line approximately 7 km long will be constructed to the west of the proposed powerhouse to connect to the existing Hydro One Networks Inc. (Hydro One) 115 kV transmission line extending from Otter Rapids GS to Abitibi Canyon GS. The proposed transmission line is also located outside of LAPP.

1.2.3 Proposed General Layout

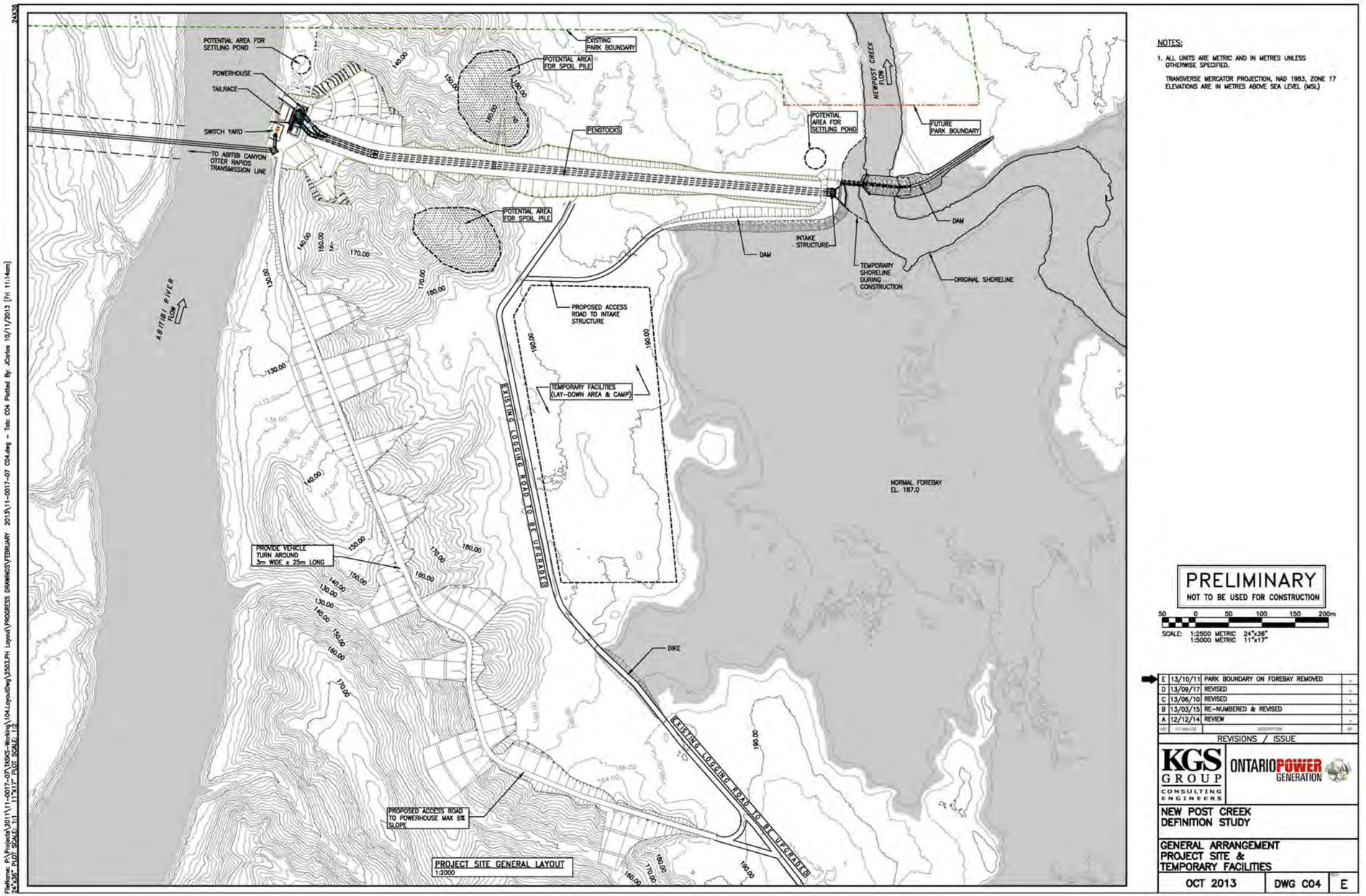
The location of and general arrangement for the proposed Project are shown in Figures 1.5 and 1.6, respectively. However, it should be noted that the final layout of the proposed Project would be selected by the successful Design Build Contractor (DBC), who is chosen based on a competitive bidding process.

Figure 1.5 Project Location, Site Area Plan and Transmission Line Route[1]



[1] It should be noted that Figure 1.5 shows the previous LAPP boundary prior to land deregulation and replacement (see Section 1.1).

Figure 1.6 General Arrangement Project Site and Temporary Facilities



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

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

The proposed Project general arrangement, i.e., from the intake structure to the powerhouse, and penstock profile are presented in Figure 1.7.

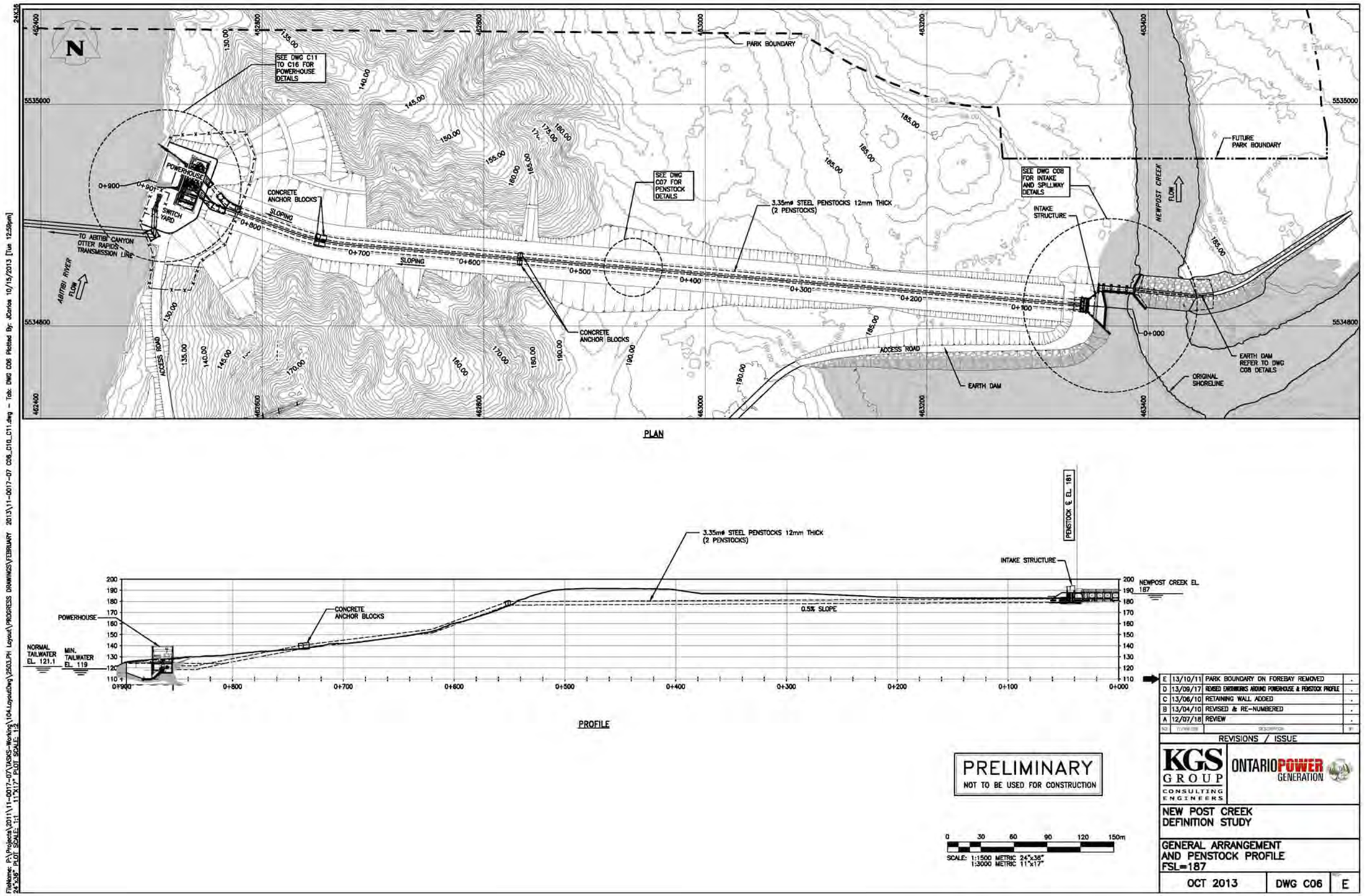
From the intake the flow will be carried by underground penstocks, or with a combination of a power canal and underground penstocks, and discharged through the powerhouse located on the east side of the Abitibi River. The anticipated powerhouse location is approximately 850 m west of the intake and just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

Flow that is not utilized for power production will be discharged over the proposed spillway, taking into account prescribed minimum flow commitments downstream (see Section 1.3.2.2 and Aquatic Environment TSD for a full discussion), particularly at the base of the waterfalls. The proposed Project would utilize the flows and the head drop of approximately 66 m between the forebay elevation upstream of the spillway and the Abitibi River to generate sustainable power in the order of 125 GWh annually.

As presented in Figure 1.5, there are existing access roads south and east of the site that would be upgraded and extended (approximately 2,500 m) to the powerhouse and intake site. The access road to the intake will also serve as a water retaining dyke under high flood flow conditions.

As shown on Figure 1.6, the site will require some areas to be used for construction purposes. This includes settling ponds in the vicinity of the proposed powerhouse and intake for the dewatering of the excavations, an area to be used for lay down, trailers, equipment maintenance and possibly the batch plant, space to accumulate the extra excavated material, and new and upgraded access roads.

Figure 1.7 General Arrangement and Penstock Profile



Intake and Spillway Structures

The proposed intake and spillway structures are located approximately 4.5 km upstream of the New Post Creek waterfalls near a bedrock (granitic gneiss) outcrop that extends across New Post Creek (Photograph 1.1). Due to its competence and good quality, the bedrock will provide an excellent foundation for the intake and spillway, with no settlement concerns. Most bedrock on the proposed Project site is not acid generating (see Section 3.1.2.4 of the Aquatic Environment TSD).

The proposed intake and spillway structures are separate but immediately adjacent to each other. The general arrangement of the spillway and intake structures is presented in Figure 1.8. The intent of the spillway and intake layout selected is to minimize inundation upstream while still ensuring flow withdrawals during all flow periods.

Photograph 1.1 Bedrock Outcrop

The spillway structure consists of gates to maintain minimum flow requirements, gates or devices to manage high flow periods and maintain forebay levels, and possibly an additional gate to provide means to evacuate sediment accumulation. The final choice of the type of equipment used will be determined by the DBC but the current concepts consist of either a series of stop logs (see Figure 1.8), or an in-stream low (3.7 m high) steel crest gate section, and an uncontrolled (fixed) concrete weir. The steel crest gate would be an Obermeyer type, which is operated by a pneumatic bladder. The combination of a gated or rubber dam section with a fixed concrete weir results in minimal incremental inundation upstream.

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

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

Normal operation of the proposed Project will increase the water level in New Post Creek by 5 m at the intake to a Full Supply Level (FSL) of 187.00 metres above sea level (m.a.s.l.), resulting in a total inundated area of approximately 170 ha (KGS Group, 2012). The upstream extent of the inundated area (approximately 7,166 m from the proposed intake weir location) is limited by the rather steep gradient at the rapids (see Figure 1.9). Under normal operating conditions, the inundated area will occur within the deregulated park area of approximately 228 ha upstream of the proposed Project spillway (Figure 1.3). Most of the flooding outside of the deregulated park area within Crown lands will encompass the unnamed tributary (MNR ID#523) that discharges to New Post Creek approximately 150 m upstream of the proposed Project intake location (Figure 1.9).

Figure 1.8 Intake, Spillway and Dam General Arrangements

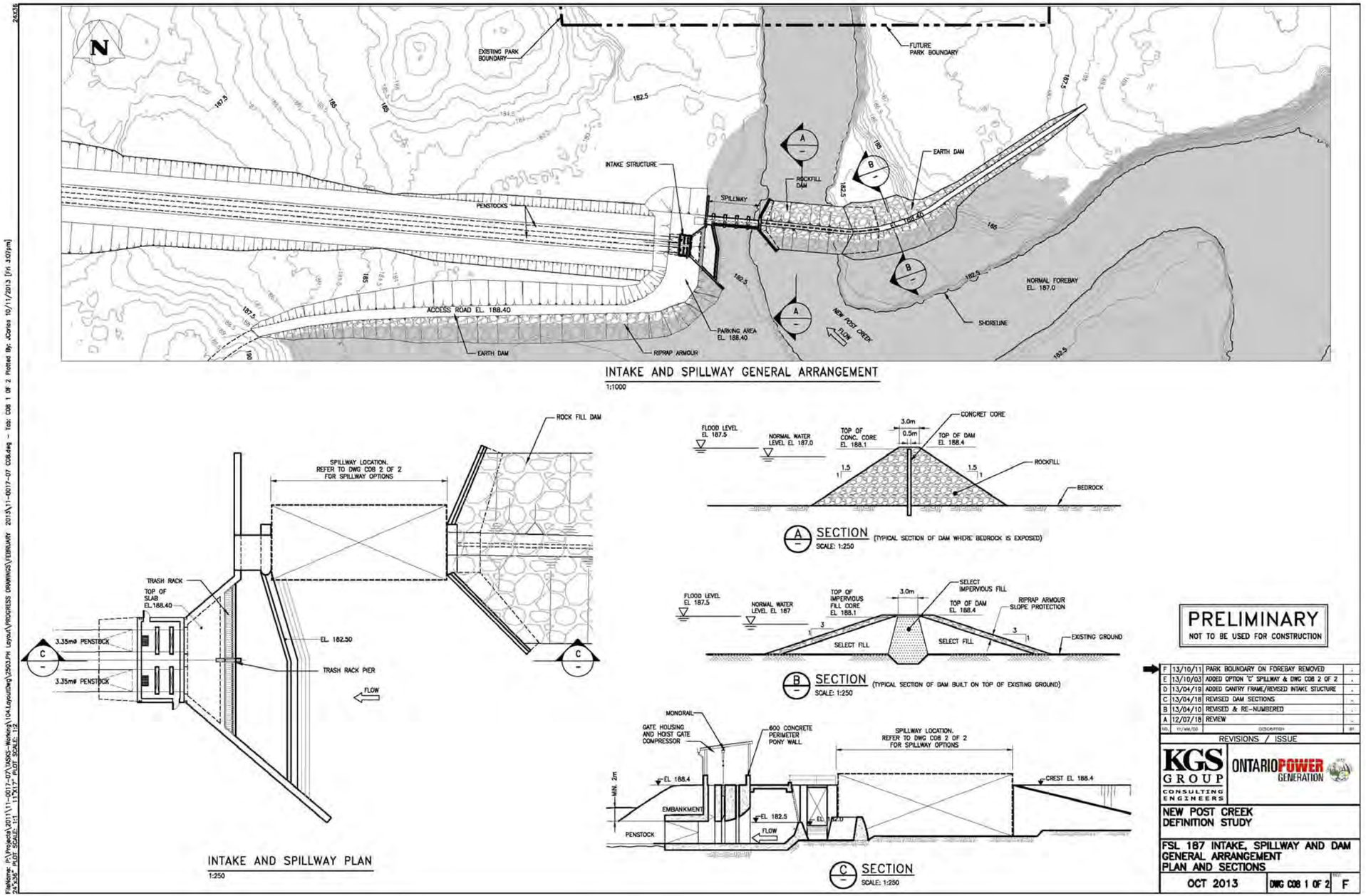
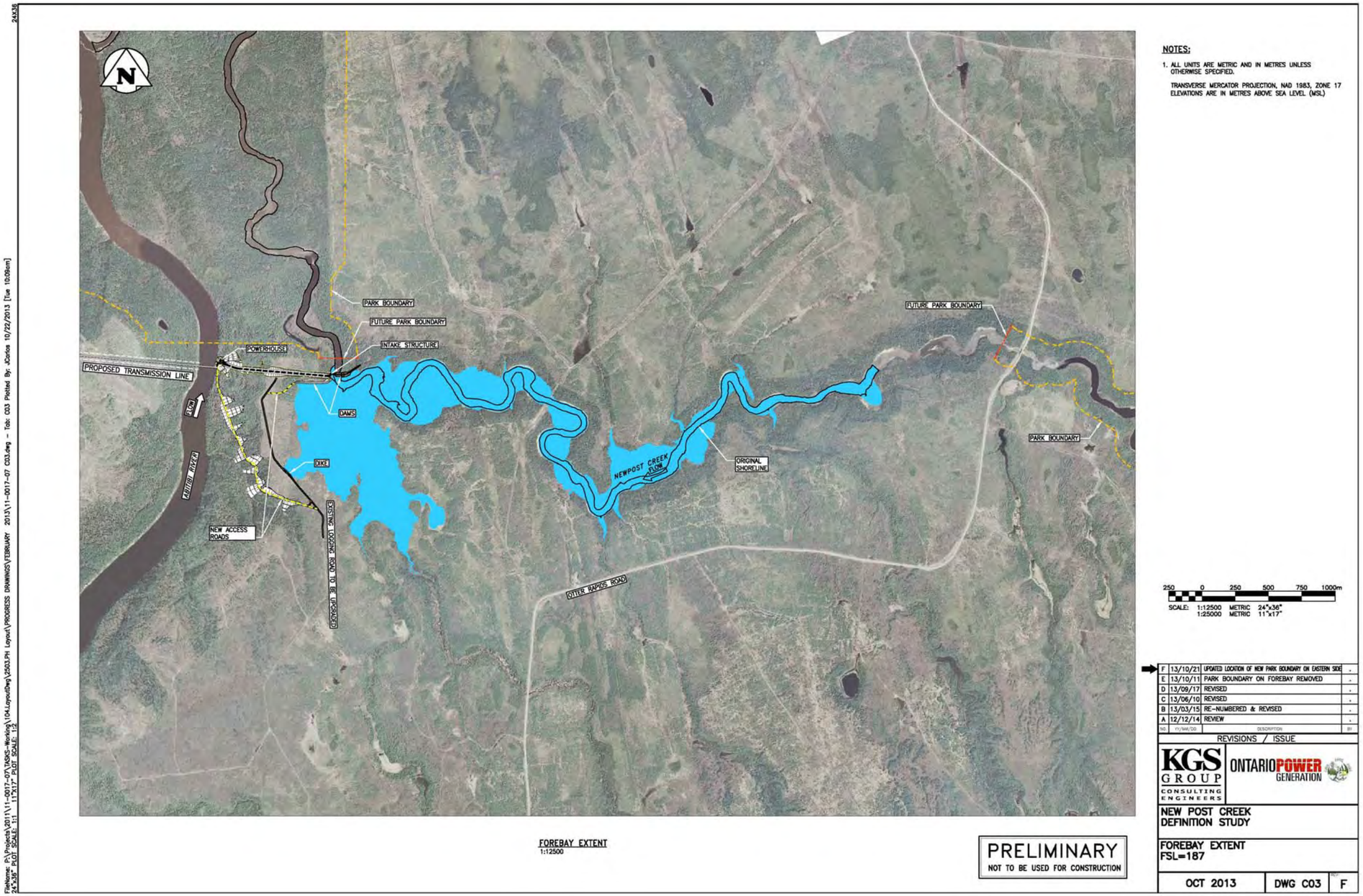


Figure 1.9 Forebay Extent for FSL = 187 m.a.s.l.



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

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

The proposed spillway structure will include a gravel trap and a sluice consisting of either a set of stop logs or an Obermeyer style crest gate. In addition, another gate may be required as a sediment sluice and outlet for continued minimum flow requirements downstream to the waterfalls (see Section 1.3.2.2).

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

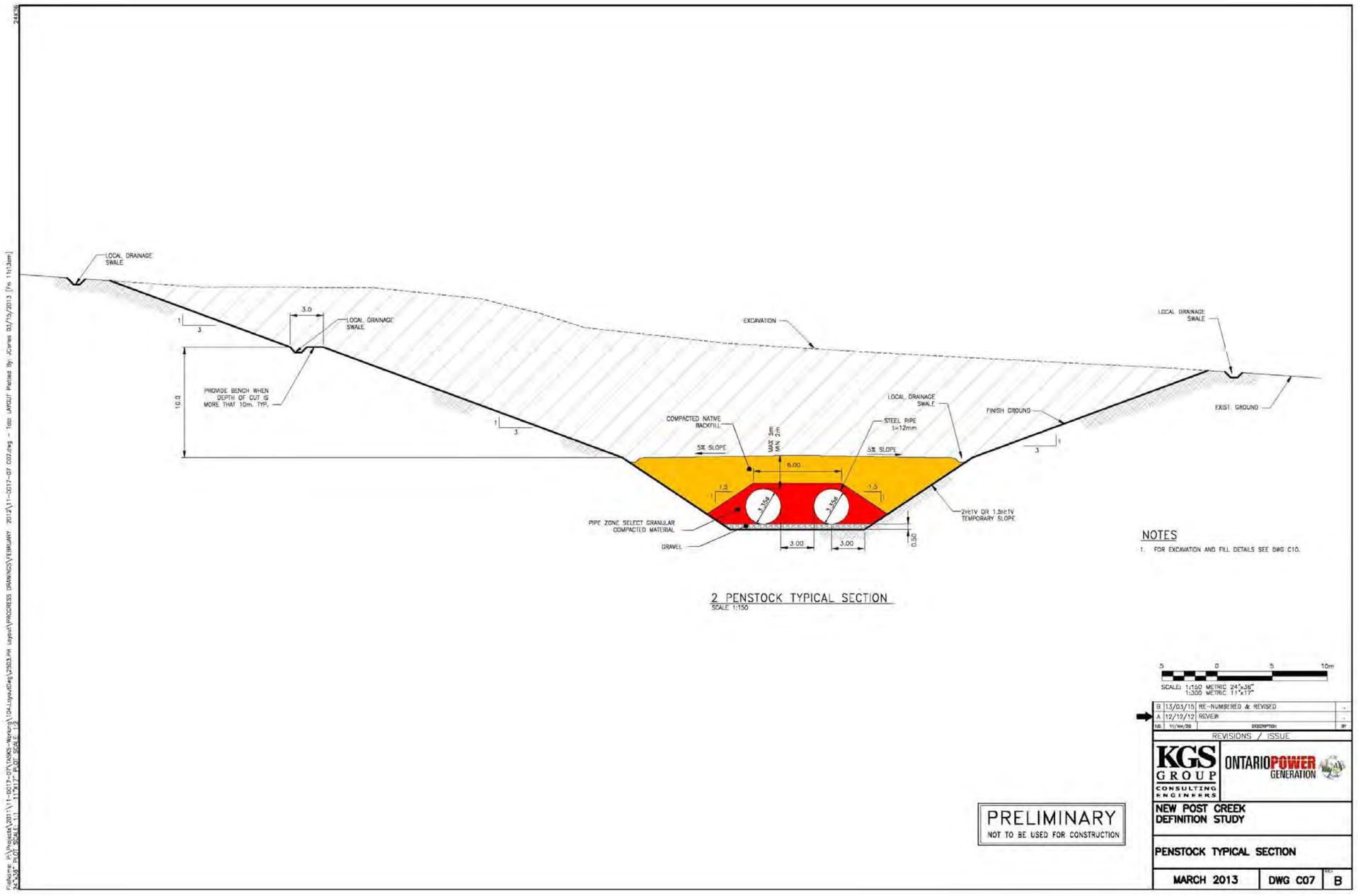
The operation of the sediment gate will consist of opening the gate, likely manually. The actual need to clear the sediment trap would be with a frequency in the order of years if not decades. However, CRP/OPG has considered this issue and is suggesting that a yearly flushing occur during near the start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

Water Conveyance System

The proposed water conveyance system includes two buried penstocks with the potential of a portion of open water canal. The two side by side buried steel penstocks, each 3.35 m in diameter, would extend approximately 820 m from the intake structure to the powerhouse. The twin penstock will extend from the intake area sloping very gently for about 650 m with minimal submergence below the forebay level and then drop approximately 61 m over 290 m down to the powerhouse at the Abitibi River shore. A head drop of just over 66 m occurs from the intake on New Post Creek to the Abitibi River. Figure 1.10 shows the penstock profile.

Due to shallow overburden, the penstock would be founded on competent bedrock along its first 150 m length from the intake structure with the remaining portion constructed within overburden.

Figure 1.10 Penstock Profile



As the overburden sands and silts are erosion prone, the penstock system will be provided with granular drainage layers and drains that can be monitored for leak detection.

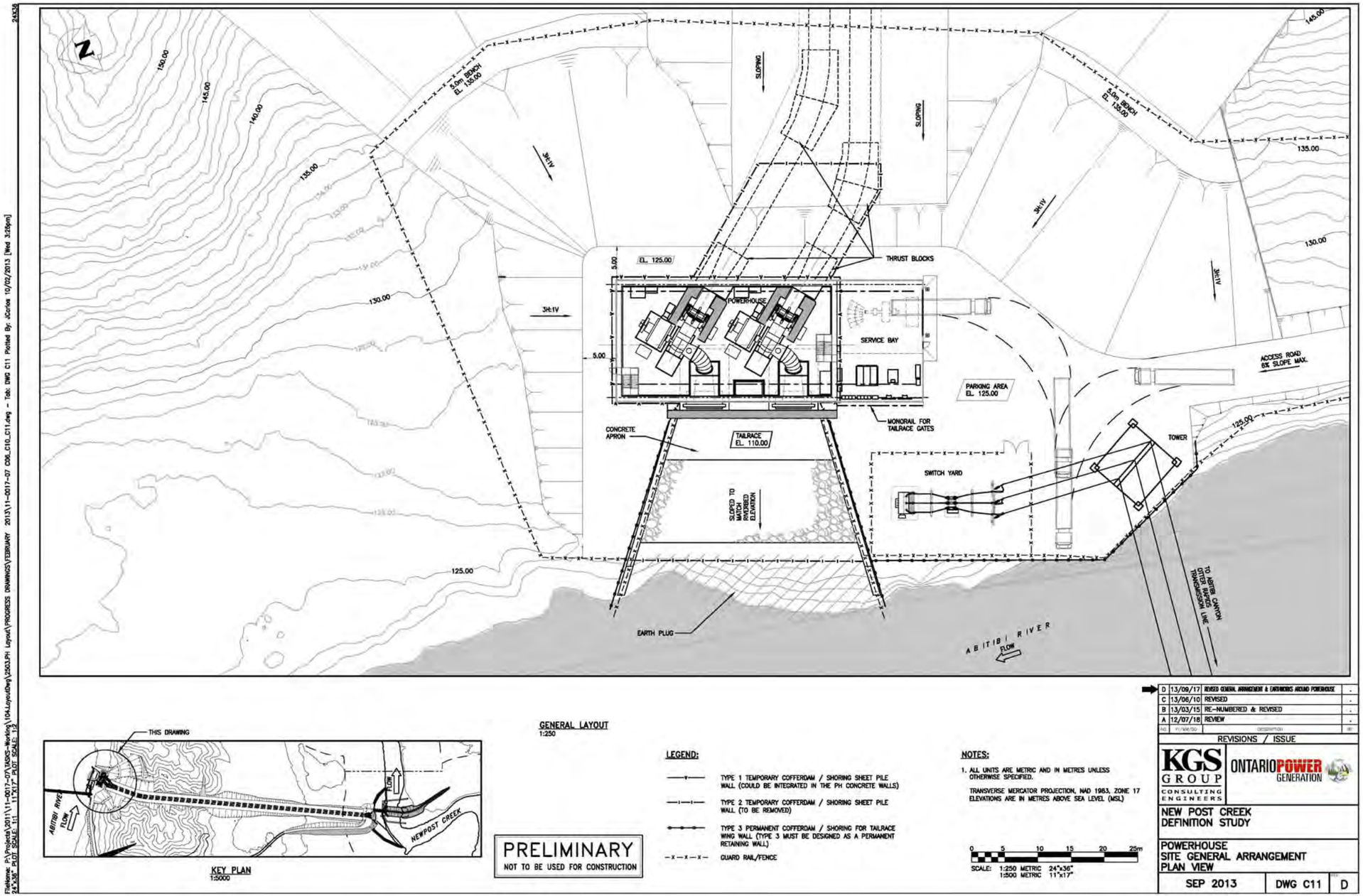
The proposed penstocks may be equipped with manhole access along the route near the end of the shallow sloping section and above the steeper portion. Impressed current or sacrificial anode cathodic protection will be provided along the penstock.

Powerhouse Structures

The proposed powerhouse will have a concrete substructure for the turbine draft tubes, with potentially the two identical horizontal Francis turbine/generator sets (approximately 12.5 MW each) and all required ancillary equipment mounted on the powerhouse floor. Each turbine is expected to have Francis type runners with 13 blades operating at nominal speeds between 277 to 360 rpm depending on the final runner dimensions. The turbine units may be mounted near or below the normal tailwater level. The turbine shutoff valves will have gravity trip counterweights located within the powerhouse. The layout and details of the powerhouse facility are presented in Figure 1.11.

The powerhouse foundation structure will be constructed on a dense sand deposit with sufficient load bearing capacity. The powerhouse and tailrace area will be excavated and founded on dense sands and gravels (Photograph 1.2), with bedrock located more than 15 m below the powerhouse draft tubes and tailrace. The surficial overburden material above the water table is relatively firm and can be excavated and temporarily sloped back at a 2H:1V slope angle, or 3H:1V for slope height higher than 10 m (KGS Group, 2013a). The firm sand deposit will be saturated below the water table reflecting the proximity to the Abitibi River. Therefore, it will be necessary to dewater the area prior to excavating below the water table. Temporary construction shoring will be required due to the depth of the required excavation and groundwater condition, and to minimize the footprint that would be disturbed. The sand deposit can be excavated using standard soil excavation equipment such as bucket excavators, bulldozers and similar equipment, in combination with an appropriate and effective dewatering procedure. A properly designed sheet pile wall, diaphragm wall and/or contiguous bored pile wall can be used to support and dewater the excavation. Groundwater depressurization/dewatering will be required for powerhouse foundation excavation below the river water level. In addition, long-term seepage control, if necessary, can be provided by the use of cut-off walls, low maintenance gravity drains and relief wells.

Figure 1.11 Powerhouse General Arrangement



Photograph 1.2 View Along the Abitibi River Shoreline in the Vicinity of the Proposed Tailrace

Cofferdams

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

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

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

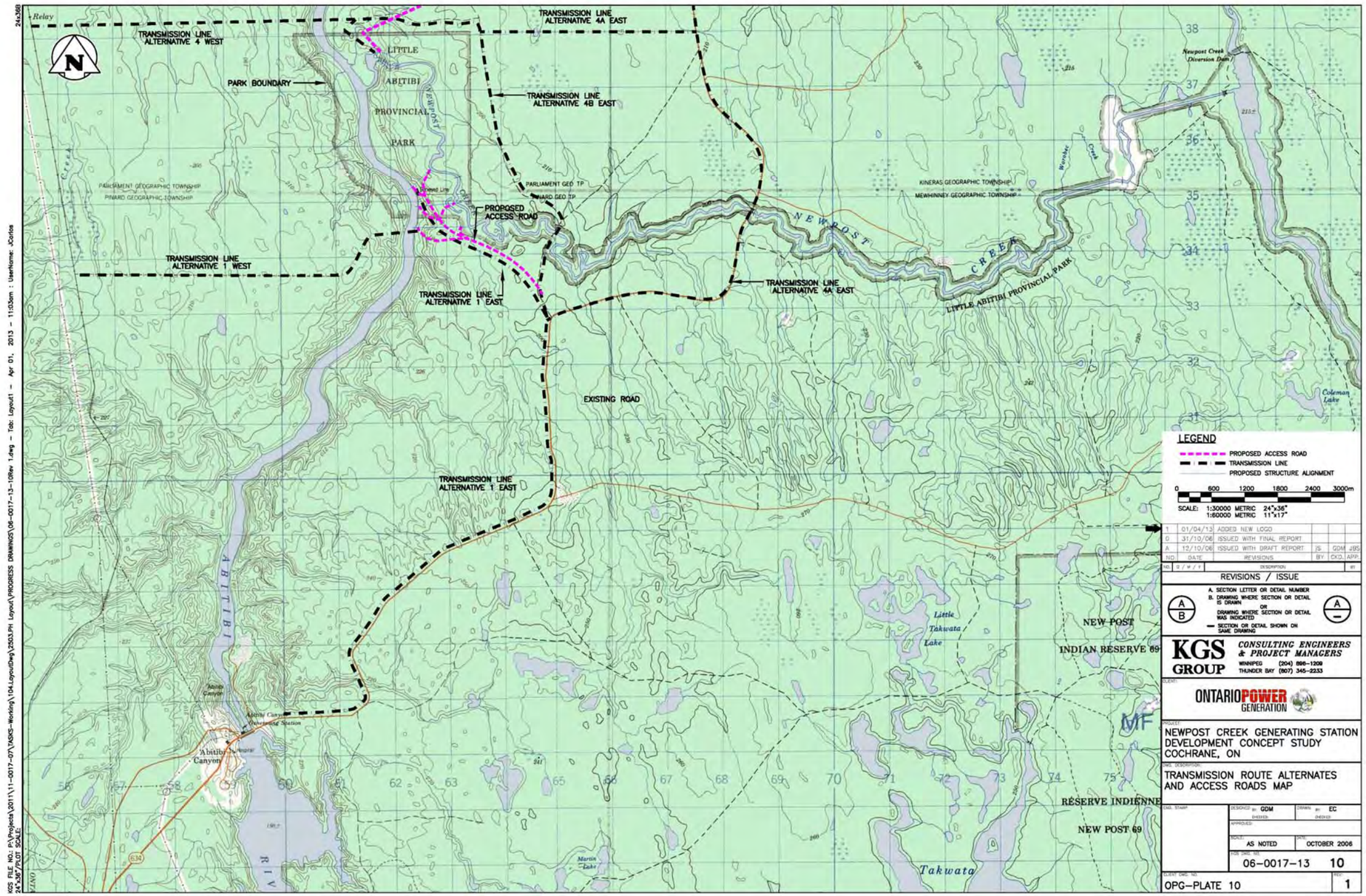
Transmission Line

A number of alternative transmission routes were assessed before selecting the preferred route (see Figure 1.12). The alternate routes shown correspond to the alternative powerhouse locations assessed in 2006 (see Section 1.2.1 and Figure 1.4). Both alternative "east" and "west" routes were considered. The "east" routes would follow access roads back to Abitibi Canyon GS, whereas the "west" routes would cross the Abitibi River and mainly recently harvested forest areas to the existing Hydro One 115 kV transmission line between Abitibi Canyon GS and Otter Rapids GS.

Once Alternative 1 had been selected for the powerhouse location (see Section 1.2.1), a "west" route was selected on the basis that it was the shortest route with fewer bends. The route of this alternative, designated as "Transmission Line Alternative 1 West" in Figure 1.12, was later modified to locate the point of interconnection with the existing Hydro One transmission line at an existing road (see Figure 1.13). The proposed transmission line right-of-way (ROW) is located outside of LAPP.

The proposed single-circuit 115 kV transmission line extending from the powerhouse switchyard directly west over a distance of approximately 7 km to the existing 115 kV Otter Rapids GS/Abitibi Canyon GS transmission line is the technically preferred connection option (see Figure 1.13). Based on available information, the preferred interconnection would involve a T-tap direct with protection provided by a circuit breaker at the new switchyard outside the powerhouse. Based on a System Impact Assessment (SIA) by the IESO (2010), the proposed connection to the existing 115 kV transmission line is acceptable conditional on a number of requirements that have been incorporated by KGS Group (2013c). Based on the Customer Impact Assessment, Hydro One (2010) concluded that the proposed New Post Creek Project can be incorporated with minor impact to Hydro One customers conditional on adherence to the requirements identified in the IESO (2010) SIA.

Figure 1.12 Alternative Transmission Line Routes[1]



[1] It should be noted that Figure 1.12 shows the previous LAPP boundary prior to land deregulation and replacement (see Section 1.1).

Figure 1.13 Proposed Transmission Line Route

The proposed transmission line begins at the substation located adjacent to the powerhouse on the east bank of the Abitibi River (see Figure 1.14). The proposed transmission line will cross the Abitibi River and extend in a direct route to a point near the intersection of the existing Hydro One transmission line and access road. The western shoreline of the Abitibi River has a fairly rapid rise in elevation with few changes in elevation to the interconnection point. The proposed transmission line will cross over land that has been subject to previous forest harvesting, some wet areas and the Ontario Northland Railway (ONR) rail line.

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

Access for transmission line construction is provided by an existing road network between the interconnection point and the west bank of the Abitibi River (see Figure 1.13) considered to be adequate for construction equipment use.

A small switchyard is to be constructed at the point of interconnection which will require the construction of a small access area from the existing road (see Figure 1.14). No permanent roads will be constructed to or along the remainder of the proposed transmission line route. It is expected that the DBC selected for this work will execute the construction of the transmission line in the same manner as other such work in this region with the work likely being done in the winter to minimize the impact on the natural environment, particularly wet areas.

A fibre optic cable will be installed by trenching directly west from the point of interconnection switchyard (see Figure 1.14) to the Ontera-owned fibre optic communications trunk, located within the existing Hydro One transmission line ROW.

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

Proposed New Post Creek Project Technical Summary

The technical details of the proposed New Post Creek Project are summarized in Tables 1.1 and 1.2.

Figure 1.14 Transmission Line Plan and Profile/Interconnection General Arrangement

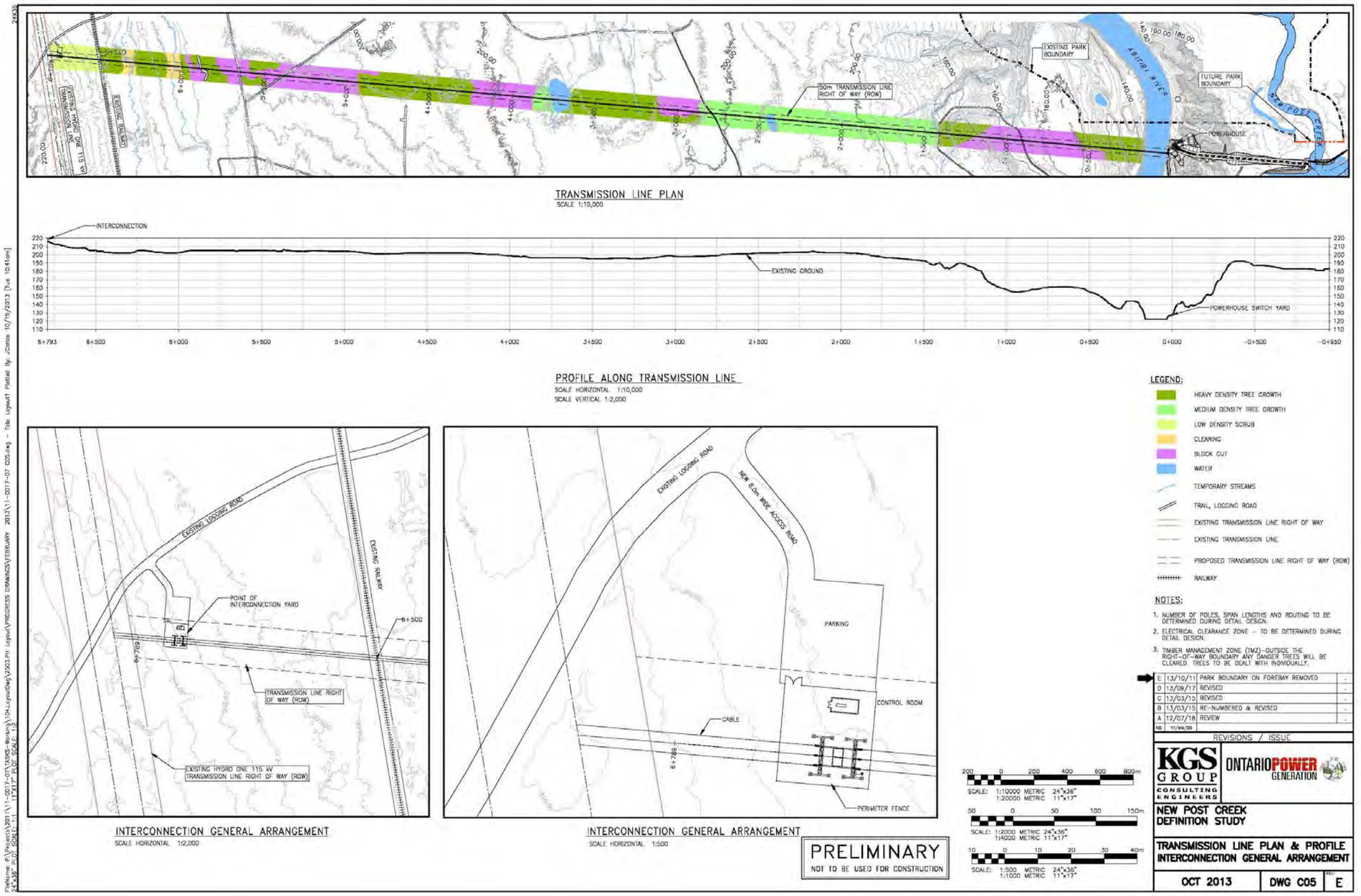


Table 1.1 Proposed New Post Creek Project Hydraulic Characteristics

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

[1] See Section 1.3.2.2 for more details.

Table 1.2 Proposed New Post Creek Project Components[1]

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

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

The spillway structure will facilitate year-round minimum flow requirements downstream of the spillway to the waterfalls (see Section 1.3.2.2).

Safety devices, such as booms and buoys, will be placed in the water upstream and downstream of the spillway, and downstream of the tailrace. A risk assessment exercise will be undertaken to identify requirements and locations for signs, booms and buoys prior to operations. Figure 1.15 provides preliminary fencing, signage and safety boom locations, but is subject to change based on the risk assessment results.

1.3 PROJECT ACTIVITIES

1.3.1 Construction

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

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

As indicated in Section 1.2.3, the proposed intake and spillway structures will be constructed adjacent to each other on competent bedrock. At the intake and spillway location, New Post Creek is currently 1 to 4 m deep and approximately 50 m wide.

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

The intake and spillway are integrated, and consequently construction of the two works requires close coordination. The initial intake and west portion of the spillway could be excavated in “dry” conditions behind a rock plug serving as a cofferdam (Figure 1.16a). This rock plug may be topped with a low level berm to achieve the desired freeboard. The access road will form a permanent berm along the west creek edge when completed.

Figure 1.15 Preliminary Fencing, Signage and Safety Boom Locations

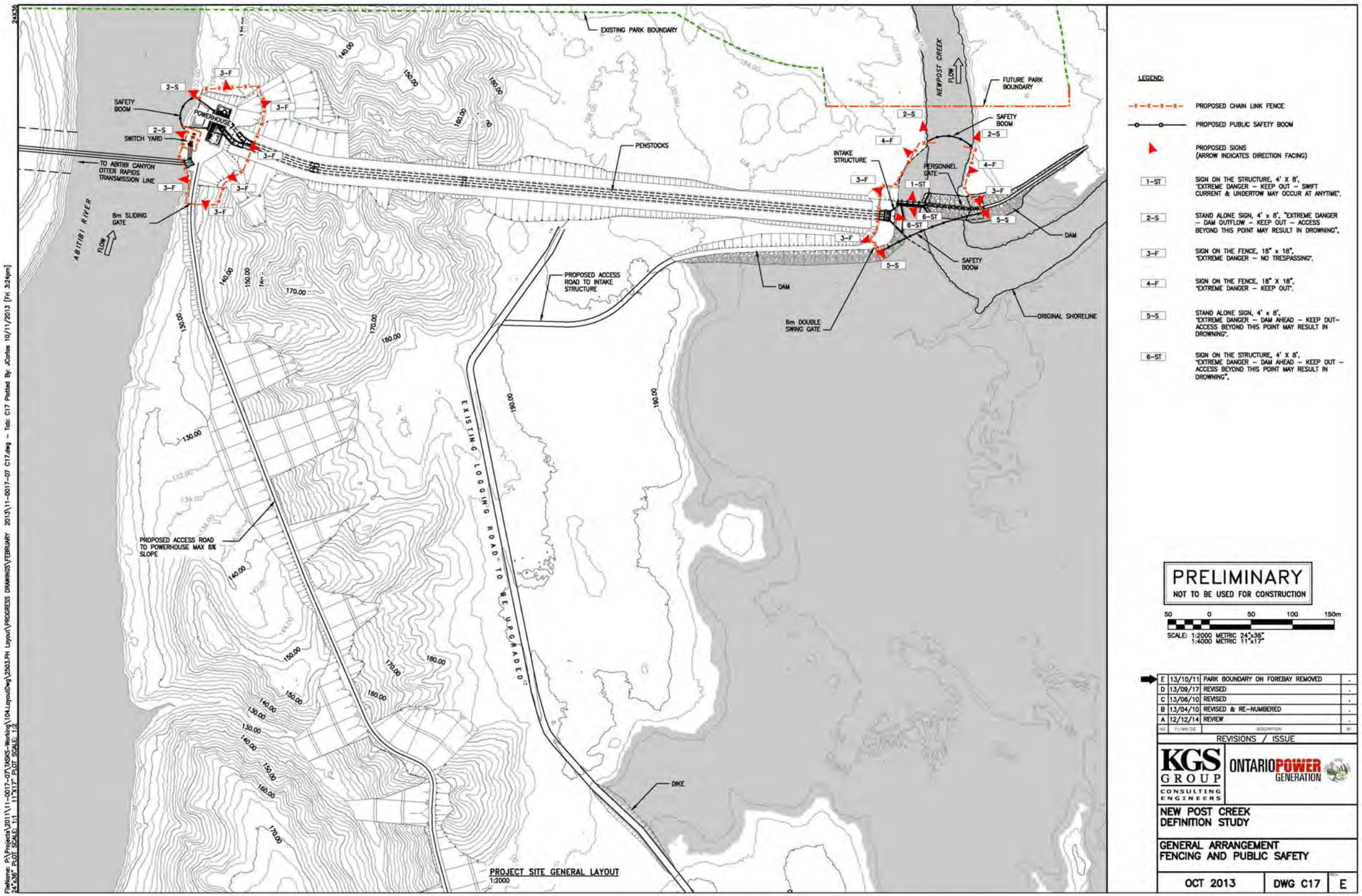
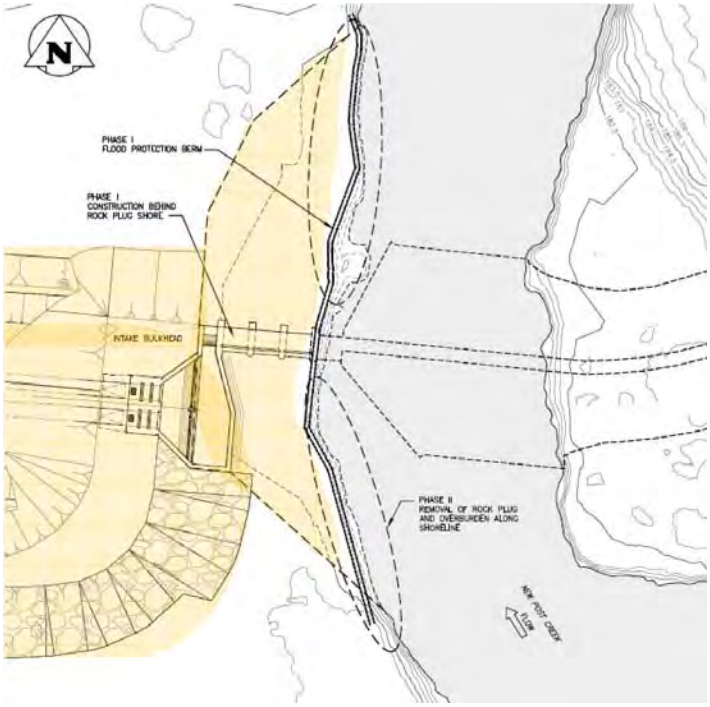
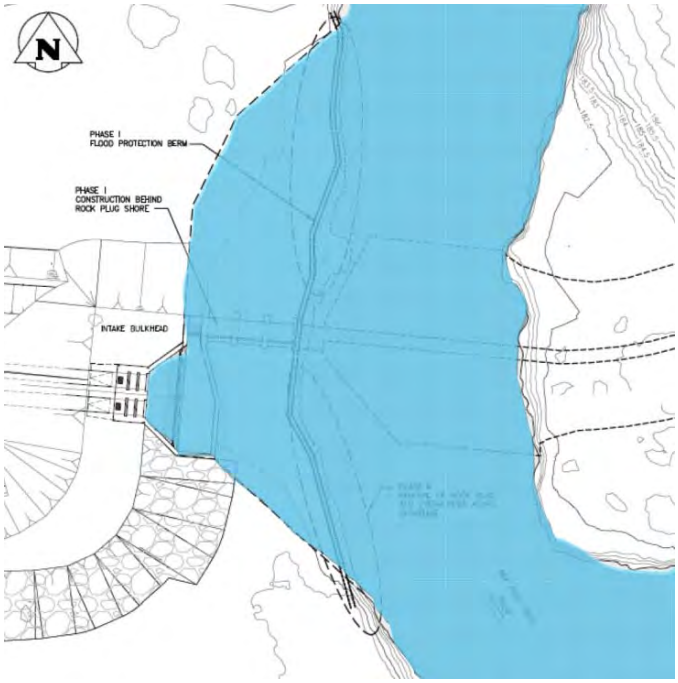


Figure 1.16a Phase I – Excavations



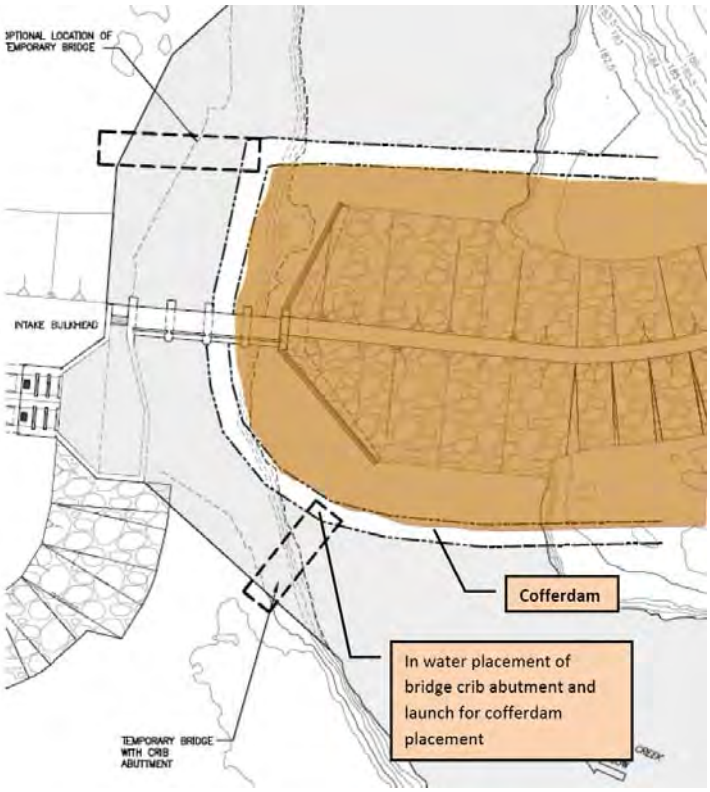
Upon completion of the intake and the concrete spillway work, the cofferdam and remaining rock plug would be removed and the new spillway bay on the west side will be used to pass creek flows downstream (Figure 1.16b).

Figure 1.16b Phase II – Removal of Rock Plug



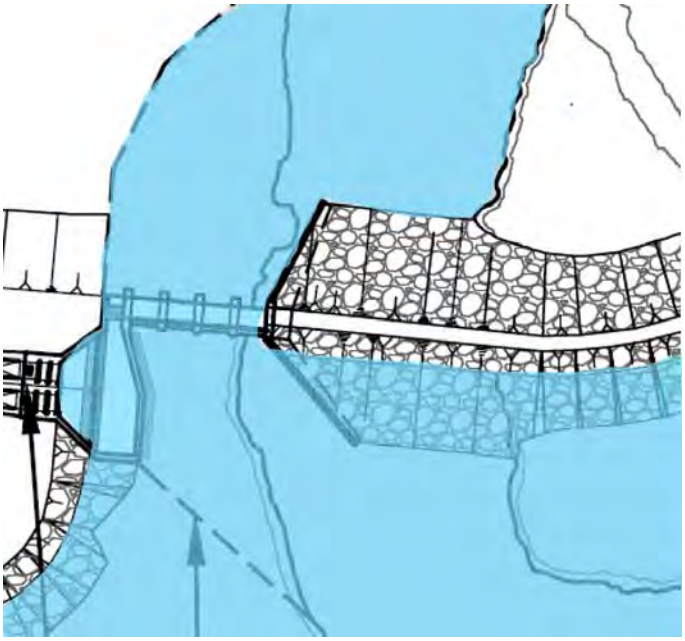
A small cofferdam for the construction of the earth dam could be constructed from the eastern shoreline (Figure 1.16c). It is anticipated that an access trail from Parliament Loop Road to the east abutment could be enhanced to facilitate construction (see Section 1.3.1.2). Alternatively, a temporary bridge could be used to cross the open portion of diverted flow, in combination with limited in-stream work for timber crib abutments. In either case the cofferdam would be quite small, with a dewatered river channel area in the order of 150 m by 50 m using a cofferdam in the order of 1.5 to 2 m high. The cofferdam selected by the DBC is anticipated to be either an in-stream water tight barrier (e.g., aquadam), or constructed of granular fill with a water retaining core (membrane or silty sand). In this phase of construction the spillway concrete components would be completed and the earth dam would be put in place.

Figure 1.16c Phase III – Construction of Earth Dam



In the final phase the cofferdam would be removed and the forebay eventually flooded as shown in Figure 1.16d. The material from the cofferdam may be used as part of the earth dam, or placed in designated spoil piles.

Figure 1.16d Phase IV – Removal of Cofferdam



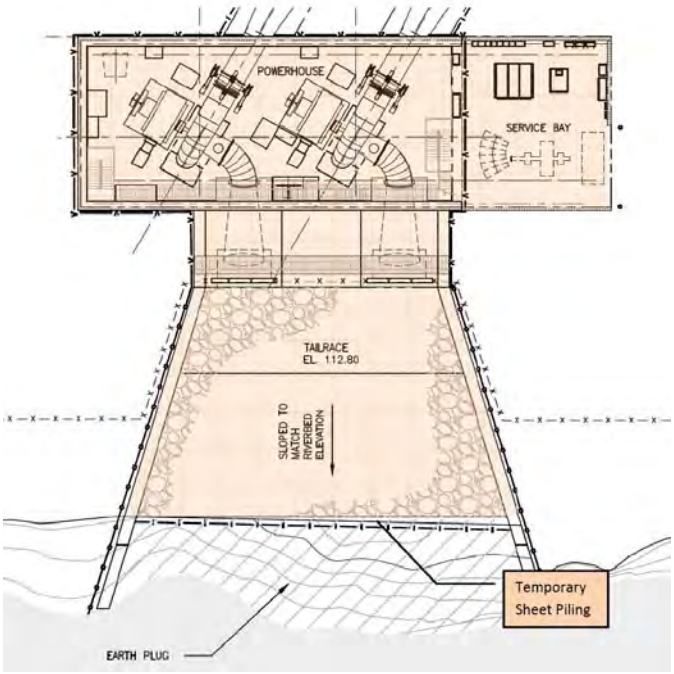
Existing slopes along the Abitibi River and inland at the proposed Project site are relatively steep. Some slope angles were near 1V:1H locally, with overall slopes of 1V:3H, reflecting fairly high strength materials in the *in-situ* sands, silts and tills and limited groundwater pressure influence.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

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

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

Construction of the proposed powerhouse and a portion of the tailrace will be set back from the Abitibi River shoreline (see Figure 1.11). Due to the presence of sand, it is anticipated that a pumped dewatering system possibly combined with a trench cut-off and/or sheet pile cut-off will be required during excavation and construction (Figure 1.17).

Figure 1.17 Powerhouse Excavation behind Earth Plug and Sheet Piling Cofferdam



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

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

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

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

Construction is anticipated to last up to 30 months.

1.3.1.1 Inundation and Total Cleared Areas

As indicated in Table 1.2, the proposed Project is projected to result in an estimated inundated area of 170 ha. The inundation is limited to the portion of waterway and land upstream of the proposed spillway structures. The inundated areas associated with the proposed Project are a combination of riparian shoreline and moist forest-covered areas (see Figure 1.9). The total area affected by the proposed Project has been calculated from mapping and by adding up the areas of the various proposed Project components. The total area affected was apportioned into three categories:

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

The areas affected by the proposed Project components are presented in Table 1.3.

Table 1.3 Quantification of Areas Affected by Proposed Project Components

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

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

The final total area to be cleared will be refined as detailed design of the proposed Project progresses. It is assumed that all temporary construction roads will be included in the footprint identified in Table 1.3. It also assumes that borrow areas would not be a permanent loss from the land base, since once the resources are depleted, site restoration will be undertaken by the borrow operators.

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

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

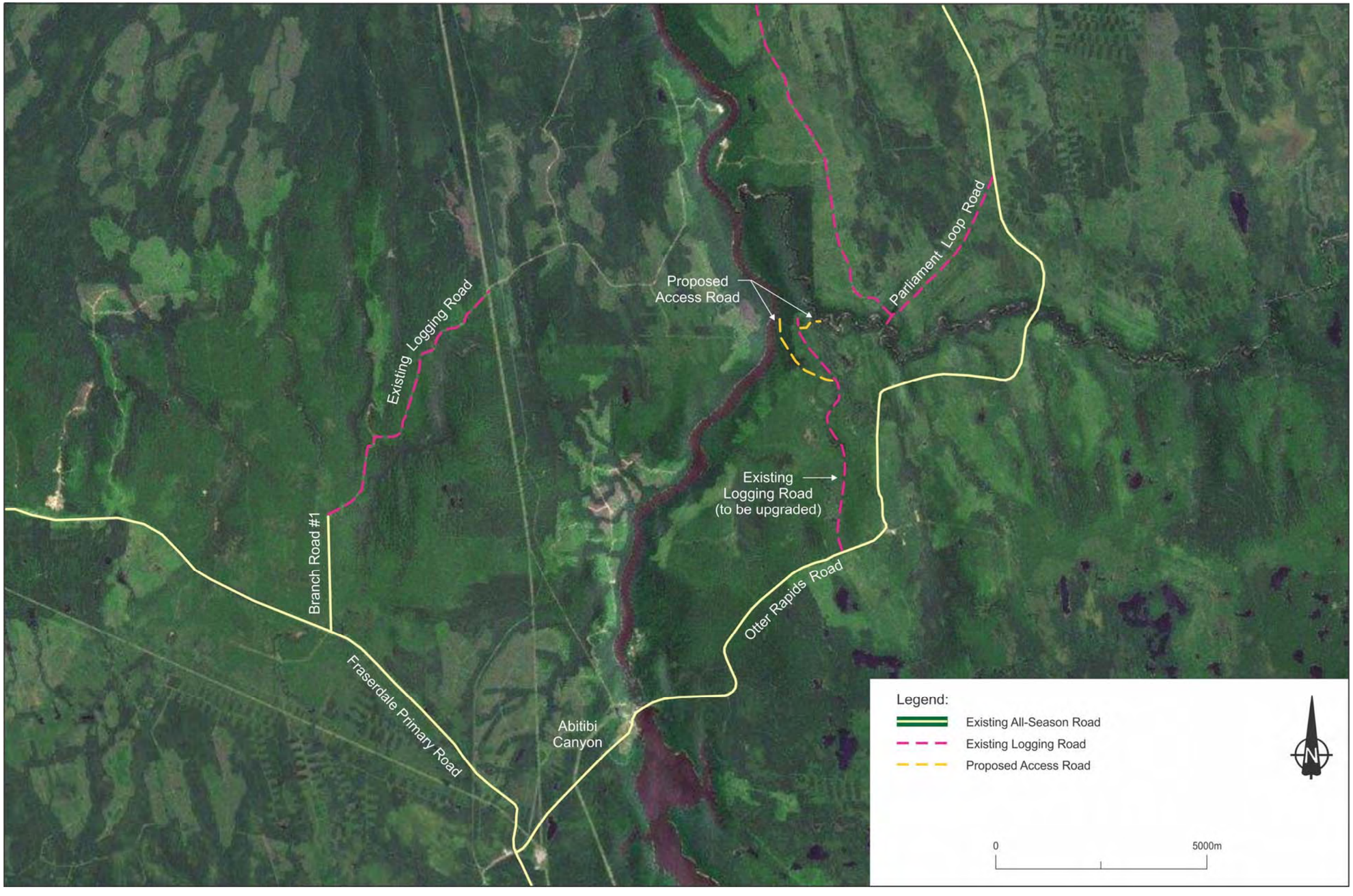
A number of ancillary facilities will be required for the proposed Project, including roads, camps for construction workers, lay-down/construction areas and borrow areas for construction materials.

Existing road access leading to the proposed GS site is provided by Provincial Highway 634 to the Abitibi Canyon GS and a short section of the Otter Rapids Road (private road) which ends at the Otter Rapids GS (see Figure 1.5).

Further access to the proposed GS Site would be via a disused clay-topped forestry road, approximately 6.1 km in length, that would have to be substantially expanded and reinforced (see Figures 1.5 and 1.18). This is a single-lane road that was constructed by grubbing and heaping the clay soil to create a sub-grade, with portions topped with sand and/or gravel. This road is assumed to have been constructed in 1980 to provide access for harvesting and has subsequently not received maintenance. The existing road would have to be upgraded and extended approximately 530 m and 1,450 m to the proposed intake and powerhouse locations, respectively. This road traverses two permanent unnamed watercourses. In addition, there are six cross-drainage culverts along the operational road to facilitate seasonal water flows and avoid pooling along the road. Culvert replacement will require a permit from the MNR.

CRP/OPG presumes that access to the east bank of the New Post Creek, as may be necessary for the construction of the dam structures, will be provided with a temporary bridge across the creek at the intake area. Other old forestry roads north of the Otter Rapids Road bridge over New Post Creek such as Parliament Loop Road may also provide access to the east bank of the creek. Figure 1.18 shows the potential access route along Parliament Loop Road. These roads would require construction and environmental mitigation measures by the DBC prior to use, and would be upgraded in accordance with permit approvals from MNR.

Figure 1.18 Proposed Project Access Roads



Access to the west bank of the Abitibi River for construction of the proposed transmission line is provided by an existing road network to the interconnection point with the existing Hydro One transmission line and is considered adequate for construction equipment traversal (see Figure 1.13). Proposed transmission line construction is expected to be carried out in winter with no additional access road creation. In any case, the DBC will have to secure permits and approvals regardless of the season of proposed transmission line construction.

The proposed interconnection point will be accessed using the Fraserdale Primary Road (#634), Branch Road #1 and an unnamed operational (logging) road (see Figures 1.5 and 1.18) that bisects the Pinard Moraine Conservation Reserve which was regulated by the MNR in 2005. Upon regulation, this road continues to be used by the forestry industry as per agreement with the MNR. An Area of Concern (AoC) prescription for use of this road during proposed Project construction may be required from the MNR.

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

Construction staging or lay-down areas will be required and are expected to be close to the main construction sites, e.g., intake and spillway structures, penstocks and powerhouse. These areas will be used for vehicle and equipment parking, materials storage, construction facilities (e.g., site office, security buildings/cabins) and construction access provision. CRP/OPG has identified from a practical perspective a number of areas that will likely be used during construction (see Figure 1.6). In some cases, the DBC will use areas that will be permanently lost to infrastructure for temporary uses. These opportunities can occur during proposed Project staging. The DBC will be required to obtain any land use permits and licences for temporary construction activities.

Borrow areas will be required primarily for the earth fill dam and dykes and other aggregate use. CRP/OPG anticipates that aggregate from the excavations would be used and supplemented from several nearby existing borrow areas for which the DBC would have to secure permits or procurement from those already holding the permits. Figure 1.5 shows the locations of potential borrow areas.

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

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

1.3.1.3 Construction Schedule and Strategy

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

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

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

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

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

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

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

CRP/OPG anticipates that explosives will be required during construction. All necessary permits will be obtained by the DBC, who will also comply with all legal requirements in connection with the use, storage and transportation of explosives, including, but not limited to, the *Canadian Explosives Act* and the *Transportation of Dangerous Goods Act* (see Section 3.1.2.3). Environmental monitoring during construction will also occur to ensure commitments in the ER and other permits are being followed as intended (see Section 3.2.13).

1.3.2 Operation

1.3.2.1 Proposed New Post Creek Hydroelectric GS

Operation of the New Post Creek Diversion Dam has been designed in a manner which requires minimal intervention by OPG personnel. Since 1974, the dam has been operated by leaving the stop logs set at elevation 218.80 m to maximize diversion flow while eliminating the need for

ongoing log operations at the dam (OPG *et al*., 2006). When the headwater exceeds this elevation, water spills over the stop logs and flows downstream along the old channel of the Little Abitibi River.

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

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

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

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

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

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

When the diverted creek flow is less than the lowest plant operating flow of the smallest turbine unit (typically 40% of the unit capacity for a Francis turbine), pulsed operation would occur. It is expected to occur primarily during the low flow winter periods and would use the limited storage available in the forebay to provide additional generation. Using a FSL of 187.00 m.a.s.l.,

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

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

1.3.2.2 Operating Regime

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

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

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

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

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

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

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

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

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

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

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

6. In the prescribed period where a 50 cm band is achievable, the cycle would be expected to repeat every 48 to 150 h, depending upon riparian flow.
7. The flows downstream of the dam would not change during this process as they will remain as the defined minimum flow requirement.

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

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

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

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

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

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

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

1.3.2.3 Transmission Facilities

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

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

1.3.3 Decommissioning

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

1.4 DESCRIPTION OF THE STUDY AREAS

In the baseline description of the terrestrial environment, reference will be made to regional, local and site-specific study areas. These study areas are defined as follows.

Regional Study Area

The regional setting is generally defined by the Abitibi River watershed (see Figure 1.19). The regional setting provides for the baseline description of climate, geology, physiography and land uses.

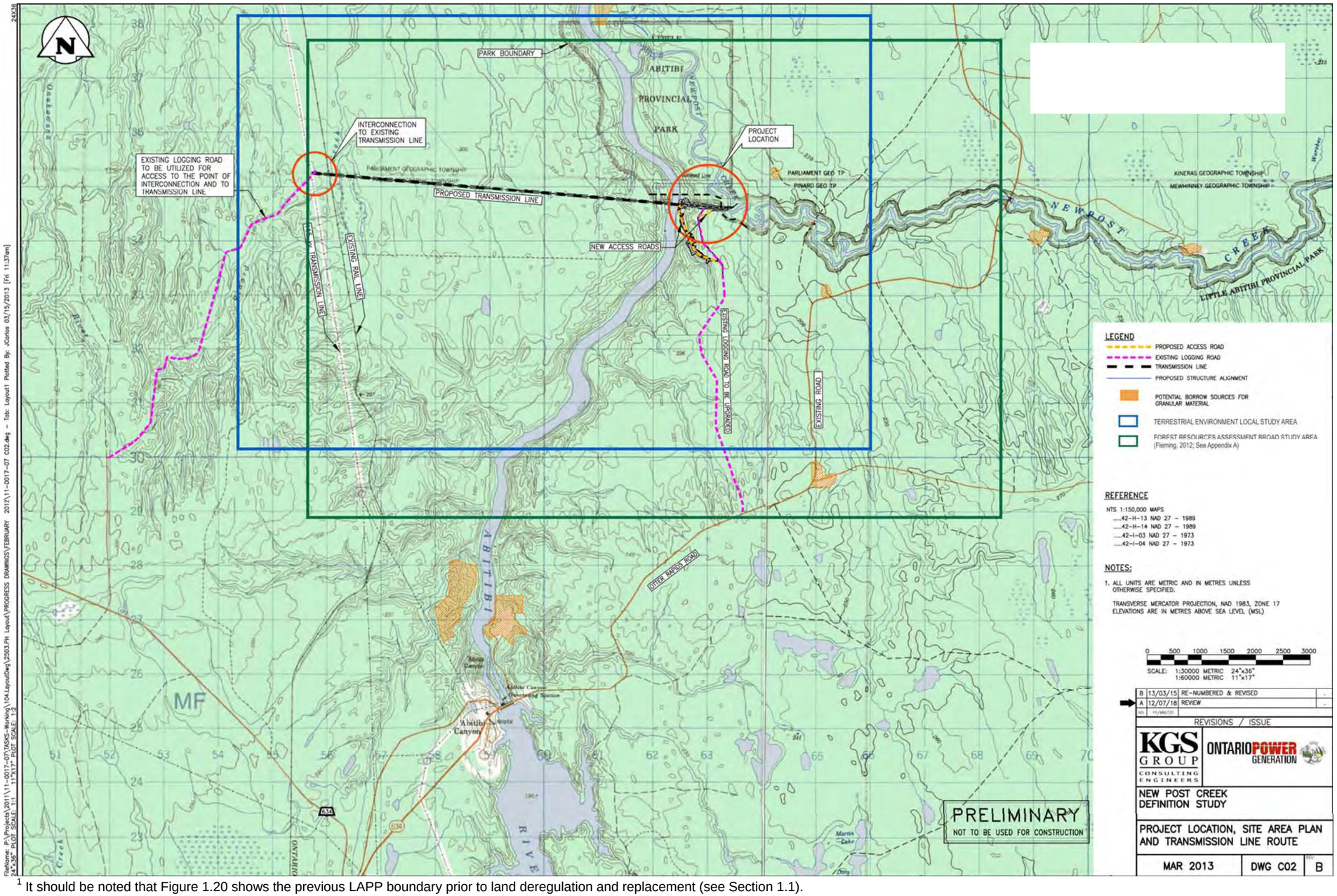
Local Study Area

The local study area for the terrestrial environment, encompasses the area possibly affected by the construction and operation of the proposed New Post Creek Project, and provides for the environmental baseline description of soils, vegetation, wildlife and environmentally sensitive areas (Figure 1.20). Figure 1.20 also delinates the forest resources assessment broad study area (see Appendix A).

Figure 1.19 Abitibi River Watershed Generating Stations and Dams

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

Figure 1.20 Local Study Areas[1]



[1] It should be noted that Figure 1.20 shows the previous LAPP boundary prior to land deregulation and replacement (see Section 1.1).

Site Specific Study Area

The site specific study area for the proposed Project includes those terrestrial environment components that will be directly affected by the proposed development, including:

- the main access road to the proposed Project location (access road study area), involving an upgrade and extension of the existing operational road to primary status (see Figure 1.21);
- the lower reaches of New Post Creek (downstream riparian study area) with decreased water levels due to flow diversion through the proposed Project GS (see Figure 1.21);
- transmission corridor study area (Figure 1.21) for the 50-m wide transmission line ROW (see Figure 1.8);
- the proposed Project footprint including the powerhouse, penstock, intake weir, parking areas and laydown areas (see Figure 1.21);
- inundation zone study area upstream of the proposed intake/weir location on New Post Creek (see Figures 1.9 and 1.21); and
- potential proposed borrow areas (see Figure 1.5).

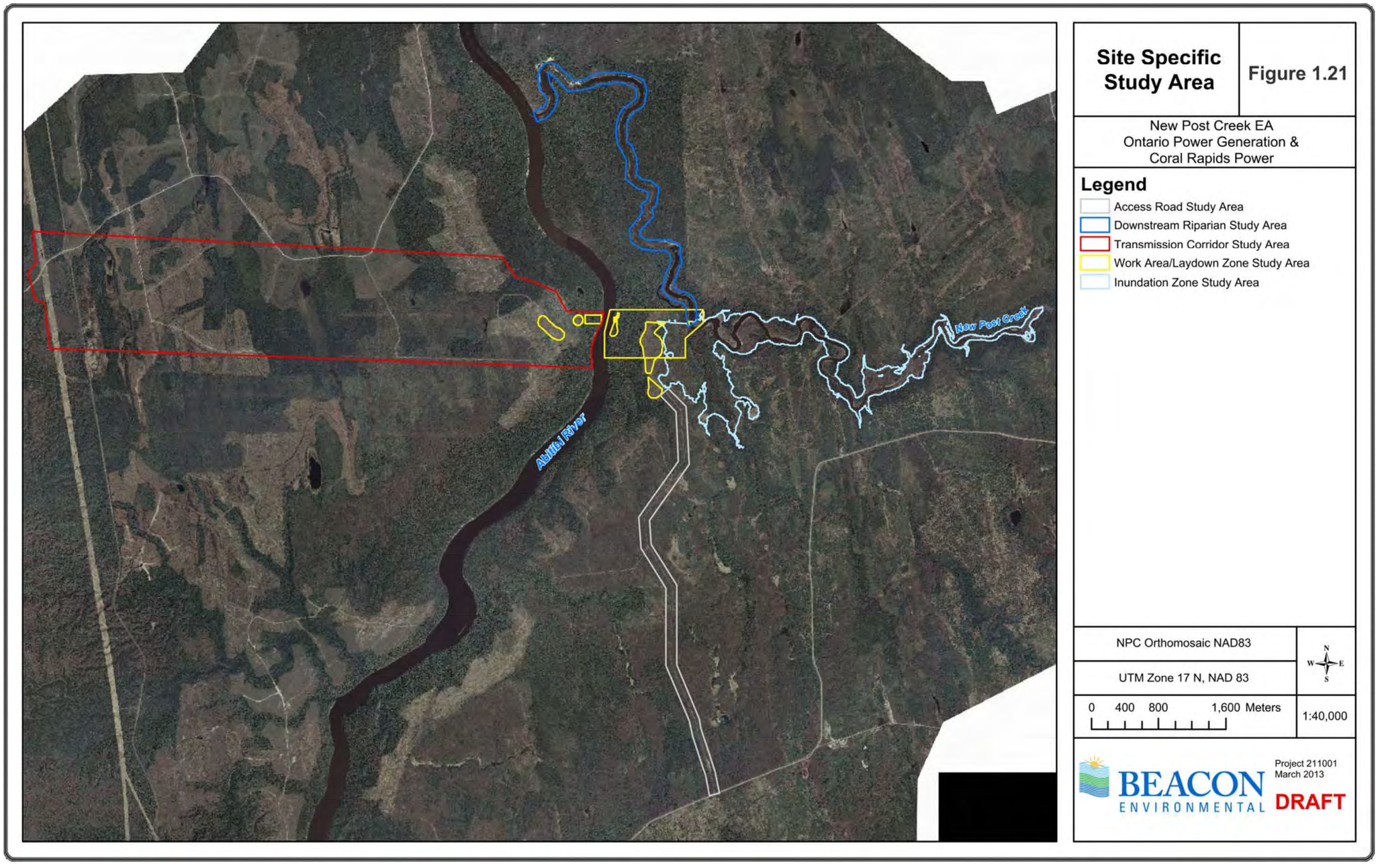
1.5 STUDY APPROACH

The baseline setting for the terrestrial environment was prepared based on literature review and personal contacts. Relevant environmental baseline information was available in reports prepared by Ontario Hydro (1982, 1995), KGS Group (2006, 2010a, b, 2012c), Ontario Parks (2006), OPG *et al.* (2006), AMEC (2010) and Beacon (2010). This information was augmented by information in other available reports and documents, and updated by data requested from the MNR. Traditional knowledge was also obtained from the TTN. Finally, site-specific studies have been undertaken by Beacon Environmental (Beacon), addressing terrestrial vegetation communities and wildlife habitat. A forestry resources assessment was also undertaken by Fleming Forestry (see Appendix A).

1.6 STRUCTURE OF REPORT

This document was prepared as a TSD to the ER (SENES, 2013) prepared pursuant to the OWA Class EA process. ER preparation has adhered to the OWA (2012a) Class EA under the *EA Act.* The ER provides a description of the proposed Project, summarizes the overall baseline environmental setting and anticipated environmental effects, recommends appropriate mitigation measures to minimize or obviate these effects, and describes agency, public, and First Nation and Métis consultation. Other TSDs address the aquatic environment, cultural heritage, socio-economics and land use, public and agency consultation, and First Nation and Métis interests and consultation.

Figure 1.21 Site Specific Study Area



This Terrestrial Environment TSD is organized into four main chapters:

- Chapter 1.0 **Introduction** – provides a description of the proposed Project, a delineation of the study areas and the study approach;
- Chapter 2.0 **Baseline Terrestrial Environment Conditions** – describes the baseline terrestrial environment conditions in the study areas;
- Chapter 3.0 **Impact Assessment and Mitigation Measures** – details the assessment of terrestrial environment effects, presents mitigation measures to minimize or obviate these effects and summarizes the net effects; and
- Chapter 4.0 **Summary and Conclusions** – summarizes the potential effects and recommended mitigation/remedial measures.

Chapters 5.0, 6.0 and 7.0 provide the References, Acronyms/Abbreviations and Glossary, respectively.

2.0 BASELINE TERRESTRIAL ENVIRONMENTAL CONDITIONS

2.1 ATMOSPHERIC ENVIRONMENT

2.1.1 Climate

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

The proposed New Post Creek Project is located near the southern limit of the Albany Climatic Region which extends north to James Bay (Chapman and Thomas, 1968). The Northern Clay Belt Climatic Region occurs to the south of the Albany Climatic Region. A summary of pertinent climatic and related growing season data for these regions is given in Table 2.1. Due to the strong influence of Arctic air masses and the cool temperatures they bring, the growing season of the Albany Climatic Region is relatively short, i.e., 154 days (based on data collected from 1931 to 1960).

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

Mean daily temperature and precipitation data by month for the meteorological stations located at Smoky Falls, Cochrane and Kapuskasing Airport are presented in Table 2.2. Mean annual temperatures at the three stations range from 0.5 to 0.7^{o}C.

Table 2.1 Climatic Data for Albany and Northern Clay Belt Climatic Regions[1]

Climatic Parameter	Albany			Northern Clay Belt		
Mean Annual Temperature °C (°F)		-1.1 (30)			1.1 (34)	
Mean Daily Temperature °C (°F)	Minimum		Maximum	Minimum		Maximum
January	-26.7 (-16)		-15.6 (4)	-24.4 (-12)		-11.7 (11)
April	-8.3 (17)		4.4 (40)	-5.6 (22)		6.1 (43)
July	10.6 (51)		22.8 (73)	10.6 (51)		23.9 (75)
October	-1.1 (30)		7.2 (45)	0 (32)		9.4 (49)
Mean Date of Last Spring Frost		12 June			8 June	
Mean Date of First Fall Frost		5 September			7 September	
Mean Annual Frost-Free Days		86			92	
Mean Start of Growing Season		15 May			7 May	
Mean End of Growing Season		8 October			13 October	
Annual Length of Growing Season (Days)		154			160	
Mean Annual Growing Degree Days		1,800			2,200	
Mean Annual Precipitation – mm (inch)		660 (26)			787 (31)	
Mean Annual Snowfall – mm (inch)		2,413 (95)			2,794 (110)	

[1] Source: Chapman and Thomas (1968).

Table 2.2 Mean Temperature and Precipitation Data, 1971-2000[1]

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Smoky Falls[2]													
Temperature (°C)	-18.8	-16.7	-9.4	-0.5	8.2	14.4	17.6	16.3	10.4	3.7	-4.6	-14.7	0.5
Rainfall (mm)	0.4	1.9	8.3	29.8	50.7	70.7	99.0	70.7	99.0	56.5	19.3	4.6	510.9
Snowfall (cm)	56.4	34.0	36.9	20.9	4.3	0.7	0.0	0.0	0.6	12.5	49.5	61.7	277.5
Total Precipitation (mm)	56.8	35.9	45.2	50.7	55.1	71.4	99.0	70.7	99.7	69.0	68.8	66.3	788.4
Days with Precipitation[3]	14.5	11.2	10.8	9.4	11.5	13.5	15.8	14.0	16.8	15.2	15.6	16.8	165.1
Cochrane[4]													
Temperature (°C)	-18.4	-15.8	-8.9	0.7	9.2	13.8	16.8	15.5	9.9	3.6	-4.5	-15.0	0.6
Rainfall (mm)	0.7	1.3	9.7	26.3	69.8	90.5	90.1	87.9	108.1	69.6	25.1	4.1	583.2
Snowfall (cm)	71.6	41.1	48.6	18.4	3.5	0.6	0.0	0.0	0.9	8.2	38.9	65.1	296.8
Total Precipitation (mm)	72.3	42.4	58.3	44.6	73.2	91.1	90.1	87.9	109.0	77.8	64.0	69.3	880.0
Days with Precipitation[3]	15.9	11.4	10.8	9.7	11.7	14.5	13.9	13.5	17.4	15.3	15.7	17.6	167.3
Kapuskasing Airport[5]													
Temperature (°C)	-18.7	-15.5	-8.6	0.5	9.0	14.4	17.2	15.7	10.1	3.8	-4.8	-14.3	0.7
Rainfall (mm)	0.7	2.4	11.2	26.7	57.0	86.2	100.5	80.3	94.2	59.2	22.9	3.3	544.6
Snowfall (cm)	60.8	36.4	46.2	28.1	9.3	0.6	0.0	0.0	2.0	21.8	50.5	57.3	313.0
Total Precipitation (mm)	54.6	35.3	53.6	53.9	66.3	86.8	100.5	80.3	96.3	81.2	69.2	53.7	831.8
Days with Precipitation[3]	18.4	14.4	14.6	11.8	12.7	14.9	15.1	14.3	17.7	17.5	19.4	20.0	190.8
Average Snow Depth (cm)	56	69	52	15	1	0	0	0	0	1	9	19	20

1 Source: www.climate.weatheroffice.ec.gc.ca/climate_normals
2 Latitude: 50°04'00"N; Longitude: 82°10'00"W; Elevation: 182.90 m.
3 ≥0.2 mm.
4 Latitude: 49°04'00"N; Longitude: 81°02'00"W; Elevation: 274.90 m.
5 Latitude: 49°24'50"N; Longitude: 82°28'03"W; Elevation: 226.50 m.

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

The mean frost-free periods at Abitibi Canyon and Smoky Falls are 80 and 99 days, respectively (Table 2.3). The occurrence of frost is quite variable, depending on weather and local differences in vegetation, soil types, proximity to watercourses and topography. Frozen ground conditions usually occur between early December and early April.

Table 2.3 Frost Data, 1951-1980[1]

Parameter	Abitibi Canyon[2]	Smoky Falls[3]
Mean Frost-Free Period (Days)	80	99
Average Last Frost (Spring)	14 June	06 June
Average First Frost (Fall)	03 September	14 September
Earliest Last Frost (Spring)	25 May[4]	15 May[5]
Latest Last Frost (Spring)	01 July[4]	30 June[5]
Earliest First Frost (Fall)	17 July[4]	10 August[5]
Latest First Frost (Fall)	28 September[4]	05 October[5]
Longest Frost-Free Period (Days)	118[4]	134[5]
Shortest Frost-Free Period (Days)	20[4]	40[5]

[1] Source: AES (1982).
[2] Based on 13 years of data.
[3] Based on 30 years of data.
[4] Based on 33 years of data.
[5] Based on 46 years of data.

The prevailing winds in the area of the proposed New Post Creek Project usually have a westerly component (see Table 2.4). The annual maximum hourly wind speeds with 1:10, 1:30 and 1:100 probabilities of exceedance are 68.4, 75.6 and 86.4 km/h; 68.4, 75.6 and 82.8 km/h; and 72.0, 79.2 and 90.0 km/h at Smooth Rock Falls, Kapuskasing and Cochrane, respectively (ACNBC, 1980).

Table 2.4 Wind Data for Kapuskasing Airport[1], 1971-2000[2]

Parameter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Average Wind Speed (km/h)	12.8	12.4	13.5	13.4	12.7	12.0	11.3	11.2	12.6	13.8	13.5	12.4	12.6
Most Frequent Direction	W	W	NW	NW	N	S	S	S	S	S	W	W	W
Max. Hourly Speed (km/h)	56	56	55	64	65	64	58	52	55	61	63	63	
Max. Gust Speed (km/h)	93	89	80	97	89	101	97	105	105	106	97	106	
Max. Gust Direction	SW	NW	SW	SW	W	NW	W	W	NW	S	NW	SW	S

[1] Latitude: 49°24'50"N; Longitude: 82°28'03"W; Elevation: 226.50 m.

[2] Source: www.climate.weatheroffice.ec.gc.ca/climate_normals

2.1.2 Air Quality

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

2.1.3 Environmental Noise

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

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

2.2 BEDROCK GEOLOGY

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

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

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

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

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

The potential for seismic activity at the proposed undertakings is low (ACNBC, 1980) as this area is located well within the North American continental plate. Areas at risk of seismic activity are traditionally located at continental plate margins, or in zones of active continental rifting or other deep-seated crustal disturbance. The geological record of this area is marked by ancient events of this nature, as represented in part by ancient regional faults. This type of activity, however, has not occurred within geologically recent time. Any seismic activity that may occur in this area is likely to be minor in nature and be related to crustal adjustments arising from isostatic rebound.

2.3 PHYSIOGRAPHY

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

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

Regionally, the original landscape was considerably modified by glaciation during the late Wisconsinan stage of glaciation. Ice-flow indicators, including striations and grooves, crag and tail features, and flutings indicate a complex sequence of ice flow in the Abitibi-Timiskaming Region (Veillette, 1995; Veillette and McClenaghan, 1996). Initially, ice flowed to the northwest across the area. Ice flow subsequently shifted counter clockwise, to the west-southwest, then south and finally southeast and southwest. In this area, the peneplained landscape typical of the Shield is modified by variable (<1 m in areas dominated by bedrock), and in some areas considerable (>10 m), thicknesses of Quaternary glacial sediments, as well as by recent organic

surficial materials. These sediments tend to obscure the already low relief of the underlying bedrock.

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

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

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

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

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

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

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

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

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

The lower reach of New Post Creek flows northward essentially parallel to the Abitibi River for 3 km forming a peninsula of land varying in width from approximately 0.5 to 1 km. There is an elevation difference of about 66 m between New Post Creek and the Abitibi River, with the head drop occurring mainly at the New Post Creek waterfall (KGS Group, 2006, 2013a).

The peninsula includes a relatively flat lying, upper eastern terrace that is approximately 500 m wide, with a discontinuous central ridge up to 8 m above New Post Creek elevation. The western scarp portion of the peninsula varies from approximately 200 m to 500 m in width and slopes relatively steeply down to the Abitibi River. Existing natural slopes in the local study area are as steep as 1V:1H locally, with overall slopes of 1V:3H to 1V:4H. Slope is very gentle along the proposed penstock footprint from the intake structure to the powerhouse over the initial 650 m with an overall average slope of 18% down to the Abitibi River shore (KGS Group, 2006, 2013a).

New Post Creek has exposed shorelines with active toe erosion and scouring of the silt and sandy slopes that range from a few metres to approximately 10 m in height. Along the Abitibi River, the vegetation frequently extends down to the shoreline, with intermittent areas of exposed steep overburden (sands, silts, tills) bluffs of low (1 to 3 m) to higher (10 m) elevations (KGS Group 2006, 2013a).

2.4 SOILS

As indicated above, surficial material is the result of glacial activities during the late Wisconsinan stage of glaciation and is characterized by glaciolacustrine deposits, glaciofluvial deposits and ground moraine (till).

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

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

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

2.5 VEGETATION

As indicated in Section 2.3, the proposed New Post Creek Project is located near the southern limit of the Hudson Bay Lowlands within a physiographic subdivision delineated by Coombs (1954) as the "Dry Zone". The greater part of the Hudson Bay Lowlands is covered by peatlands and wetlands, i.e., marshes, fens, swamps and bogs, interlaced with ponds, lakes, streams and rivers (Sims *et al*., 1979). Mineral soil uplands ("dry land") are scarce, comprising approximately 8% of the surface area, and are found primarily in the form of beach ridges, particularly near the coast, river banks and levees, and less commonly as other gravel and sand formations such as moraines, eskers and dunes.

The southern "Dry Zone" physiographic subdivision has approximately 40% dry land. Although much peatland is present, particularly large patterned fens and conifer swamps, a sizeable portion of the area is well wooded upland vegetation (Sims *et al*., 1979). The drier condition is attributed to the development of a more mature drainage system, although a somewhat milder climate and a longer frost-free period also contribute to the dissipation of soil moisture in this zone (Coombs, 1954).

The proposed New Post Creek Project is located in the Northern Clay Forest Section of the Boreal Forest Region (Rowe, 1977). White Spruce (*Picea glauca*) and Black Spruce (*Picea mariana*) are characteristic species of the Boreal Forest Region. Other common species are Tamarack (*Larix laricina*), Balsam Fir (*Abies balsamea*) and Jack Pine (*Pinus banksiana*). Although the forests are primarily coniferous, there is a general admixture of broadleaved trees such as White (Paper) Birch (*Betula papyrifera*), Trembling Aspen (*Populus tremuloides*) and Balsam Poplar (*Populus balsamifera*), as well as species typical of the more southerly Great Lakes-Saint Lawrence Forest Region, such as Eastern White Pine (*Pinus strobus*), Red Pine (*Pinus resinosa*), Yellow Birch (*Betula alleghaniensis*), Sugar Maple (*Acer saccharum*), Black Ash (*Fraxinas nigra*) and Eastern White Cedar (*Thuja occidentalis*).

The Northern Clay Forest Section is dominated by Black Spruce which forms large stands on both the poorly-drained lowland flats of the clay plain and the gently rising uplands (Rowe, 1972). Tamarack occurs infrequently in these stands. In the wetter areas, Eastern White Cedar grows in association with Black Spruce. Pure hardwood and mixedwoods stands of Trembling Aspen, Balsam Poplar, Balsam Fir, White Spruce and Black Spruce grow in better-drained areas, such as in areas of higher relief and along the margins of lakes and rivers. Balsam Fir is a common component of the forest understory and has increased in abundance by regeneration

on cut-over Black Spruce woods. Jack Pine forms extensive stands on dry, sandy areas, while White Birch is also typically found growing in the sandy soils of old beaches, eskers and outwash deposits.

2.5.1 Forestry Resources

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

Forestry resource plots were used to assess the specific forest stands to be affected by the proposed New Post Creek Project (Fleming, 2012). The cruise plot information was used to assess the accuracy of the Forest Resource Inventory (FRI) and to estimate timber volume loss due to proposed transmission line ROW clearing, access road ROW widening, construction site clearing and New Post Creek shoreline inundation. A total of 44 forest resource assessment plots were completed. All tree species less than 10 cm in diameter were counted by species and all species greater than 10 cm were tallied by 2-cm diameter classes. Any unique stand conditions, fish and wildlife values, First Nation values sites, or evidence of human activity were also noted. The forestry resources study methodology and findings are provided in Appendix A.

Forest units identified in the local study area included Lowland Black Spruce Bog (Bog), White Birch Poplar Mixedwood (Bw1), Lowland Conifer (Lc1), Conifer Hardwood Mixedwood (Mwd), Jack Pine Pure (Pj1), Pine Spruce Mixedwood (Pj2), Poplar Pure Rich Sites (Po1), Poplar Pure Poor Sites (Po3), Lowland Black Spruce Pure Rich (Sb1), Lowland Black Spruce Pure Poor (Sb3), Spruce Fir Mixedwood (Sf1), Spruce Pine Mixedwood (Sp1) and Non-forested. All but White Birch Poplar Mixedwood (Bw1) were present in the site-specific study area.

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

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

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

proposed forestry operations in the current Forest Management Plans (FMPs) within or in the vicinity of the local study area.

2.5.2 Site-specific Vegetation Communities

Comprehensive ground-truthing of the vegetation communities in the proposed Project site-specific study area was undertaken during the 2011 growing season based on the ELC Working Group (2009) Ecosites of Ontario Operational Draft for the Boreal Region. Field work was conducted by Beacon and Fleming Forestry with support from TTN and Forest Tech Services. Field work took place from July 17 to July 25, 2011, September 26 to 28, 2011, October 12, 2011 and August 20 to 25, 2012. Earlier field surveys were completed by Beacon in part of the proposed Project local study area from September 27 to October 6, 2010 as part of the LAPP Ecological Integrity Study (Beacon, 2010).

The surveys involved establishing vegetation assessment plots in representative ecosites within the study areas. A total of 88 potential assessment plot locations were preselected based on existing mapping and air photo interpretation. Plots were established in the following areas:

- proposed transmission line corridor;
- proposed access road;
- construction zone (proposed GS site);
- inundation zone;
- riparian zone downstream of proposed Project intake location; and
- spray zone at New Post Creek waterfalls.

A total of 66 100-m^2 circular plots were installed and sampled during the 2011-2012 field seasons. Sample sites were located as close as possible to the preselected site locations. In addition, 18 plots were previously established in the proposed inundation zone along New Post Creek by Beacon in 2010 for the LAPP Ecological Integrity Study (Beacon, 2010). The data from that study were used in this TSD.

Several of the proposed plot locations downstream of the proposed Project intake could not be accessed due to unsafe boating conditions; however, it was determined from background studies and aerial photography that the riparian environment in the downstream area is very similar to the area upstream. It was also determined that the environment around New Post Creek waterfalls was unsafe and not conducive to establishing plots; instead, photographs and species checklists were compiled within the spray zone on the north side of the waterfalls.

For each sample plot, a pole was used to mark the plot centre and a 5.64-m length of rope was used to mark out the plot perimeter. The location coordinates for each plot were obtained using a Garmin Etrex Legend HCx GPS. Plot locations are shown on Figures 2.1a, b, c and d.

Figure 2.1a ELC Vegetation Type Mapping – Transmission Line Study Area

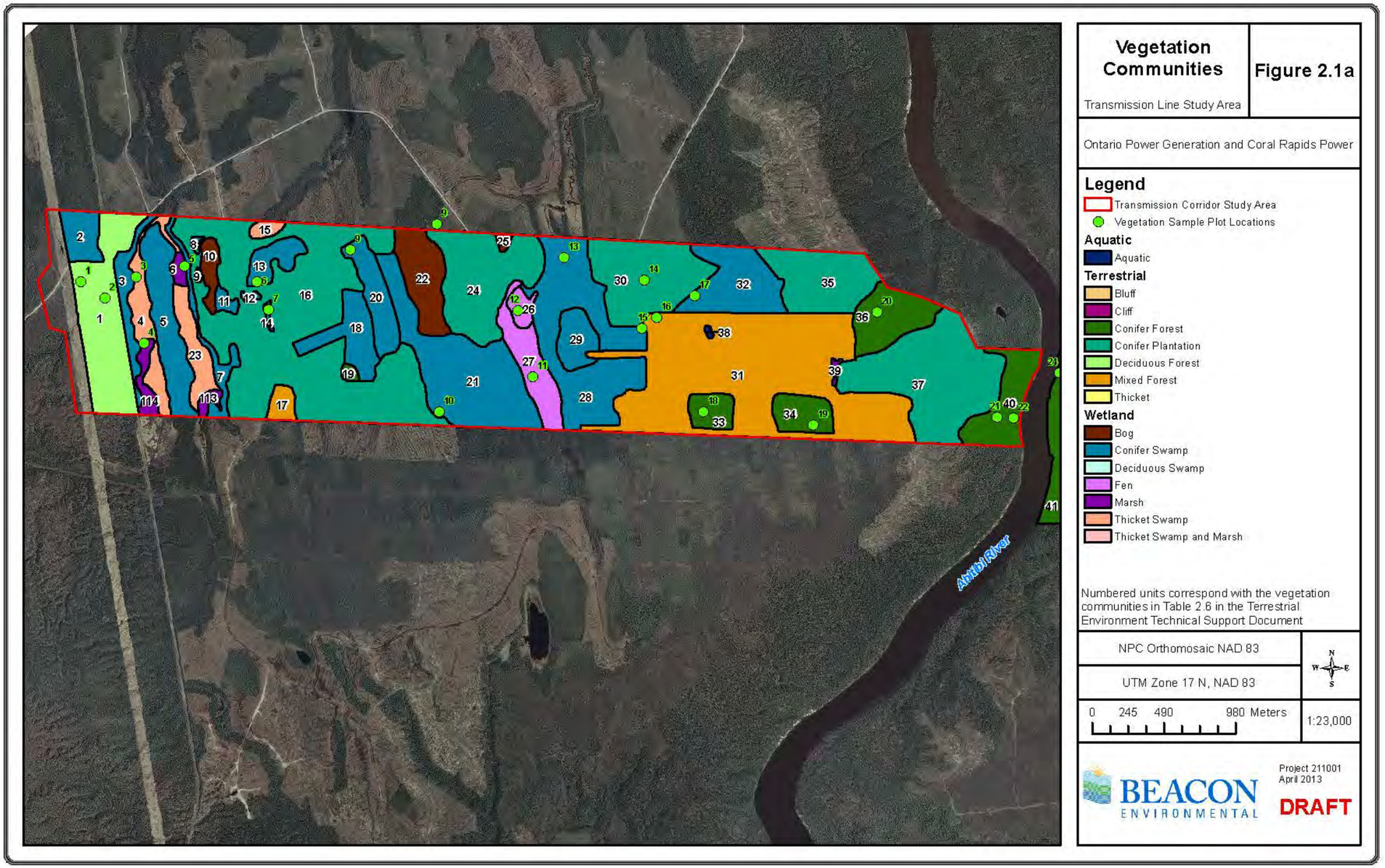


Figure 2.1b ELC Vegetation Type Mapping – Work Area/Laydown Zone and Downstream Riparian Study Areas

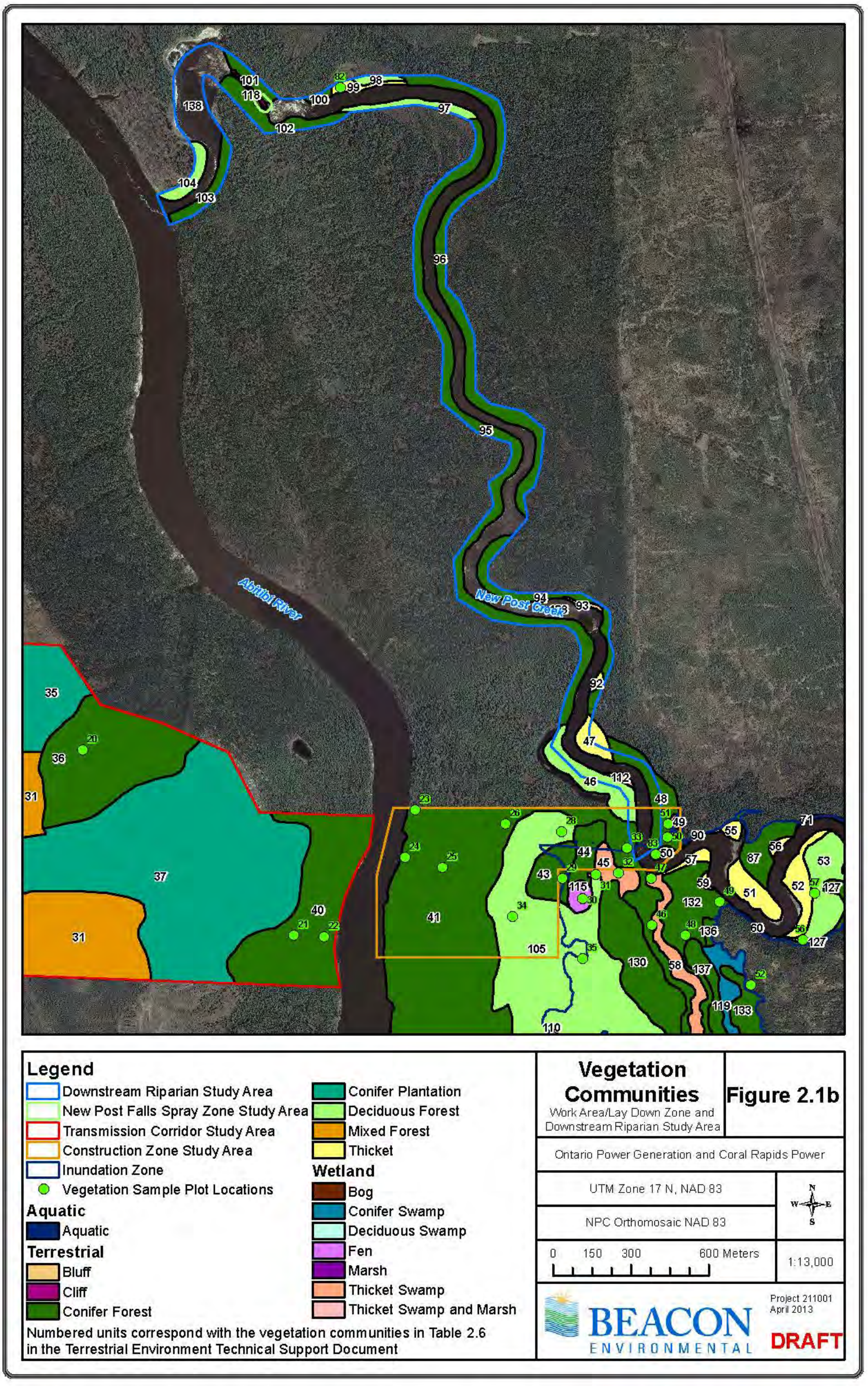
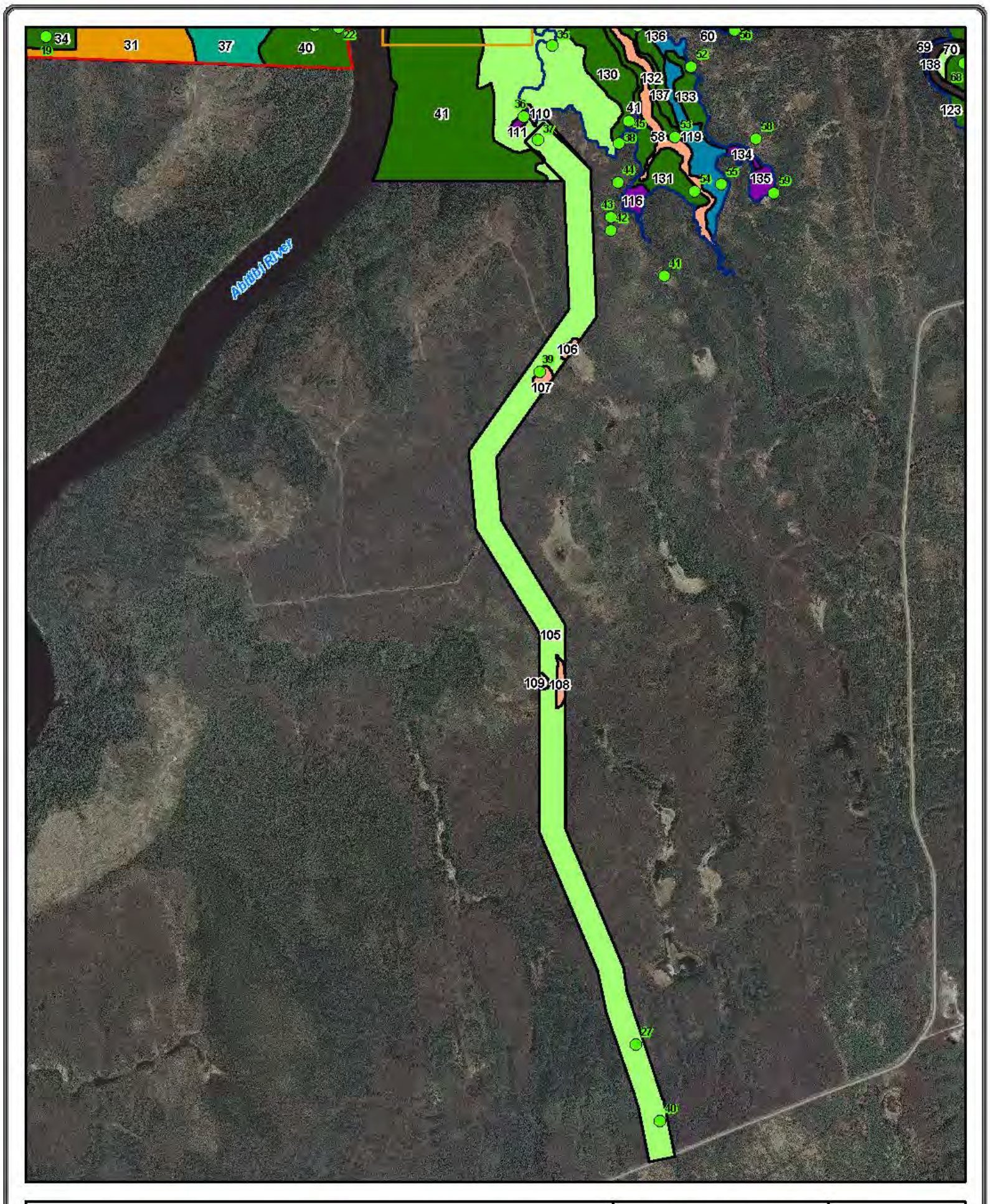


Figure 2.1c ELC Vegetation Type Mapping – Access Road Study Area



Legend

- Access Road Study Area
- Transmission Corridor Study Area
- Construction Area
- Inundation Zone
- Vegetation Sample Plot Locations

Aquatic

- Aquatic

Terrestrial

- Bluff
- Cliff
- Conifer Forest
- Conifer Plantation
- Deciduous Forest
- Mixed Forest
- Thicket

Wetland

- Bog
- Conifer Swamp
- Deciduous Swamp
- Fen
- Marsh
- Thicket Swamp
- Thicket Swamp and Marsh

Numbered units correspond with the vegetation communities in Table 2.6 in the Terrestrial Environment Technical Support Document

Vegetation Communities

Access Road Study Area

Figure 2.1c

Ontario Power Generation and Coral Rapids Power

UTM Zone 17 N, NAD 83

NPC Orthomosaic NAD 83

0 225 450 900 Meters

1:18,000

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Project 211001
April 2013

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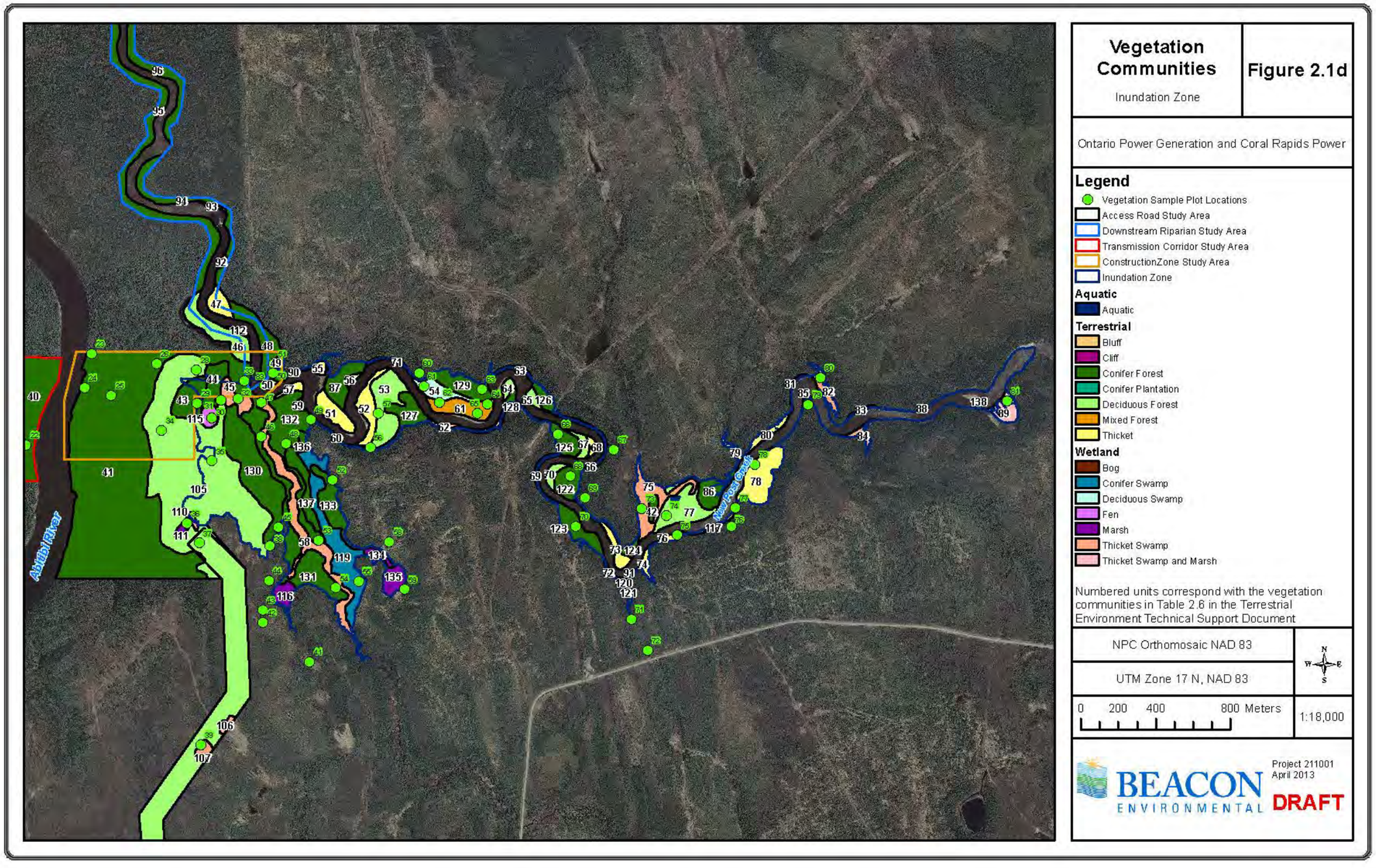
Figure 2.1d ELC Vegetation Type Mapping – Inundation Zone and Upstream Riparian Study Area



Data were recorded on modified Ontario Parks Inventory and Monitoring Program (OPIAM) data sheets (Plot Tombstone Information, Groundcover Plot Information, Vegetation Plot Layers, and Plot Flora List). For each plot, general information was recorded concerning the ground level attributes that describe the area, including information on the system, landform, mode of deposition, substrate type, community type, dominant plant form and cover. Data were collected on vegetation composition and structure, substrate conditions and habitat conditions. Substrate conditions (depth, type, texture, moisture regime, drainage class, etc.) were assessed using a 120-cm long, 5.0-cm diameter soil auger.

Vegetation and substrate data gathered from each plot was used to classify sample sites to the ecosite level (see Table 2.5). Ecosites were determined according to the "Operational Draft of the Ecosystems of Ontario: Provincial Ecosites" (Banton *et al*., 2009).

Table 2.5 Vegetation Sample Plot Ecosite Classification

Plot No.	Ecosite	Vegetation Class	Plot No.	Ecosite	Vegetation Class
1	Fresh, Silty to Fine Loamy: Aspen – Birch	Deciduous Forest	2	Fresh, Silty to Fine Loamy: Aspen - Birch	Deciduous Forest
3	Mineral Thicket Swamp	Thicket Swamp	4	Organic Meadow Marsh	Marsh
5	Organic Shallow Marsh	Marsh	6	Rich Coniferous Swamp	Conifer Swamp
7	Rich Organic Coniferous Swamp	Conifer Swamp	8	Poor Coniferous Swamp	Conifer Swamp
9	Rich Coniferous Swamp	Conifer Swamp	10	Poor Coniferous Swamp	Conifer Swamp
11	Sparse Treed Fen	Fen	12	Poor Fen	Fen
13	Mineral Poor Coniferous Swamp	Conifer Swamp	14	Poor Coniferous Swamp	Conifer Plantation
15	Intermediate Coniferous Swamp	Conifer Swamp	16	Poor Coniferous Swamp	Conifer Plantation
17	Poor Coniferous Swamp	Conifer Swamp	18	Moist, Fine: Pine - Black Spruce Conifer	Conifer Forest
19	Moist, Fine: Pine - Black Spruce Conifer	Conifer Forest	20	Fresh, Silty to Fine Loamy: Spruce - Fir Conifer	Conifer Forest
21	Dry to Fresh, Coarse: Spruce - Fir Conifer	Conifer Forest	22	Fresh, Silty to Fine Loamy: Spruce - Fir Conifer	Conifer Forest
23	Dry to Fresh, Coarse: Spruce - Fir Conifer	Conifer Forest	24	Fresh, Silty to Fine Loamy: Pine - Black Spruce Conifer	Conifer Forest
25	Fresh, Silty to Fine Loamy: Pine - Black Spruce Conifer	Conifer Forest	26	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Forest
27	Fresh, Silty to Fine Loamy: Aspen - Birch Hardwood	Deciduous Forest	28	Fresh, Clayey: Aspen - Birch Hardwood	Deciduous Forest
29	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest	30	Sparse Treed Fen	Fen
31	Mineral Thicket Swamp	Thicket Swamp	32	Mineral Meadow Marsh	Marsh

Table 2.5 Vegetation Sample Plot Ecosite Classification (Cont'd)

Plot No.	Ecosite	Vegetation Class	Plot No.	Ecosite	Vegetation Class
33	Moist, Coarse: Pine - Black Spruce Conifer	Conifer Forest	34	Fresh, Clayey: Aspen - Birch Hardwood	Deciduous Forest
35	Fresh, Clayey: Aspen-Birch Hardwood	Deciduous Forest	36	Organic Shallow Marsh	Marsh
37	Fresh, Silty to Fine Loamy: Aspen - Birch Hardwood	Deciduous Forest	38	Moist, Fine: Shrub	Thicket
39	Organic Thicket Swamp	Thicket Swamp	40	Dry to Fresh, Coarse: Aspen - Birch Hardwood	Deciduous Forest
41	Organic Meadow Marsh	Marsh	42	Organic Thicket Swamp	Thicket Swamp
43	Fresh, Silty to Fine Loamy: Aspen-Birch Hardwood	Deciduous Forest	44	Sparse Treed Bog	Bog
45	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Plantation	46	Poor Coniferous Swamp	Conifer Swamp
47	Moist, Coarse: Shrub	Thicket	48	Dry, Sandy Spruce-Fir Conifer	Conifer Forest
49	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Conifer Forest	50	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest
51	Fresh, Silty to Fine Loamy: Shrub	Thicket	52	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Plantation
53	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Forest	54	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Forest
55	Organic Poor Coniferous Swamp	Conifer Plantation	56	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
57	Fresh, Silty to Fine Loamy: Aspen-Birch Hardwood	Deciduous Forest	58	Organic Poor Coniferous Swamp	Conifer Plantation
59	Organic Shallow Marsh	Marsh	60	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Forest
61	Intolerant Hardwood Swamp	Deciduous Swamp	62	Intolerant Hardwood Swamp	Deciduous Swamp
63	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Conifer Forest	64	Moist, Coarse: Spruce-Conifer	Conifer Forest
65	Moist, Coarse: Conifer	Conifer Forest	66	Dry-Fresh, Coarse: Spruce-Fir Conifer	Conifer Forest
67	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest	68	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Conifer Forest
69	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Forest	70	Moist, Coarse: Spruce-Fir Conifer	Conifer Forest
71	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest	72	Mineral Thicket Swamp	Thicket Swamp
73	Mineral Thicket Swamp	Thicket Swamp	74	Fresh, Silty to Fine Loamy: Aspen-Birch Hardwood	Deciduous Forest
75	Dry-Fresh, Coarse: Shrub	Thicket	76	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Conifer Forest
77	Moist, Coarse: Shrub	Thicket	78	Dry-Fresh, Coarse: Shrub	Thicket

Table 2.5 Vegetation Sample Plot Ecosite Classification (Cont'd)

Plot No.	Ecosite	Vegetation Class	Plot No.	Ecosite	Vegetation Class
79	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Conifer Forest	80	Dry to Fresh, Coarse: Shrub	Thicket
81	Mineral Thicket Swamp	Thicket Swamp	82	Dry to Fresh, Coarse: Shrub	Thicket
83	Moist, Coarse: Aspen - Birch Hardwood	Deciduous Forest			

2.5.3 Ecosite Descriptions

A total of 137 Ecological Land Classification (ELC) vegetation units were mapped within the proposed Project site-specific study area, which are presented on Figures 2.1a, 2.1b, 2.1c and 2.1d. The maps were produced from a combination of vegetation plot data, air photo interpretation and FRI mapping. Table 2.6 lists the vegetation type for each map unit. Of the 137 vegetation units mapped, a total of 35 distinct ecosites were recorded in the proposed Project site-specific study area based on field investigations (Table 2.7).

Table 2.6 Map Units and Corresponding Vegetation Types

Map Unit	Ecosite	Vegetation Class	Map Unit	Ecosite	Vegetation Class
1	Fresh, Silty to Fine Loamy: Aspen-Birch Hardwood	Deciduous Forest	2	Poor Conifer Swamp	Conifer Swamp
3	Poor Conifer Swamp	Conifer Swamp	4	Organic Thicket Swamp	Thicket Swamp
5	Poor Conifer Swamp	Conifer Swamp	6	Organic Shallow Marsh	Marsh
7	Poor Conifer Swamp	Conifer Swamp	8	Poor Conifer Swamp	Conifer Swamp
9	Poor Conifer Swamp	Conifer Swamp	10	Sparse Treed Bog	Bog
11	Poor Conifer Swamp	Conifer Swamp	12	Organic Rich Conifer Swamp	Conifer Swamp
13	Organic Rich Conifer Swamp	Conifer Swamp	14	Organic Rich Conifer Swamp	Conifer Swamp
15	Organic Thicket Swamp	Thicket Swamp	16	Spruce-Fir Conifer	Conifer Plantation
17	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Conifer	Mixed Forest	18	Poor Conifer Swamp	Conifer Swamp
19	Spruce-Fir Conifer	Conifer Forest	20	Organic Rich Conifer Swamp	Conifer Swamp
21	Poor Conifer Swamp	Conifer Swamp	22	Sparse Treed Bog	Bog
23	Organic Thicket Swamp	Thicket Swamp	24	Black Spruce Plantation	Conifer Plantation
25	Sparse Treed Bog	Bog	26	Poor Fen	Fen

Table 2.6 Map Units and Corresponding Vegetation Types (Cont'd)

Map Unit	Ecosite	Vegetation Class	Map Unit	Ecosite	Vegetation Class
27	Sparse Treed Fen	Fen	28	Poor Conifer Swamp	Conifer Swamp
29	Organic Rich Conifer Swamp	Conifer Swamp	30	Black Spruce Plantation	Conifer Plantation
31	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Co	Mixed Forest	32	Poor Conifer Swamp	Conifer Swamp
33	Moist, Fine: Pine-Black Spruce Conifer	Conifer Forest	34	Moist, Fine: Pine-Black Spruce Conifer	Conifer Forest
35	Black Spruce Plantation	Conifer Plantation	36	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Conifer Forest
37	Black Spruce Plantation	Conifer Plantation	38	Open Water	Aquatic
39	Open Water Marsh: Organic	Marsh	40	Spruce-Fir Conifer	Conifer Forest
41	Pine-Black Spruce Conifer	Conifer Forest	42	Spruce-Fir Conifer	Conifer Forest
43	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest	44	Spruce-Fir Conifer	Conifer Forest
45	Mineral Thicket Swamp	Thicket Swamp	46	Aspen-Birch Hardwood	Deciduous Forest
47	Moist, Coarse: Shrub	Thicket	48	Pine-Black Spruce Conifer	Conifer Forest
49	Mineral Thicket Swamp	Thicket Swamp	50	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
51	Moist, Coarse: Shrub	Thicket	52	Moist, Coarse: Shrub	Thicket
53	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	54	Intolerant Hardwood Swamp	Deciduous Swamp
55	Moist, Coarse: Shrub	Thicket	56	Moist, Coarse: Shrub	Thicket
57	Moist, Coarse: Shrub	Thicket	58	Mineral Thicket Swamp	Thicket Swamp
59	Moist, Coarse: Shrub	Thicket	60	Active Bluff	Bluff
61	Moist, Coarse: Aspen-Birch Hardwood; Moist, Coarse: Spruce-Fir Conifer	Mixed Forest	62	Active Bluff	Bluff
63	Active Bluff	Bluff	64	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
65	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	66	Active Bluff	Bluff
67	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	68	Moist, Coarse: Shrub	Thicket
69	Active Bluff	Bluff	70	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
71	Active Bluff	Bluff	72	Active Bluff	Bluff
73	Moist, Coarse: Shrub	Thicket	74	Moist, Coarse: Shrub	Thicket
75	Mineral Thicket Swamp	Thicket Swamp	76	Moist, Coarse: Shrub	Thicket
77	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	78	Moist, Coarse: Shrub	Thicket
79	Moist, Coarse: Shrub	Thicket	80	Moist, Coarse: Shrub	Thicket
81	Active Bluff	Bluff	82	Mineral Thicket Swamp	Thicket Swamp

Table 2.6 Map Units and Corresponding Vegetation Types (Cont'd)

Map Unit	Ecosite	Vegetation Class	Map Unit	Ecosite	Vegetation Class
83	Active Bluff	Bluff	84	Mineral Thicket Swamp	Thicket Swamp
85	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Conifer Forest	86	Moist, Coarse: Spruce-Fir Conifer	Conifer Forest
87	Pine-Black Spruce Conifer	Conifer Forest	88	Mineral Thicket Swamp	Thicket Swamp
89	Mineral Thicket Swamp; Mineral Shallow Marsh	Thicket Swamp and Marsh	90	Bluff	Active Bluff
91	Active Bluff	Bluff	92	Moist, Coarse: Shrub	Thicket
93	Active Bluff	Bluff	94	Spruce-Fir Conifer	Conifer Forest
95	Spruce-Fir Conifer	Conifer Forest	96	Spruce-Fir Conifer	Conifer Forest
97	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest	98	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
99	Dry-Fresh, Coarse: Shrub	Thicket	100	Spruce-Fir Conifer	Conifer Forest
101	Spruce-Fir Conifer	Conifer Forest	102	Spruce-Fir Conifer	Conifer Forest
103	Spruce-Fir Conifer	Conifer Forest	104	Moist, Coarse: Aspen-Birch Hardwood	Deciduous Forest
105	Aspen-Birch Hardwood	Deciduous Forest	106	Organic Thicket Swamp	Thicket Swamp
107	Organic Thicket Swamp	Thicket Swamp	108	Organic Thicket Swamp	Thicket Swamp
109	Organic Thicket Swamp	Thicket Swamp	110	Organic Thicket Swamp	Thicket Swamp
111	Organic Shallow Marsh	Marsh	112	Organic Thicket Swamp	Thicket
113	Organic Meadow Marsh	Marsh	114	Organic Meadow Marsh	Marsh
115	Sparse Treed Fen	Fen	116	Organic Meadow Marsh	Marsh
117	Active Bluff	Bluff	118	Active Cliff	Cliff
119	Organic Poor Conifer Swamp	Conifer Plantation	120	Mineral Thicket Swamp	Thicket Swamp
121	Fresh, Clayey: Spruce-Fir Conifer	Conifer Forest	122	Dry-Fresh, Course: Jack Pine-Black Spurce Dominated	Conifer Forest
123	Moist-Coarse Spruce-Fir Conifer	Conifer Forest	124	Moist-Coarse Spruce-Fir Conifer	Conifer Forest
125	Dry-Fresh, Coarse Spruce-Fir Conifer	Conifer Forest	126	Dry-Fresh, Coarse Spruce-Fir Conifer	Conifer Forest
127	Spruce-Fir Conifer	Conifer Forest	128	Dry-Fresh, Coarse Spruce-Fir Conifer	Conifer Forest
129	Dry-Fresh, Coarse: Jack Pine-Black Spurce Dominated	Conifer Forest	130	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Plantation
131	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Forest	132	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Conifer Forest
133	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Plantation	134	Open Water Marsh: Organic	Marsh

Table 2.6 Map Units and Corresponding Vegetation Types (Cont'd)

Map Unit	Ecosite	Vegetation Class	Map Unit	Ecosite	Vegetation Class
135	Organic Shallow Marsh	Marsh	136	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Plantation
137	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Conifer Plantation	138	New Post Creek	Watercourse

Table 2.7 Ecosites Recorded in Proposed Project Area

Ecosite	Ecosite No.
Active Bluff	2
Active Mineral Shoreline	5
Dry, Sandy Spruce-Fir Conifer	37
Dry to Fresh, Coarse: Shrub	47
Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	49
Dry to Fresh, Coarse: Spruce-Fir Conifer	52
Dry to Fresh, Coarse: Aspen-Birch Hardwood	55
Moist, Coarse: Shrub	63
Moist, Coarse: Pine-Black Spruce Conifer	65
Moist, Coarse: Spruce-Fir Conifer	67
Moist, Coarse: Aspen – Birch Hardwood	70
Fresh, Clayey: Jack Pine-Black Spruce Dominated	82
Fresh, Clayey: Spruce-Fir Conifer	85
Fresh, Clayey: Aspen-Birch Hardwood	88
Fresh, Silty to Fine Loamy: Shrub	96
Fresh, Silty to Fine Loamy: Pine-Black Spruce Dominated	99
Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	101
Fresh, Silty to Fine Loamy: Aspen – Birch Hardwood	104
Moist, Fine: Pine – Black Spruce Conifer	114
Sparse Treed Bog	126
Organic Poor Conifer Swamp	127
Organic Intermediate Conifer Swamp	128
Organic Rich Conifer Swamp	129
Intolerant Hardwood Swamp	130
Mineral Thicket Swamp	134
Organic Thicket Swamp	135
Sparse Treed Fen	136
Poor Fen	139
Mineral Meadow Marsh	142

Table 2.7 Ecosites Recorded in Proposed Project Area (Cont'd)

Ecosite	Ecosite No.
Organic Meadow Marsh	144
Organic Shallow Marsh	149
Open Water Marsh: Organic	152
Active Cliff	173
Mineral Poor Conifer Swamp	222

The following ecosite summaries of the 34 distinct ecosites recorded in the proposed Project site-specific study area are adapted from "Draft Boreal Ecosite Factsheets" (Banton *et al*., 2009) and "Great Lakes – St. Lawrence Ecosite Fact Sheets" (Wester *et al*., 2012) and supplemented with information gathered from vegetation plot data collected from 2010 through 2012.

Active Bluff (Ecosite No. 002)

This ecosite consists of exposed vertical mineral material communities often associated with rivers and lakeshores. These communities support limited vegetation due to activity such as riverbank slumping, erosion, or slope failure. Bluffs occur frequently along New Post Creek, often reaching heights of up to 10 m. They are generally sparsely vegetated and littered with fallen trees having toppled due to undercutting and slumping along the bluff rims.

Active Mineral Shoreline (005)

This ecosite, located along New Post Creek, consists of exposed mineral material communities that support limited vascular vegetation, ferns and lichen due to shoreline processes such as waves, flooding, ice scour and high winds. The substrate texture typically consists of well-drained sands. Vegetation cover is limited (<25%) and varies seasonally. Conditions favour annual plants and perennials that develop from rhizomes and detached or floatable parts.

Dry, Sandy Spruce-Fir Conifer (037)

Within the proposed Project site-specific study area, this conifer forest has a sparse to open canopy consisting of Black Spruce and Balsam Fir, with sparse amounts of Jack Pine (*Pinus banksiana*). Understory tree species include Balsam Fir and Black Spruce. Shrubs include Red-osier Dogwood (*Cornus sericea* ssp. *sericea*), Speckled Alder (*Alnus incana* ssp. *rugosa*), and Common Labrador Tea (*Ledum groenlandicum*). Ground covers are sparse but include Bunchberry (*Cornus canadensis*), Large-leaf Wood-aster (*Eurybia macrophylla*) and Wild Strawberry (*Fragaria virginiana).* Ground surface mostly consists of feather moss and conifer litter. Soils are sandy, deep, and moderately fresh.

This community is widespread but uncommon throughout the boreal range.

Dry to Fresh, Coarse: Shrub (047)

This ecosite is dominated by willows (*Salix* spp.) and/or Speckled Alder, often in association with Wild Red Raspberry (*Rubus idaeus* ssp. *strigosus*), Red-osier Dogwood and currents (*Ribes* spp.). Scattered, open-grown trees, such as Trembling Aspen, may be present, but not exceeding 10% cover. Shrub cover is generally high, typically ranging from 50 to 90%. Typical ground cover includes Canada Anemone (*Anemone canadensis*), Naked Bishop's-cap (*Mitella nuda*), Canada Blue-joint (*Calamagrostis canadensis*) and Wild Strawberry. Substrates are sandy to coarse loamy, moderately deep to deep and fresh.

This ecosite occurs frequently along the shoreline of New Post Creek.

Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated (049)

The canopy of this ecosite consists of Jack Pine and/or Black Spruce, but is typically dominated by Black Spruce in the proposed Project local study area and throughout Ecoregion 3E. Trees are generally over 10 m tall and the canopy cover ranges from sparse to closed. Understory tree species consist of Black Spruce, Balsam Fir and White Birch. Shrub and herb cover and diversity are typically low. Common understory vegetation includes Velvetleaf Blueberry (*Vaccinium myrtilloides*), Late Lowbush Blueberry (*V. angustifolium*), Trailing Arbutus (*Epigaea repens*), Creeping Snowberry (*Gaultheria hispidula*), Bunchberry and Wild-lily-of-the-valley (*Maianthemum canadense*). The ground surface is covered with moss, conifer litter, woody debris, broadleaf litter and lichens. Substrates are sandy to coarse loamy, over 15 cm deep and dry to fresh.

This ecosite is widespread and floristically consistent across the boreal range.

Dry-Fresh, Coarse: Spruce-Fir Conifer (052)

Conifer canopy ranges from sparse to closed and is mostly comprised of Balsam Fir and White Spruce. White Birch, Trembling Aspen and Black Spruce are common associates. Understory tree species often include Balsam Fir, Trembling Aspen, White Birch and White Spruce. Shrub and herb diversity is typically low. Common understory vegetation includes Twinflower (*Linnaea borealis*), Bush-honeysuckle (*Diervilla lonicera*), Mountain Maple (*Acer spicatum*), Bunchberry, Wild Sarsaparilla (*Aralia nudicaulis*), Blue Bead-lily (*Clintonia borealis*) and Naked Bishop's-cap. Ground surface is covered with mosses, broadleaf litter, woody debris and conifer litter. Substrates are sandy to coarse loamy, over 15 cm deep and fresh.

This ecosite is widespread across the boreal range and often associated with morainal or glaciofluvial parent materials over bedrock.

Dry-Fresh, Coarse: Aspen-Birch Hardwood (055)

The canopy consists of Trembling Aspen and/or White Birch, often mixed with Balsam Fir, Black Spruce and White Spruce. Trembling Aspen tends to dominate. Understory tree species

include Balsam Fir, Trembling Aspen, White Birch and Black Spruce. This ecosite is typically shrub rich and herb poor. Common understory vegetation includes Bush-honeysuckle, Beaked Hazel (*Corylus cornuta*), Mountain Maple, Catherinettes (Dwarf) Raspberry (*Rubus pubescens*), Wild-lily-of-the-valley, Wild Sarsaparilla, Blue Bead-lily and Large-leaf Wood-aster. The ground surface is comprised of broadleaf litter with moss, woody debris and conifer litter. Substrates are sandy to coarse loamy, deep and dry to fresh.

This ecosite is widespread across the boreal range and often associated with morainal or glaciofluvial parent materials over bedrock.

Moist, Coarse: Shrub (063)

This ecosite is dominated by various willows and/or Speckled Alder, often in association with Woodland Raspberry, Red-osier Dogwood and currents. Shrub cover is generally high, typically ranging from 50 to 90%. Typical ground cover within these communities along New Post Creek includes Smooth Goldenrod (*Solidago gigantea*), Canada Anemone, Naked Bishop's-cap, Canada Blue-joint and Woodland Strawberry. Substrates are sandy to coarse loamy, deep and fresh.

This ecosite often occurs on fluvial deposits in floodplain environments and occurs frequently along New Post Creek.

Moist, Coarse: Pine-Black Spruce Conifer (065)

The canopy consists of Black Spruce and/or Jack Pine, but typically dominated by Black Spruce in the proposed Project local study area and throughout Ecodistrict 3E. Understory tree species include Black Spruce and Balsam Fir. Shrub and herb diversity is low to moderate. Shrubs include Creeping Snowberry, Common Labrador Tea, Late Lowbush Blueberry and Speckled Alder. Herbs include Bunchberry, Wild-lily-of-the-valley, Woodland Horsetail (*Equisetum sylvaticum*), Large-leaf Wood-aster and Naked Bishop's-cap. The ground surface is mostly moss with conifer litter, woody debris and broadleaf litter. Substrate is sandy to coarse loamy, deep and moist.

This ecosite is widespread across the boreal range and often associated morainal or glaciofluvial parent materials over bedrock.

Moist, Coarse: Spruce-Fir Conifer (067)

The canopy consists of Balsam Fir, Black Spruce and White Spruce, often mixed with Trembling Aspen, White Birch, Jack Pine and Balsam Poplar. Understory tree species typically include Balsam Fir, White Birch and Black Spruce. Shrub and herb diversity is moderately poor. Shrubs include Catherinettes (Dwarf) Raspberry, Velvetleaf Blueberry, Wild Red Raspberry and Speckled Alder. Herbs include Large-leaf Wood-aster, Blue Bead-lily, Bunchberry, Naked

Bishop's-cap and Wild Sarsaparilla. The ground surface is covered in moss, conifer litter, broadleaf litter and woody debris. Substrates are sandy to coarse loamy, deep and moist.

This ecosite is widespread across the boreal range. It occurs in the New Post Creek floodplain, but is often associated with morainal or glaciofluvial parent materials over bedrock.

Moist, Coarse: Aspen – Birch Hardwood (070)

The canopy consists Trembling Aspen and/or White Birch, mixed with Balsam Fir, White Spruce, Black Spruce and Jack Pine. Trembling Aspen is typically dominant, but occasionally White Birch or Balsam Poplar dominate. Understory tree species include Balsam Fir, Trembling Aspen, White Birch and Black Spruce. Shrub and herb diversity is moderately rich. Typical shrubs include Speckled Alder, willows, Red-osier Dogwood and Wild Red Raspberry. Dominant ground cover includes Smooth Goldenrod, Canada Anemone, Field Horsetail (*Equisetum arvense*) and Spotted Joe-pye Weed (*Eupatorium maculatum* var. *maculatum*). The ground surface consists mostly of broadleaf litter with woody debris, moss and conifer litter. Substrates are sandy to coarse loamy, deep and moist.

This ecosite occurs in the New Post Creek floodplain. It is widespread across the boreal range and often associated with morainal or glaciofluvial parent materials over bedrock.

Fresh, Clayey: Jack Pine-Black Spruce Dominated (082)

The canopy consists mostly of Black Spruce and/or Jack Pine. Within the proposed Project local study area and throughout Ecoregion 3E, this ecosite is most often dominated by Black Spruce with lesser amounts of Jack Pine (or none at all). However, there are several Jack Pine plantations within the inundation zone area that fit this classification (ELC units 133, 136 and 138). Canopy cover ranges from open to closed. Understory tree species consist of Black Spruce and Balsam Fir. Typically, shrub and herb diversity is low. Shrubs include Velvetleaf Blueberry, Twinflower, Common Labrador Tea and Prickly Rose (*Rosa acicularis*). Herbs include Bunchberry, Blue Bead-lily, Wild Sarsaparilla and Wild-lily-of-the-valley. The ground surface is mostly moss with woody debris, conifer litter and broadleaf litter. Substrates are clayey, deep and fresh.

This ecosite is widespread across the boreal range. It is associated with lacustrine, glaciolacustrine, fluvial, or glaciofluvial deposits, as well as fine-textured morainal deposits.

Fresh, Clayey: Spruce-Fir Conifer (085)

Conifer canopy consists mostly of Balsam Fir and White Spruce and often mixed with Trembling Aspen, Black Spruce and White Birch. Understory tree species consist of Balsam Fir, Trembling Aspen, White Spruce and White Birch. This ecosite is typically low in shrub and herb diversity. Shrubs include Catherinettes (Dwarf) Raspberry, Mountain Maple, Twinflower and Bush-honeysuckle. Herbs include Blue Bead-lily, Wild Sarsaparilla, Wild-lily-of-the-valley,

Bunchberry and Naked Bishop's-cap. The ground surface consists of broadleaf litter with moss, woody debris and conifer litter. Substrates are clayey, deep and fresh

This ecosite is widespread across the boreal range and particularly common in 3E. It is usually associated with lacustrine, glaciolacustrine, fluvial, or glaciofluvial landforms, as well as fine-textured morainal deposits

Fresh, Clayey: Aspen – Birch Hardwood (088)

Hardwood canopy consists of Trembling Aspen and/or birch species and often mixed with Balsam Fir, Black Spruce, White Birch and White Spruce. Trembling Aspen is typically more abundant than White Birch. Understory tree species consists of Balsam Fir, Trembling Aspen, White Birch, White Spruce and Black Spruce. Shrub and herb diversity is usually high. Common shrubs include Bush-honeysuckle, Speckled Alder, Prickly Rose and Catherinettes (Dwarf) Raspberry. Herbs include Wild Sarsaparilla, Blue Bead-lily, Large-leaf Wood-aster and Bunchberry. The ground surface is typically covered in broadleaf litter with woody debris, moss and conifer litter. Substrates are clayey, moderately deep to deep and fresh.

This ecosite is widespread across the boreal range and especially common in Ecoregion 3E. It is typically associated with lacustrine, glaciolacustrine, fluvial, or glaciofluvial landforms, as well as fine textured morainal deposits.

Fresh, Silty to Fine Loamy: Shrub (096)

This ecosite occurs just northwest of the proposed GS footprint on the west side of New Post Creek. It is dominated by Speckled Alder, in association with Wild Red Raspberry (*Rubus idaeus*). Shrub cover is high, at approximately 80% cover. Ground flora diversity is low. Cover is sparse, but includes Spinulose Shield Fern (*Dryopteris carthusiana*), Wild-lily-of-the-valley, Northern Starflower (*Trientalis borealis*) and mosses. Soils are silty loam, deep and fresh.

Fresh, Silty to Fine Loamy: Pine-Black Spruce Dominated (099)

The canopy consists predominantly of Black Spruce mixed with Balsam Fir and sparse amounts of Jack Pine. Understory trees species include Balsam Fir, Black Spruce, White Birch and Trembling Aspen. Common understory vegetation includes Twinflower, Velvetleaf Blueberry, Bush-honeysuckle, Bunchberry, Wild-lily-of-the-valley, Blue Bead-lily and feather moss. The ground surface is comprised mostly of moss with broadleaf litter, woody debris and conifer litter. Substrates are silty to fine loamy, deep and dry to fresh.

Fresh, Silty to Fine Loamy: Spruce-Fir Conifer (101)

The canopy consists mostly of Balsam Fir and White Spruce, often mixed with Black Spruce, Trembling Aspen, White Birch and Jack Pine. Understory tree species consist of Balsam Fir, White Birch, Trembling Aspen, White Spruce and Black Spruce. This ecosite is shrub and herb

rich. Common shrubs include Catherinettes (Dwarf) Raspberry, Northern Mountain-ash (*Sorbus decora*), Bush-honeysuckle and Twinflower. Herbs include Wild-lily-of-the-valley, Blue Bead-lily, Bunchberry, Naked Bishop's-cap and Northern Starflower. The ground surface consists of broadleaf litter, moss, conifer litter and woody debris. Substrates are silty to fine loamy, deep and fresh.

This ecosite is widespread across the boreal range and particularly common in Ecoregion 3E. It is generally associated with fine-textured morainal, lacustrine, glaciolacustrine, fluvial, or glaciofluvial deposits.

Fresh, Silty to Fine Loamy: Aspen – Birch Hardwood (104)

The hardwood canopy consists mostly of Trembling Aspen and/or White Birch. Within the study area, Trembling Aspen tends to dominate, but White Birch or Balsam Poplar occasionally dominates, often mixed with Balsam Fir, White Spruce and Black Spruce. Understory tree species consist of Balsam Fir, Trembling Aspen, Black Spruce, White Birch and White Spruce. This ecosite is shrub and herb rich. Typical shrubs include Speckled Alder, willows, Red-osier Dogwood and Wild Red Raspberry. Dominant herbaceous species in upland environments include Large-leaf Wood-aster, Wild Sarsaparilla, Blue Bead-lily and Naked Bishop's-cap. Within the New Post Creek floodplain, ground cover consists of Smooth Goldenrod, Canada Anemone, Field Horsetail and Large-leaf Wood-aster. Ground surface is mostly broadleaf litter with woody debris, moss and conifer litter. Soils are silty to fine loamy, often deep and fresh.

This ecosite is widespread across the boreal range.

Moist, Fine: Black Spruce – Pine Conifer (114)

Conifer canopy is sparse to closed and consists of Black Spruce and/or Jack Pine (>50% cover of conifer species), but is dominated by Black Spruce in the proposed Project local study area and throughout Ecoregion 3E. Trembling Aspen, Balsam Fir and White Birch are common associates. Common understory tree species include Balsam Fir, Black Spruce and Trembling Aspen. Shrub and herb diversity is moderate to low. Shrubs include Velvetleaf Blueberry, Creeping Snowberry, Common Labrador Tea and Sheep-laurel (*Kalmia angustifolia*). Herbaceous species include Bunchberry, Blue Bead-lily, Wild-lily-of-the-valley and Goldthread (*Coptis trifolium*). The ground surface consists mostly of mosses with conifer litter, woody debris and broadleaf litter. Substrates are silty to fine loamy to clayey, over 15 cm deep and moist.

This ecosite is widespread across the boreal range and often associated with lacustrine, glaciolacustrine, fluvial, and glaciofluvial landforms, as well as fine-textured morainal deposits.

Sparse Treed Bog (126)

Conifer canopy is dominated by Black Spruce. Tall tree cover is sparse (<25%) and low tree cover is open (25-60%). Ericaceous shrubs are abundant, including Common Labrador Tea, Leatherleaf (*Chamaedaphne calyculata*), Small Cranberry (*Vaccinium oxycoccos*), blueberries (*Vaccinium* spp.*)* and Pale Laurel (*Kalmia polifolia*). Herbaceous cover and diversity are low. The ground surface is mostly moss with conifer litter. Substrates are organic, deep and hydric. Bogs are hydrologically isolated.

This ecosite is widespread and floristically consistent across the boreal range.

Organic Poor Conifer Swamp (127)

The canopy is dominated by Black Spruce with few other species. Canopy cover is typically open (25 to 60%), but rarely closed (>60%). Typically, ericaceous shrubs are abundant and herbaceous species diversity and cover are low. Ground surface is mostly moss. Common understory vegetation includes Creeping Snowberry, Common Labrador Tea, Velvetleaf Blueberry, Three-leaf Solomon's-seal (*Maianthemum trifolium*), Threeseeded Sedge (*Carex trisperma*), Woodland Horsetail, Sphagnum moss (*Sphagnum* spp.) and feather moss (Hypnaceae). Swamp indicator species, such as Speckled Alder, Bunchberry, Stiff (Bristly) Clubmoss (*Lycopodium annotinum*), Canada Blue-joint, Knight's Plume (*Ptilidium crista-castrensis*), Common Green Peat Moss (*Sphagnum girgensohnii*), Stair-step Moss (*Hylocomium splendens*) and Wulf's Peat Moss (*Sphagnum wulfianum*), are often present. Substrates are organic, moderately deep to deep and hydric.

This ecosite is widespread and floristically consistent across the boreal range. It is often associated with depressions in bedrock controlled topography to relatively flat lacustrine or glaciolacustrine plains.

Organic Intermediate Conifer Swamp (128)

Canopy consists of Black Spruce with Tamarack and may be mixed with Balsam Fir. Canopy closure is variable, ranging from 25% to over 60% cover. Understory tree species often include Black Spruce and Balsam Fir. Shrub, herb and moss diversity is moderate. Common understory vegetation includes Common Labrador Tea, Creeping Snowberry, Velvetleaf Blueberry, Bunchberry, Three-leaf Solomon's-seal, Goldthread, Sphagnum moss and feather moss. Speckled Alder is abundant. Rich and intermediate swamp indicator species are present, such as Twinflower, Catherinettes (Dwarf) Raspberry, Blue Bead-lily, Wild-lily-of-the-valley, Naked Bishop's-cap and Wulf's Peat Moss. The ground surface is mostly moss with woody debris and conifer litter. Substrates are organic, moderately deep to deep and hydric.

This ecosite is widespread and floristically consistent across the boreal range. It is often associated with depressions in bedrock controlled topography to relatively flat lacustrine or glaciolacustrine plains.

Organic Rich Conifer Swamp (129)

This ecosite has a conifer canopy consisting of Eastern White Cedar often mixed with Black Spruce, Tamarack and Balsam Fir. Canopy closure is variable, ranging from 25% to over 60% cover. Canopy height is also variable. Understory tree species commonly include Balsam Fir, Black Spruce and Eastern White Cedar. Shrubs are typically sparse. Herbs and mosses are moderately rich. Common understory vegetation includes Creeping Snowberry, Common Labrador Tea, Velvetleaf Blueberry, Three-leaf Solomon's-seal, Threeseeded Sedge, Woodland Horsetail, Sphagnum moss and feather moss. Swamp indicator species such as Speckled Alder, Bunchberry, Canada Blue-Joint, Knight's Plume, Common Green Peat Moss, Stair-step Moss and Wulf's Peat Moss may also be present. The ground surface consists of mostly mosses with conifer litter, woody debris, broadleaf litter and water. Substrates are organic, moderately deep to deep and hydric.

This ecosite is widespread and floristically consistent across the boreal range. It is typically associated with depressions in bedrock controlled topography to relatively flat lacustrine or glaciolacustrine plains.

Intolerant Hardwood Swamp (130)

Hardwood canopy consists of Balsam Poplar and/or Trembling Aspen often mixed with Balsam Fir, White Birch, Black Spruce and White Spruce. Canopy cover is variable, typically ranging from 50 to 80%. Understory tree species include Balsam Fir, Trembling Aspen, White Spruce, Black Spruce and White Birch. This ecosite is typically shrub and herb rich. Shrubs include Speckled Alder, willows, Red-osier Dogwood and Wild Red Raspberry. Dominant herbaceous species include Smooth Goldenrod, Canada Anemone, Field Horsetail, Large-leaf Wood-aster and sedges (*Carex* spp.). The ground surface is mostly broadleaf litter with moss, woody debris, conifer litter and humus. Soils are mineral or peaty phase mineral, moderately deep to deep and hydric.

This ecosite occurs within New Post Creek floodplain. It is widespread and floristically consistent across the boreal range.

Mineral Thicket Swamp (134)/Organic Thicket Swamp (135)

These ecosites are dominated by various willows and/or Speckled Alder, often with lesser associates of Wild Red Raspberry, currents/gooseberries and Red-osier Dogwood. Shrub cover is generally high, typically ranging from 50 to 90%. Ground surface is mostly broadleaf litter, dead wood and mineral material. Substrates are mineral, peaty-phase mineral or organic, moderately deep to deep and hydric. Within the proposed Project local study area, these ecosites often occur on streambanks and floodplains.

Sparse Treed Fen (136)

Canopy cover is sparse (10 to 25% cover) and consists of conifer species, predominantly Tamarack and/or Black Spruce. Tree height is variable, but typically less than 10 m. Understory tree species consist of Black Spruce and Tamarack. Shrub, herb and moss diversity is moderate, with fen indicator species present such as Swamp Birch (*Betula pumila*), Alderleaf Buckthorn (*Rhamnus alnifolia*), Marsh Marigold (*Caltha palustris*), Canada Blue-joint, violets (*Viola* spp.), Marsh Cinquefoil (*Comarum palustre*) and Bog Buckbean (*Menyanthes trifoliata*). Ground surface is mostly moss with standing water and conifer litter. Fens receive water and nutrients through continuous, slow movement of groundwater. Water chemistry is neutral to alkaline. Substrates are organic, deep and hydric, with the water level commonly at or above the substrate surface.

This ecosite is uncommon in the study area, but widespread and floristically consistent across the boreal range.

Poor Fen (139)

Tree and shrub cover is less than 10%. Herb diversity is low and sedges tend to dominate. Fen indicator species, such as Bog Buckbean and Marsh Cinquefoil, are present. Fens receive water and nutrients through continuous slow movement of groundwater. Water chemistry of poor fens tends to be slightly acidic to neutral and nutrient poor. Soils are organic, deep and hydric, with the water level frequently at or above the substrate surface.

Mineral Meadow Marsh (142)

Meadow marshes are dominated by herbaceous vegetation. Tree cover less is than 10% and shrub cover is less than 25%. Herbaceous species diversity is low to moderate, with sedges dominating in sampled plots. Soils are mineral, deep and hydric. Water level is normally below the substrate surface.

Organic Meadow Marsh (144)

Herbaceous vegetation is the dominant vegetation form. Tree cover less is than 10% and shrub cover is less than 25%. Herbaceous species diversity is low to moderate, with sedges tending to dominate. Soils are organic, deep and hydric. Water level is normally below the substrate surface.

Organic Shallow Marsh (149)

Tree cover less is than 10% and shrub cover is less than 25%. Herbaceous species diversity is low to moderate, but sedges tend to dominate. Soils are organic, deep and hydric. Water level is normally at or above substrate surface.

Open Water Marsh: Organic (152)

This community is typically composed of submergent aquatic vegetation, although emergent and floating-leaved species may also be present. The water level is normally above the substrate surface, but less than 2 m deep. Substrates are typically organic and deep. Floating-leaved species may include Yellow Cowlily (*Nuphar lutea* ssp. *variegata*) and pondweeds (*Potamogeton* spp.). Submergent species typically include pondweeds and bladderwort (*Utricularia* spp.).

Active Cliff (173)

This ecosite, located at the New Post Creek waterfalls, consists of exposed vertical bedrock communities supporting limited (<2% cover) vascular vegetation, ferns and lichens due to natural energy. The substrate is rock.

Mineral Poor Conifer Swamp (222)

The canopy of this ecosite is dominated by Black Spruce with lesser amounts of other species. This ecosite is often pure conifer. Understory tree species include Black Spruce and Balsam Fir. Ericaceous shrubs are abundant and herbaceous cover and diversity are typically low. Common understory vegetation includes Velvetleaf Blueberry, Common Labrador Tea, Creeping Snowberry, Bunchberry, feather moss and Sphagnum moss. Swamp indicator species may be present, such as Woodland Horsetail, Goldthread, Blue Bead-lily, Northern Starflower, Knight's Plume and Common Green Peat Moss. The ground surface consists mostly of feathermoss and peat moss with woody debris, conifer litter and broadleaf litter. Substrates are mineral or peaty phase mineral, moderately deep to deep and hydric.

This ecosite is widespread and floristically consistent across the boreal range and often associated with depressions in bedrock controlled topography to relatively flat lacustrine or glaciolacustrine plains.

2.5.4 Summary of Vegetation within Proposed Project Site-Specific Study Area

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

- proposed transmission line corridor;
- proposed access road;
- proposed construction zone and laydown area;
- proposed inundation zone;
- riparian zone downstream of the proposed intake weir location; and
- spray zone at New Post Creek waterfalls.

It should be noted that there are minor discrepancies in the areas delineated as part of the vegetation communities assessment and the forestry resources assessment, as listed below:

Proposed Project Component	Vegetation Community (ha)	Forestry Resources (ha)
Transmission ROW	33.2	34.0
Spoil Piles	2.3	2.3
Camp/Laydown	8.2	8.2
Access Roads	24.4	24.4
Earthworks	10.6	10.8
Headpond	131.4	131.4

Although each assessment was based on the same shape files provided by KGS Group, the minor discrepancies were the result of differences in interpretation and measurement. As indicated in Section 1.3.1.1, the final total area to be cleared will be refined during detailed design of the proposed Project.

2.5.4.1 Proposed Transmission Corridor

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

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

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

2.5.4.2 Proposed Access Road

Several roads will be constructed to provide access to the proposed GS site. The main access road will connect the proposed GS site with Otter Rapids Road to the south, which will involve upgrading an existing logging road that leads to the site. Two additional new roads will be constructed at the proposed Project site to provide access to the powerhouse and intake structures.

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

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

2.5.4.3 Proposed Inundation Zone

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

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

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

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

The large area of land within the inundation zone south of the proposed intake weir location has been extensively modified by past logging operations and now consists largely of mid-aged secondary growth conifer and hardwood forests. A large portion of Map Unit 105 is situated in

the inundation zone. This community is a young to mid-aged hardwood forest dominated by Trembling Aspen intermixed with Black Spruce, White Spruce and Balsam Fir. Alder thicket is interspersed throughout this area.

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

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

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

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

2.5.4.4 Downstream Riparian Zone

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

2.5.4.5 Proposed Work Area and Laydown Zone

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

A large contiguous block of mature forest dominated by Black Spruce and Balsam Fir, and interspersed with Jack Pine, occupies the western and northern portions of the proposed work

area (Map Unit 41). A remnant patch of mature Balsam Fir intermixed with White Spruce (Map Unit 43) is situated on a knoll near the centre of the proposed work area.

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

2.5.4.6 New Post Creek Waterfalls Spray Zone

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

2.5.5 Flora

A list was compiled of vascular plants and mosses observed during the vegetation surveys in the proposed Project area. Specimens that could not be identified in the field were collected for subsequent identification. Lichen samples were also collected during the 2012 vegetation surveys and were submitted to Dr. Troy McMullin (Biodiversity Institute of Ontario Herbarium, University of Guelph) for identification.

Table 2.8 lists the 203 plant taxa (196 species) identified within the proposed New Post Creek Project area. The species in Table 2.8 include those recorded in the vegetation plots, as well as observations made while walking through the proposed Project local study area. Of the 196 species recorded, 174 are designated by the MNR Natural Heritage Information Centre (NHIC, 2010) as S5, i.e., secure – common, widespread and abundant in the Province; eight are designated as S4 or S4?, i.e., apparently secure – uncommon but not rare with some cause for long-term concern due to declines or other factors (? indicates rank uncertain); and four are designated as S4S5, i.e., apparently secure to secure. Seven plants were only identified to the genus level (e.g., *Osmorhiza* sp.), and therefore, are not rankable. The remaining ten species are designated SNA, i.e., not applicable – a conservation status rank is not applicable because the species is not a suitable target for conservation activities. The percentage of exotic (SNA) species (5.1%) is well below the general proportion of non-native plants in the Province, estimated around 25% (e.g., Kaiser, 1983).

Table 2.8 Plant Species Observed within the New Post Creek Project Area

Scientific Name	Common Name	Provincial Status[1]	Regional Status[2]	Regional Status[3]
Aceraceae	**Maple Family**			
Acer negundo	Manitoba Maple (Box Elder)	S5	na[4]	na
A. spicatum	Mountain Maple	S5	C	O
Alismataceae	**Water-Plantain Family**			
Sagittaria cuneata	Wapatum Arrowhead	S4?	O	O
Sagittaria latifolia	Broadleaf Arrowhead	S5	A	O
Apiaceae	**Carrot Family**			
Cicuta bulbifera	Bulb-bearing Water-hemlock	S5	F	A
Heracleum maximum	Cow-parsnip	S5	F	A
Osmorhiza sp.	Sweet-cicely species	-[5]		
Sium suave	Hemlock Water-parsnip	S5	F	A
Araliaceae	**Aralia Family**			
Aralia nudicaulis	Wild Sarsaparilla	S5	A	O
Asteraceae	**Aster Family**			
Achillea millefolium var. *occidentalis*	Wooly Yarrow	S5	C	O
Cirsium muticum	Swamp Thistle	S5	F	O
Doellingeria umbellata var. *umbellata*	Flat-top White Aster	S5	na	A
Erigeron hyssopifolius	Daisy (Hyssop-leaved) Fleabane	S5	R	A
E. philadelphicus var. *philadelphicus*	Philadelphia Fleabane	S5	C	O
Eupatorium maculatum var. *maculatum*	Spotted Joe-pye Weed	S5	C	O
Eurybia macrophylla	Large-leaved Aster	S5	A	A
Euthamia graminifolia	Flat-top Fragrant-goldenrod	S5	C	A
Hieracium caespitosum	Field Hawkweed	SNA	na	na
Lactuca sp.	Lettuce species	-	na	na
Leucanthemum vulgare	Oxeye Daisy	SNA	C	A
Packera aurea	Golden Ragwort	S5	F	O
Petasites frigidus	Sweet Coltsfoot	S5	C	O
Solidago hispida var. *hispida*	Hairy Goldenrod	S5	C	A
S. uliginosa	Bog Goldenrod	S5	C	A
Symphyotrichum ciliolatum	Lindley's (Ciliolate) Aster	S5	C	A
S. cordifolium	Heart-leaf Aster	S5	na	na
S. lanceolatum var. *lanceolatum*	Panicled Aster	S5	C	O
Taraxacum officinale	Brown-seed (Common) Dandelion	SNA	A	O
Betulaceae	**Birch Family**			
Alnus incana ssp. *rugosa*	Speckled Alder	S5	A	O
Betula papyrifera	Paper Birch	S5	A	O
B. pumila	Swamp Birch	S5	A	A
Corylus cornuta ssp. *cornuta*	Beaked Hazelnut	S5	C	R
Boraginaceae	**Borage Family**	S5	F	O
Mertensia paniculata	Tall (Northern) Bluebells			
Campanulaceae	**Bellflower Family**			
Campanula aparinoides	Marsh Bellflower	S5	F	O
Lobelia kalmii	Kalm's Lobelia	S5	O	A
Caprifoliaceae	**Honeysuckle Family**			
Diervilla lonicera	Northern Bush-honeysuckle	S5	C	O
Linnaea borealis ssp. *Longiflora*	Twinflower	S5	C	A
Lonicera canadensis	American Fly-honeysuckle	S5	F	na
L. hirsuta	Hairy Honeysuckle	S5	F	O
L. involucrata	Fly (Bracted) Honeysuckle	S5	C	A
L. villosa	Mountain Fly-honeysuckle	S5	F	A
Sambucus sp.	Elderberry species	-	na	na
Viburnum edule	Squashberry (Lowbush Cranberry)	S5	C	A

Table 2.8 Plant Species Observed within the New Post Creek Project Area (Cont'd)

Scientific Name	Common Name	Provincial Status[1]	Regional Status[2]	Regional Status[3]
Cornaceae	**Dogwood Family**			
Cornus canadensis	Bunchberry	S5	A	A
C. sericea ssp. *sericea*	Red-osier Dogwood	S5	C	A
Cupressaceae	**Cedar Family**			
Juniperus communis	Ground Juniper	S5	na	A
Thuja occidentalis	Eastern White Cedar	S5	F	O
Cyperaceae	**Sedge Family**			
Carex arctata	Black (Bear) Sedge	S5	F	R
C. aurea	Golden-fruited Sedge	S5	O	A
C. bebbii	Bebb's Sedge	S5	C	O
C. deweyana	Short-scale Sedge	S5	F	na
C. disperma	Softleaf Sedge	S5	C	A
C. echinata ssp. *echinata*	Little Prickly Sedge	S5	na	na
*C.*cf. *exilis*	Coast Sedge	S5	na	O
C. flava	Yellow Sedge	S5	C	O
C. houghtoniana	Houghton's Sedge	S5	C	O
C. interior	Inland Sedge	S5	na	A
C. lacustris	Lake-bank Sedge	S5	na	na
C. lasiocarpa	Slender Sedge	S5	C	A
C. leptalea ssp. *leptalea*	Bristly-stalk Sedge	S5	na	A
C. magellanica ssp.*irrigua*	Boreal Bog (Stunted) Sedge	S5	O	A
C. pedunculata	Longstalk (Peduncled) Sedge	S5	na	R
C. pensylvanica	Pennsylvania Sedge	S5	na	na
C. retrorsa	Retrorse Sedge	S5	O	O
C. stipata	Stalk-grain Sedge	S5	F	O
C. stricta	Tussock Sedge	S5	C	O
C. sychnocephala	Many-headed Sedge	S4	na	na
C. tenuiflora	Sparse-flowered Sedge	S5	O	A
C. utriculata	Beaked Sedge	S5	na	A
Eleocharis sp.	Spikerush species	-	na	na
Eriophorum viridicarinatum	Green Keeled Cottongrass	S5	O	A
Rhynchospora capillacea	Capillary Beakrush	S4?	na	na
Scirpus cyperinus	Cottongrass Bulrush	S5	F	O
Trichophorum alpinum	Alpine Leafless- (Hudson Bay) Bulrush	S5	na	A
Dennstaedtiaceae	**Fern Family**			
Pteridium aquilinum var. *latiusculum*	Bracken Fern	S5	F	R
Droseraceae	**Sundew Family**			
Drosera intermedi	Spoon- (Spatulate-) leaved Sundew	S5	na	na
D. rotundifolia	Roundleaf Sundew	S5	F	A
Dryopteridaceae	**Wood Fern Family**			
Athyrium filix-femina ssp. *angustum*	Lady Fern	S5	F	O
Cystopteris tenuis	Mackay's Fragile Fern	S5	na	na
Dryopteris carthusiana	Spinulose Wood Fern	S5	na	O
Gymnocarpium dryopteris	Oak Fern	S5	C	O
Matteuccia struthiopteris var. *pensylvanica*	Ostrich Fern	S5	F	O
Equisetaceae	**Horsetail Family**			
Equisetum arvense	Field Horsetail	S5	F	A
E. fluviatile	Water Horsetail	S5	F	A
E. hyemale var. *affine*	Scouring Rush	S5	O	R
E. sylvaticum	Woodland Horsetail	S5	VC	O
E. variegatum ssp. *variegatum*	Variegated Horsetail	S5	R	A
Ericaceae	**Heath Family**			
Andromeda polifolia var. *glaucophylla*	Bog Rosemary	S5	C	A

Table 2.8 Plant Species Observed within the New Post Creek Project Area (Cont'd)

Scientific Name	Common Name	Provincial Status[1]	Regional Status[2]	Regional Status[3]
A. polifolia var.*polifolia*	Bog (Wild) Rosemary	S4	na	A
Chamaedaphne calyculata	Leatherleaf	S5	A	A
Epigaea repens	Trailing Arbutus	S5	F	na
Gaultheria hispidula	Creeping Snowberry	S5	A	A
Kalmia angustifolia	Sheep-laurel	S5	C	O
K. polifolia	Pale Laurel	S5	C	A
Ledum groenlandicum	Common Labrador Tea	S5	A	A
Vaccinium angustifolium	Late Lowbush Blueberry	S5	A	A
V. myrtilloides	Velvetleaf Blueberry	S5	C	A
V. oxycoccos	Small Cranberry	S5	A	A
Fabaceae *Lathyrus palustris*	**Pea Family** Vetchling Peavine (Marsh Vetchling)	S5	na	A
Trifolium repens	White Clover	SNA	C	A
Vicia cracca	Tufted Vetch	SNA	C	A
Gentianaceae *Halenia deflexa* ssp. *deflexa*	**Gentian Family** Spurred Gentian	S5	O	O
Grossulariaceae *Ribes glandulosum*	**Currant Family** Skunk Currant	S5	C	O
R. lacustre	Bristly Black Currant	S5	C	A
R. triste	Swamp Red Currant	S5	O	A
Iridaceae *Iris versicolor*	**Iris Family** Blueflag	S5	C	O
Juncaceae *Juncus nodosus*	**Rush Family** Knotted Rush	S5	O	O
J. dudleyi	Dudley's Rush	S5	C	O
Lamiaceae *Mentha arvensis*	**Mint Family** Corn Mint	S5	C	A
Scutellaria galericulata	Hooded Skullcap	S5	F	O
Liliaceae *Clintonia borealis*	**Lily Family** Blue Bead Lily	S5	C	O
Lilium michiganense	Michigan Lily	S5	na	na
L. philadelphicum	Wood Lily	S5	O	A
Maianthemum canadense	Wild-lily-of-the-valley	S5	C	O
M. racemosum ssp. *racemosum*	False Solomon's Seal	S5	C	na
M. trifolium	Three-leaf Solomon's-seal	S5	C	A
Streptopus lanceolatus var. *roseus*	Rose Twisted-stalk	S5	C	O
Lycopodiaceae *Huperzia lucidula*	**Clubmoss Family** Shining Clubmoss	S5	F	na
Lycopodium annotinum	Stiff Clubmoss	S5	C	O
L. clavatum	Running Pine	S5	C	O
Menyanthaceae *Menyanthes trifoliata*	**Buckbean Family** Bog Buckbean	S5	O	A
Nymphaeaceae *Nuphar lutea* ssp. *variegata*	**Pond-lily Family** Yellow Cowlily	S5	A	O
Onagraceae *Circaea alpina*	**Evening-primrose Family** Small Enchanter's Nightshade	S5	O	O
Epilobium angustifolium	Fireweed	S5	C	A
E. leptophyllum	Linear-leaved Willow-herb	S5	na	O
Ophioglossaceae *Botrychium virginianum*	**Adder's-tongue Family** Rattlesnake Fern	S5	F	O
Orchidaceae *Coeloglossum viride* var. *virescens*	**Orchid Family** Long-bract Green Orchis	S4	na	O
Corallorhiza sp.	Coralroot species	-	na	na
Goodyera repens	Dwarf Rattlesnake-plantain	S5	S	O
Platanthera dilatata	Leafy White (Tall White Bog) Orchid	S5	R	O

Table 2.8 Plant Species Observed within the New Post Creek Project Area (Cont'd)

Scientific Name	Common Name	Provincial Status[1]	Regional Status[2]	Regional Status[3]
P. hyperborea	Tall Northern Green Orchid	S5	F	A
Pinaceae	**Pine Family**			
Abies balsamea	Balsam Fir	S5	A	O
Picea glauca	White Spruce	S5	C	A
Picea mariana	Black Spruce	S5	A	A
Pinus banksiana	Jack Pine	S5	C	O
Plantaginaceae	**Plantain Family**			
Plantago major	Nipple-seed Plantain	SNA	C	A
Poaceae	**Grass Family**			
Agrostis scabra	Rough Bentgrass	S5	O	A
Bromus ciliatus	Fringed Brome	S5	C	A
B. inermis spp. *inermis*	Awnless (Smooth) Brome	SNA	na	O
Calamagrostis canadensis	Canada Blue-joint	S5	C	A
Cinna latifolia	Slender Wood Reedgrass	S5	O	O
Elymus canadensis	Nodding Wild-rye	S4S5	na	O
E. repens	Creeping Wild-rye (Quack Grass)	SNA	C	na
Festuca arundinacea	Kentucky Fescue	SNA	O	R
Glyceria striata var. *striata*	Fowl Manna-grass	S4S5	C	O
Muhlenbergia glomerata	Marsh Muhly	S5	na	A
Oryzopsis aserpifolia	White-grained Mountain-ricegrass	S5	F	O
Poa compressa	Canada Bluegrass	SNA	na	O
P. palustris	Fowl Bluegrass	S5	A	A
Schizachne purpurascens	Purple Oat	S5	F	O
Polygonaceae	**Smartweed Family**			
Polygonum sp.	Smartweed species	-	na	na
P. amphibium	Water Smartweed	S5	C	O
Rumex orbiculatus	Water Dock	S4S5	na	R
Primulaceae	**Primrose Family**			
Trientalis borealis ssp. *borealis*	Northern Starflower	S5	C	O
Pyrolaceae	**Wintergreen Family**			
Moneses uniflora	One-flower Wintergreen	S5	O	A
Orthilia secunda	One-sided Wintergreen	S5	O	A
Pyrola asarifolia	Pink Wintergreen	S5	O	A
Ranunculaceae	**Buttercup Family**			
Actaea rubra	Red Baneberry	S5	O	O
Anemone canadensis	Canada Anemone	S5	O	A
A. quinquefolia var. *quinquefolia*	Wood Anemone	S5	na	O
Caltha palustris	Marsh Marigold	S5	C	A
Coptis trifolia	Goldthread	S5	C	O
Ranunculus hispidus var. *caricetorum*	Swamp Buttercup	S5	O	O
R. longirostris	Eastern White Water-crowfoot	S4S5	na	na
R. pensylvanicus	Bristly Crowfoot	S5	C	O
Thalictrum dasycarpum	Purple Meadowrue	S4?	C	O
Rhamnaceae	**Buckthorn Family**			
Rhamnus alnifolia	Alderleaf Buckthorn	S5	C	A
Roseaceae	**Rose Family**			
Amelanchier sp.	Serviceberry species	-	na	na
Comarum palustre	Marsh Cinquefoil	S5	C	A
Fragaria virginiana	Virginia Strawberry	S5	C	A
Geum macrophyllum	Large-leaved Avens	S5	na	A
G. rivale	Purple Avens	S5	na	O
Prunus pensylvanica	Pin (Fire) Cherry	S5	C	O
Rosa acicularis ssp. *sayi*	Prickly Rose	S5	C	A

Table 2.8 Plant Species Observed within the New Post Creek Project Area (Cont'd)

Scientific Name	Common Name	Provincial Status[1]	Regional Status[2]	Regional Status[3]
Rubus arcticus ssp. *acaulis*	Nagoonberry (Stemless Raspberry)	S5	R	A
R. chamaemorus	Cloudberry	S5	O	A
R. idaeus ssp. *strigosus*	Wild Red Raspberry	S5	na	A
R. pubescens	Catherinettes (Dwarf) Raspberry	S5	A	O
Sorbus americana	American Mountain-ash	S5	F	R
S. decora	Northern Mountain-ash	S5	F	O
Spiraea alba	Narrow-leaved Meadow-sweet	S5	F	O
Rubiaceae	**Bedstraw Family**			
Galium asprellum	Rough Bedstraw	S5	O	O
G. trifidum	Small (Three-lobe) Bedstraw	S5	F	O
G. triflorum	Sweet-scent Bedstraw	S5	C	O
Salicaceae	**Willow Family**			
Populus balsamifera ssp. *balsamifera*	Balsam Poplar	S5	C	A
P. tremuloides	Trembling (Quaking) Aspen	S5	A	A
Salix bebbiana	Bebb's Willow	S5	C	A
S. candida	Hoary Willow	S5	O	A
S. discolor	Pussy Willow	S5	na	R
S. eriocephala	Heart-leaved Willow	S5	na	O
S. pedicellaris	Bog Willow	S5	na	A
S. planifolia	Tea- (Flat-) leaved Willow	S5	C	A
S. pyrifolia	Balsam Willow	S5	na	O
S. serissima	Autumn Willow	S4	O	A
Saxifragaceae	**Saxifrage Family**			
Mitella nuda	Naked Bishop's-cap	S5	C	A
Parnassia palustris	Marsh (Northern) Grass-of-parnassus	S5	na	A
Scrophulariaceae	**Snapdragon Family**			
Chelone glabra	White Turtlehead	S5	na	O
Veronica scutellata	Marsh Speedwell	S5	C	O
Sparganiaceae	**Bur-reed Family**			
Sparganium natans	Small Bur-reed	S5	F	A
Taxaceae	**Yew Family**			
Taxus canadensis	Canadian Yew	S4	O	R
Typhaceae	**Cattail Family**			
Typha latifolia	Broad-leaf Cattail	S5	C	O
Urticaceae	**Nettle Family**			
Urtica dioica ssp. *gracilis*	Slender Stinging Nettle	S5	na	O
Violaceae	**Violet Family**			
Viola renifolia	Kidney-leaf White Violet	S5	C	A

[1] NHIC (2010): S5 = secure; S4S5 = apparently secure to secure; S4? = apparently secure, rank uncertain; SNA = not applicable.
[2] Regional status based on Baldwin (1958): R = Rare; S = Scarce; O = Occasional; C = Common; VC = Very Common; F = Frequent; A = Abundant.
[3] Regional status based on Riley (2003): A = Abundant to Common; O = Occasional to Infrequent; R = Rare.
[4] na = species not listed or no status provided.
[5] Status not available as taxonomy only at genus level.

In addition to vascular plants, seven moss and 27 lichen species were identified in the proposed Project site-specific study area (see Table 2.9). All mosses are ranked S5 (secure) by the NHIC (2010). A number of *Sphagnum* mosses were also encountered, but were not identified to species level. Of the lichens identified, 17 species are ranked S5 (secure), one species is ranked S4 (apparently secure), eight species are ranked S4S5 (apparently secure to secure), and one is ranked SNR (not ranked, conservation status not yet assessed). Four lichen species were not identified to species level and, thus, are not rankable.

Table 2.9 Mosses and Lichens Recorded in the Proposed Project Area

Species	Provincial Status[1]
Mosses	
Dicranum polysetum	S5
Hylocomium splendens	S5
Pleurozium schreberi	S5
Polytrichum commune	S5
P. juniperinum	S5
Ptilium crista-castrensis	S5
Rhytidiadelphus triquetrus	S5
Sphagnum spp.	-[2]
Lichens	
Bryoria sp.	-
B. furcellata	S4S5
Caloplaca cf. *xanthostigmoidea*	S4S5
Cladonia cenotea	S5
C. chlorophaea	S5
C. coniocraea	S5
C. crispate	S5
C. deformis	S5
C. digitata	S4S5
C. gracilis	S5
C. mitis	S5
C. rangiferina	S5
C. sulphurina	S5
Evernia mesomorpha	S5
Hypogymnia physodes	S5
H. tubulosa	S4S5
Imshaugia placorodia	S4
Lobaria pulmonaria	S4S5
Nephroma helveticum	S4S5
Parmelia sulcata	S5
Parmeliopsis ambigua	S5
P. capitata	SNR
P. hyperopta	S5

Table 2.9 Mosses and Lichens Recorded in the Proposed Project Area (Cont'd)

Species	Provincial Status[1]
Lichens	
Peltigera sp.	-
Ramalina dilacerata	S5
Trapeliopsis granulosa	S5
Tuckermanopsis sp.	-
T. americana	S5
Usnea sp.	-
U. cf. *subfloridana*	S4S5
Vulpicida pinastri	S4S5

[1] NHIC (2010): S5 = secure; S4S5 = apparently secure to secure; S4 = apparently secure; SNR = unranked.
[2] Status not available as taxonomy only at the genus level.

2.5.6 Significant Plant Species

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

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

None of the flora species identified during the field surveys are designated as SAR by COSEWIC (2012) or COSSARO (MNR, 2013) (see Table 2.8).

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

A number of terrestrial plant species considered to be significant by the MNR were listed in the Abitibi River WMP (see Table 2.10). None of these species are considered to be Endangered, Threatened or of Special Concern by the COSEWIC (2012) or COSSARO (MNR, 2013). Based on examination of the NHIC (2012) database, none of these species have been recorded within the proposed Project local study area, nor were any documented during site-specific field investigations.

Table 2.10 Significant Terrestrial Plant Species Recorded in the Abitibi River Watershed[1]

Common Name	Scientific Name	Habitat Requirements	Provincial Rank[2]
A moss	*Bryum blindii*	No information available	S2
A moss	*Pohlia andalusica*	Disturbed soils	S1
Chinese Hemlock Parsley	*Conioselinum chinense*	Thickets, open slopes, meadows, sandy shores and wet woods	S2
Horned Sea-blite	*Suaeda calceoliformis*	Inland on alkaline flats and around salt springs	S2
Clinton's Clubrush	*Trichophorum clintonii*	Rocky river ledges, argillaceous soils, clearings of fir forests, and prairie and open woods	S2S3
Slender Bulrush	*Schoenoplectus heterochaetus*	Marshes, shores and pond margins	S3
Saltmarsh Club-rush	*S. maritimus*	Saline marshes and shores, and alkaline marshes inland	S3?
Long-scaled Tussock Sedge	*Carex haydenii*	Thickets, meadows and swamps	S4
Wiegand's Sedge	*C. wiegandii*	Boggy or peat soils	S1
Limesone Oak Fern	*Gymnocarpium robertianum*	Damp to dry calcareous ledges	S2
Northern Twayblade	*Listera borealis*	Dryish humus of coniferous forests and thickets	S1S2
Bog Adder's-mouth	*Malaxis paludosa*	Very local in wet sphagnous bogs	S1
Northern Mudwort	*Limosella aquatic*	Fresh to brackish shores and wet sands	S2
Round-leaved Monkey-flower	*Mimulus glabratus*	Swampy places, shores and shallow water	S1
Palmate-leaved Violet	*Viola palmate*	Rich deciduous woods and shaded calcareous ledges	S2S3

[1] Source: OPG *et al.* (2006).

[2] Source: NHIC (2010); S1 = critically imperiled; S1S2 = critically imperiled to imperiled; S2 = imperiled; S2S3 = imperiled to vulnerable; S3 = vulnerable; S3? = vulnerable, rank uncertain; S4 = apparently secure.

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

In both sources, the majority of the species are listed as Occasional, Common, Frequent or Abundant. Baldwin (1953) and Riley (2003) did not list or assign a status for 41 and 17 species, respectively, recorded in the proposed Project area.

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

Also noteworthy are recent observations of Canada Plum (*Prunus nigra*) by Ontario Parks staff in 2008 (Sheppard and Morris, 2008). These observations represent the first records of this species in Cochrane District, and a possible range extension as the closest known populations are 300 km to the south. The population occurs on the terraces of the Abitibi River in the vicinity the historic HBC trading post of New Post. Sheppard and Morris (2008) postulated that this population is likely introduced, intentionally or accidentally, by European or aboriginal people inhabiting the site.

2.6 WETLANDS AND SIGNIFICANT NATURAL FEATURES

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

As discussed in Section 2.5, wetlands are located throughout the proposed Project local study area, particularly in the transmission line study area, which include conifer swamp, fen, bog, thicket swamp and open marsh.

LAPP, located proximate to the proposed Project property provides waterway and natural environment class representation in the Lake Abitibi Ecodistrict (3E-1). The Little Abitibi River – New Post Creek section of the LAPP is considered waterway class, whereas the upstream lake system is natural environment class. LAPP has a number of significant earth and life science features (Ontario Parks, 2006). The Park is considered to be of moderate to high significance in providing representative samples of Precambrian and Quaternary activities that have occurred in this area of northeastern Ontario. The Pinard Moraine is one of the most prominent northern moraines in the Hudson Bay Lowlands. This feature extends eastward over a broad area from west of the Abitibi River across the New Post Creek area to the east. The esker complex in the Zinger Lake area is significant for study purposes as it preserves a Late Wisconsian esker under the blanket of Cochrane Till. The exposure of interbedded Cochrane Till and lacustrine silt and sand at the north end of Zinger Lake identifies a portion of the Cochrane lobe as having advanced into a proglacial lake. This feature is regionally unique in the Northeast Zone and possibly is the only one of its kind. Numerous faults and fractures are present within the Park affecting drainage and topography in some areas. The most significant fault occurs below the 25 m waterfalls on New Post Creek. This vertical fault includes an 8 m wide canyon which extends for 200 m below the waterfalls. One of the most significant life science feature is a Red Pine (*Pinus resinosa*) stand that is estimated to be 300+ years old and is considered to be one of the most northerly examples remaining in this part of the Province (Riley, 1978). This stand is considered to be provincially significant (Del Monte, 1984).

The Replacement Lands regulated into LAPP increase the size of the Park by approximately 212 ha and support more extensive areas of landform/vegetation associations that are presently under-represented in both LAPP and Ecodistrict 3E-1 (Beacon, 2010). The Replacement Lands support a greater number of ecological functions, have a higher level of diversity and encompass lands that have been considerably less disturbed by human activities. The Replacement Lands are also situated in an area where the surrounding landscape matrix is less disturbed. The contribution of these lands into LAPP will reinforce the large scale linkages to the north. As a consequence, the area is considered to support a higher level of ecological integrity than the deregulated area.

The nearest designated natural area is the Pinard Moraine Conservation Reserve (CR), located west of the Abitibi River approximately 8 km from the proposed GS location and 30 m west of

proposed transmission line interconnection with the existing 115 kV transmission line connecting Otter Rapids GS to Abitibi Canyon GS.

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

2.7 WILDLIFE

Most of the lands surrounding the proposed New Post Creek Project remain in native forest vegetation. There is an abundance of forest and wetland habitat throughout the area that support wildlife habitat. Comprehensive wildlife surveys were not conducted as part of the proposed Project; however, incidental wildlife observations were documented during the vegetation assessments. The majority of wildlife information pertaining to the proposed Project local study area that is presented in the following sections was gathered from background sources and existing species lists for the area.

2.7.1 Mammals

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

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

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

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

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

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

Table 2.11 provides a list of mammals likely present in the proposed New Post Creek Project local study area based on distribution maps (Dobbyn, 1994). The numerous wetlands in the area may provide suitable habitat for a number of aquatic mammals such as Beaver, Northern River Otter and Muskrat. Other furbearers that are relatively abundant throughout the region include Mink, American Marten, Ermine, Fisher, Lynx, Red Fox, Coyote, Northern Gray Wolf and squirrels.

Table 2.11 Mammal Species Likely Present in the Proposed Project Local Study Area[1]

Common Name	Scientific Name	Provincial Status[2]
Shrews	**Soricidae**	
Black-backed Shrew	*Sorex arcticus*	S5
Masked (Common) Shrew	*S. cinereus*	S5
Smoky Shrew	*S. fumeus*	S5
Pygmy Shrew	*S. hoyi*	S4
Water Shrew	*S. palustris*	S5
Northern Short-tailed Shrew	*Blarina brevicauda*	S5
Moles	**Talpiae**	
Star-nosed Mole	*Condylura cristata*	S5
Bats	**Vespertilionidae**	
Little Brown Myotis[3]	*Myotis lucifugus*	S4
Rabbits and Hares	**Leporidae**	
Snowshoe Hare	*Lepus americanus*	S5
Squirrels	**Sciuridae**	
Red Squirrel	*Tamiasciurus hudsonicus*	S5
Northern Flying Squirrel	*Glaucomys sabrinus*	S5
Least Chipmunk	*Tamias minimus*	S5
Eastern Chipmunk	T. striatus	S5
Beavers	**Castoridae**	
Beaver	*Castor canadensis*	S5

Table 2.11 Mammal Species Likely Present in the Proposed Project Local Study Area[1] (Cont'd)

Common Name	Scientific Name	Provincial Status[2]
Mice, Rats and Voles	**Muridae**	
Deer Mouse	*Peromyscus maniculatus*	S5
Gapper's Red-backed Vole	*Clethrionomys gapperi*	S5
Rock Vole	*Microtus chrotorrhinus*	S3S4
Meadow Vole	*M. pennsylvanicus*	S5
House Mouse	*Mus musculus*	SNA
Muskrat	Ondatra zibethicus	S5
Jumping Mice	**Dipodidae**	
Woodland Jumping Mouse	*Napaeozapus insignis*	S5
Meadow Jumping Mouse	*Zapus hudsonius*	S5
Dogs	**Canidae**	
Northern Gray Wolf	*Canis lupus occidentalis*	S4
Coyote	*C. latrans*	S5
Red Fox	*Vulpes vulpes*	S5
Bears	**Ursidae**	
Black Bear	*Ursus americanus*	S5
Weasels	**Mustelidae**	
Northern River Otter	*Lutra canadensis*	S5
Striped Skunk	*Mephitis mephitis*	S5
Mink	*Mustela vison*	S5
Ermine	*M. erminea*	S5
American Marten	*Martes americana*	S5
Fisher	*M. pennanti*	S5
Cats	**Felidae**	
Lynx	*Lynx lynx canadensis*	S5
Deer	**Cervidae**	
Moose	*Alces alces*	S5
White-tailed Deer*	*Odocoileus virginianus borealis*	S5
Woodland Caribou*,[4]	*Rangifer tarandus caribou*	S4

* Likely present in the study area based on Beacon (2010).

[1] Source: Dobbyn (1994).

[2] NHIC (2010): S5 = secure; S4 = apparently secure; S3S4 = vulnerable to apparently secure; SNA = not applicable (non-native).

[3] Designated as Endangered federally by COSEWIC (2012) and provincially by COSSARO (MNR, 2013).

[4] Designated as Threatened federally by COSEWIC (2012) and provincially by COSSARO (MNR, 2013).

Of the 35 native species listed in Table 2.11, 30 are ranked by the NHIC (2010) as S5, i.e., secure; four are S4, i.e., apparently secure; and one is S3S4, i.e., vulnerable to apparently secure. The vulnerable status is due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making the species vulnerable to extirpation in the Province.

The Little Brown Myotis was recently designated as Endangered federally (COSEWIC, 2012) are provincially (MNR, 2013) due to potential impacts of white-nose syndrome on the population (COSSARO, 2012). As indicated in Section 2.7.5, no bat hibernacula, maternity colonies or migratory stopover areas are identified by MNR NRVIS in the proposed Project local study area. Based on site-specific field surveys, their occurrence is unlikely.

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

2.7.2 Terrestrial Avifauna

Few species of terrestrial birds reside in the region year-round, e.g., Pine Grosbeak (*Pinicola enucleator*), Boreal Chickadee (*Poecile hudsonica*), Black-capped Chickadee (*Poecile atricapillus*), Common Raven (*Corvus corax*), American Crow (*Corvus brachyrhynchus*), Ruffed Grouse (*Bonasa umbellus*), Spruce Grouse (*Falcipennis canadensis*), Great Horned Owl (*Bubo virginianus*), Boreal Owl (*Aegolius funereus*) and Northern Saw-whet Owl (*Aegolius acadicus*).

Other passerine and non-passerine species are migratory. The general Project area lies within the Atlantic flyway used by migratory birds which have breeding habitat preferences within the boreal forest (Erskine, 1977). Numerous passerines that are typical boreal species occur in the area of the proposed Project site. In black spruce-dominated forests these include Spruce Grouse, Boreal Chickadee, Gray Jay (*Perisoreus Canadensis*), Yellow-bellied Flycatcher (*Empidonax flaviventris*), Winter Wren (*Troglodytes troglodytes*), Swainson's Thrush (*Catharus ustulatus*), Ruby-crowned Kinglet (*Regulus calendula*), Nashville Warbler (*Vermivora ruficapilla*), Yellow-rumped Warbler (*Dendroica coronata*), Magnolia Warbler (*Dendroica magnolia*), Dark-eyed Junco (*Junco hyemalis*), Chipping Sparrow (*Spizella passerine*) and White-throated Sparrow (*Zonotrchia albicollis*) (Erskine, 1977). In stands dominated by balsam fir, the Spruce Grouse and Gray Jay are replaced by Ruffed Grouse and Blue Jay (*Cyanocitta cristata*), respectively. Jack pine stands support a less diverse avian community. Birds occurring in jack pine communities include American Robin (*Turdus migratorius*), Hermit Thrush (*Catharus guttatus*), Swainson's Thrush, Ruby-crowned Kinglet, Blue-headed Vireo (*Vireo solitarius*), Tennessee Warbler (*Vermivora peregrine*), Nashville Warbler, Chipping Sparrow and White-throated Sparrow.

Table 2.12 provides a list of terrestrial bird species recorded in the Ontario Breeding Bird Atlas as breeding or likely breeding within the two 10-km by 10-km square girds (17MR53 and 17MR63) encompassing the proposed Project local study area (Bird Studies Canada, 2006). Of the 63 species likely or confirmed to be breeding within the two grids, 45 are considered by the NHIC (2010) to be S5, i.e., secure and 18 are S4, i.e., apparently secure.

Table 2.12 Terrestrial Breeding Bird Species Recorded within 10 km by 10 km Square Grids Overlapping the Proposed Project Local Study Area[1]

Common Name	Scientific Name	Breeding Status	Provincial Status[2]
Ospreys, Eagles and Hawks	**Accipitridae**		
Northern Goshawk	*Accipiter gentilis*	Possible	S4
Falcons	**Falconidae**		
Merlin	*Falco columbarius*	Possible	S5
American Kestrel	*F. sparverius*	Probable	S4
Partridges, Pheasants and Grouse	**Phasianidae**		
Ruffed Grouse	*Bonasa umbellus*	Confirmed	S4
Typical Owls	**Strigidae**		
Great Horned Owl	*Bubo virginianus*	Possible	S4
Hummingbirds	**Trochilidae**		
Ruby-throated Hummingbird	*Archilochus colubris*	Possible	S5
Woodpeckers	**Picidae**		
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Possible	S5
Downy Woodpecker	*Picoides pubescens*	Possible	S5
Hairy Woodpecker	*P. villosus*	Confirmed	S5
Northern Flicker	*Colaptes auratus*	Probable	S4
Pileated Woodpecker	*Dryocopus pileatus*	Possible	S5
Tyrant Flycatchers	**Tyrannidae**		
Eastern Wood-pewee	*Contopus virens*	Possible	S4
Alder Flycatcher	*Empidonax alnorum*	Possible	S5
Yellow-bellied Flycatcher	*E. flaviventris*	Confirmed	S5
Least Flycatcher	*E. minimus*	Possible	S4
Swallows	**Hirundinidae**		
Tree Swallow	*Tachycineta bicolor*	Possible	S4
Jays, Magpies and Crows	**Corvidae**		
Gray Jay	*Perisoreus canadensis*	Possible	S5
Blue Jay	*Cyanocitta cristata*	Probable	S5
American Crow	*Corvus brachyrhynchos*	Possible	S5
Common Raven	*C. corax*	Possible	S5
Titmice	**Paridae**		
Black-capped Chickadee	*Poecile atricapillus*	Probable	S5
Boreal Chickadee	*P. hudsonica*	Possible	S5
Nuthatches	**Sittidae**		
Red-breasted Nuthatch	*Sitta canadensis*	Possible	S5
Creepers	**Certhiidae**		
Brown Creeper	*Certhia americana*	Possible	S5
Wrens	**Troglodytidae**		
Winter Wren	*Troglodytes troglodytes*	Possible	S5

Table 2.12 Terrestrial Breeding Bird Species Recorded within 10 km by 10 km Square Grids Overlapping the Proposed Project Study Area[1] (Cont'd)

Common Name	Scientific Name	Breeding Status	Provincial Status[2]
Kinglets and Thrushes	**Muscicapidae**		
Ruby-crowned Kinglet	*Regulus calendula*	Possible	S4
Golden-crowned Kinglet	*R. satrapa*	Possible	S5
Veery	*Catharus fuscescens*	Possible	S4
Hermit Thrush	*C. guttatus*	Possible	S5
Swainson's Thrush	*C. ustulatus*	Possible	S4
American Robin	*Turdus migratorius*	Probable	S5
Waxwings	**Bombycillidae**		
Cedar Waxwing	*Bombycilla cedrorum*	Probable	S5
Vireos	**Vireonidae**		
Red-eyed Vireo	*Vireo olivaceus*	Possible	S5
Philadelphia Vireo	*V. philadelphicus*	Possible	S5
Blue-headed (Solitary) Vireo	*V. solitarius*	Possible	S5
Warblers, Sparrows, Blackbirds and Orioles	**Emberizidae**		
Tennessee Warbler	*Vermivora peregrina*	Possible	S5
Nashville Warbler	*V. ruficapilla*	Probable	S5
Black-throated Blue Warbler	*Dendroica caerulescens*	Possible	S5
Bay-breasted Warbler	*D. castanea*	Possible	S5
Yellow-rumped Warbler	*D. coronata*	Probable	S5
Magnolia Warbler	*D. magnolia*	Possible	S5
Chestnut-sided Warbler	*D. pensylvanica*	Possible	S5
Yellow Warbler	*D. petechia*	Possible	S5
Cape May Warbler	*D. tigrina*	Possible	S5
Black-throated Green Warbler	*D. virens*	Possible	S5
Black-and-white Warbler	*Mniotilta varia*	Possible	S5
American Redstart	*Setophaga ruticilla*	Probable	S5
Ovenbird	*Seiurus aurocapilla*	Possible	S4
Northern Waterthrush	*S. noveboracensis*	Possible	S5
Mourning Warbler	*Oporornis philadelphia*	Confirmed	S4
Common Yellowthroat	*Geothlypis trichas*	Possible	S5
Canada Warbler[3]	*Wilsonia canadensis*	Possible	S4
Chipping Sparrow	*Spizella passerina*	Probable	S5
Fox Sparrow	*Passerella iliaca*	Possible	S4
Lincoln's Sparrow	*Melospiza lincolnii*	Possible	S5
Song Sparrow	*M. melodia*	Possible	S5
White-throated Sparrow	*Zonotrichia albicollis*	Possible	S5
Dark-eyed Junco	*Junco hyemalis*	Possible	S5
Rusty Blackbird[4]	*Euphagus carolinus*	Possible	S4

Table 2.12 Terrestrial Breeding Bird Species Recorded within 10 km by 10 km Square Grids Overlapping the Proposed Project Study Area[1] (Cont'd)

Common Name	Scientific Name	Breeding Status	Provincial Status[2]
Finches	**Fringillidae**		
Purple Finch	*Carpodacus purpureus*	Possible	S4
White-winged Crossbill	*Loxia leucoptera*	Possible	S5
Pine Siskin	*Carduelis pinus*	Possible	S4
American Goldfinch	*C. tristis*	Possible	S5

[1] Source: Bird Studies Canada (2006); Cadman *et al*. (2007), based on grids 17MR53 and 17MR63.

[2] NHIC (2010): S5 = secure; S4 = apparently secure.

[3] Designated as Threatened federally by COSEWIC (2012), and Special Concern provincially by COSSARO (MNR, 2013).

[4] Designated Special Concern provincially by COSSARO (MNR, 2013), but Not At Risk federally by COSEWIC (2012).

During the bird nesting survey undertaken in June 2009 prior to the initiation of the geotechnical studies, Wedeles (2009) observed 13 bird species in the New Post Creek Project area (see Table 2.13). Only the Song Sparrow was determined to be nesting. During the 2011 and 2012 site-specific field investigations, 11 bird species were observed in the local study area, including Bald Eagle (*Haliaeetus leucocephalus*) foraging along the Abitibi River downstream of the proposed tailrace location (Table 2.13). Bald Eagle is designated Special Concern provincially (MNR, 2013), but Not at Risk federally (COSEWIC, 2012). Based on the MNR NRVIS database, an unknown raptor nest is located approximately 1 km north of the proposed Project site within LAPP along the Abitibi River.

Table 2.13 Terrestrial Bird Species Observed within the Proposed Project Local Study Area[1]

Common Name	Scientific Name	Survey Date		Provincial Status[2]
		2009[1]	2011/2	
Ospreys, Eagles and Hawks	**Accipitridae**			
Bald Eagle[3]	*Haliaeetus leucocephalus*		X	S4
Partridges, Pheasants and Grouse	**Phasianidae**			
Spruce Grouse	*Falcipennis canadensis*		X	S5
Kingfishers	**Alcedinidae**			
Belted Kingfisher	*Megaceryle alcyon*		X	S4
Woodpeckers	**Picidae**			
Northern Flicker	*Colaptes auratus*	X	X	S4
Tyrant Flycatchers	**Tyrannidae**			S5
Alder Flycatcher	*Empidonax alnorum*		X	S5
Jays, Magpies and Crows	**Corvidae**			
Gray Jay	*Perisoreus canadensis*		X	S5
Common Raven	*Corvus corax*		X	S5

Table 2.13 Terrestrial Bird Species Observed within the Proposed Project Local Study Area[1] (Cont'd)

Common Name	Scientific Name	Survey Date		Provincial Status[2]
		2009[1]	2011/2	
Titmice	**Paridae**			
Black-capped Chickadee	*Poecile atricapillus*	X	X	S5
Boreal Chickadee	*P. hudsonica*		X	S5
Wrens	**Troglodytidae**			
Winter Wren	*Troglodytes troglodytes*	X		S5
Kinglets and Thrushes	**Muscicapidae**			
American Robin	*Turdus migratorius*	X		S5
Waxwings	**Bombycillidae**			
Cedar Waxwing	*Bombycilla cedrorum*		X	S5
Warblers, Sparrows, Blackbirds and Orioles	**Emberizidae**			
Northern Parula	*Parula americana*	X		S4
Yellow-rumped Warbler	*Dendroica coronata*	X		S5
Yellow Warbler	*D. petechia*	X		S5
Lincoln's Sparrow	*Melospiza lincolnii*	X		S5
Song Sparrow	*M. melodia*	X		S5
White-throated Sparrow	*Zonotrichia albicollis*	X	X	S5
Dark-eyed Junco	*Junco hyemalis*	X		S5
Finches	**Fringillidae**			
Red Crossbill	*Loxia curvirostra*	X		S4

[1] Wedeles (2009).
[2] NHIC (2010); S5 = secure; S4 = apparently secure.
[3] Designated Special Concern provincially (MNR, 2013) but Not At Risk federally (COSEWIC, 2012).

2.7.3 Amphibians and Reptiles

Table 2.14 provides a list of amphibian and reptile species likely present in the New Post Creek Project area based on distribution mapping (Ontario Nature, 2010). Of the nine species listed in Table 2.14, seven are ranked by the NHIC (2010) as S5, i.e., secure and two are S4, i.e., apparently secure. The MOE (1972) reported that Eastern Gartersnake and Wood Frog were observed only occasionally in the Onakawana area located approximately 75 km north of the proposed Project site, suggesting low populations of these species. On sunny days, a sizable population of American Toad was observed. An Eastern Gartersnake was observed in June 2008 by Ontario Parks staff in the vicinity of New Post Creek waterfalls (Ontario Parks, 2008). During the summer and fall 2011 site-specific field investigations, a red variation of Eastern Gartersnake (Photograph 2.1) and a Wood Frog were observed.

Table 2.14 Amphibians and Reptiles Likely Present in the Proposed Project Local Study Area[1]

Common Name	Scientific Name	Provincial Status[2]
AMPHIBIANS		
Mole Salamanders	**Ambystomatidae**	
Blue-spotted Salamander	*Ambystoma laterale*	S4
Lungless Salamanders	**Plethodontidae**	
Northern Two-lined Salamander	*Eurycea bislineata*	S4
Toads	**Bufonidae**	
American Toad	*Bufo americanus*	S5
Treefrogs	**Hylidae**	
Spring Peeper	*Pseudacris crucifer*	S5
Boreal Chorus Frog	*P. maculata*	S5
True Frogs	**Ranidae**	
Northern Leopard Frog	*Lithobates pipiens*	S5
Mink Frog	*L. septentrionalis*	S5
Wood Frog	*L. sylvaticus*	S5
REPTILES		
Typical Snakes	**Colubridae**	
Eastern Gartersnake	*Thamnophis sauritus*	S5

[1] Source: Ontario Nature (2010).
[2] NHIC (2010); S5 = secure; S4 = apparently secure.

Photograph 2.1 Eastern Gartersnake (Red Variation)

2.7.4 Significant Wildlife Species

As indicated in Section 2.7.1, Woodland Caribou, designated as Threatened federally and provincially, have been reported in the vicinity of the proposed New Post Creek Project. However, their utilization of the site-specific study area is unlikely due to the presence of roads and clearings. No Woodland Caribou has been observed within 5 km of the proposed Project site (M. Gauthier, MNR, 2011, pers. comm.). A Habitat Regulation for Woodland Caribou is currently being developed by the MNR with an approach to habitat protection recently posted on the Environmental Registry (EBR Registry Number: 011-2303). As of June 30, 2013, there will be a general habitat protection for Woodland Caribou under the *ESA* if no habitat regulation yet applies (F. Miklas, MNR Thunder Bay District, 2013, pers. comm.). In addition, a progress report has been recently prepared by the MNR (2012a) on Ontario's Woodland Caribou Conservation Plan.

As also indicated in Section 2.7.1, the Little Brown Myotis has recently been designated as Endangered federally (COSEWIC, 2012) and provincially (MNR, 2013) due to potential impacts of white-nose syndrome on the population (COSSARO, 2012). As indicated in Section 2.7.5, no bat hibernacula, maternity colonies and migratory stopover areas are identified in the NRVIS database within the proposed Project local study area, and the potential occurrence of this type of habitat is unlikely.

As indicated in Table 2.13, Bald Eagle, designated Special Concern provincially (MNR, 2013), but Not At Risk federally (COSEWIC, 2012), was observed in the proposed Project local study area.

Canada Warbler and Rusty Blackbird, with S4 rankings, have been recorded as possibly breeding in the 10-km by 10-km grids overlapping the proposed New Post Creek Project area (Table 2.12). Canada Warbler is designated as Threatened federally by COSEWIC (2012) and Special Concern provincially by COSSARO (MNR, 2013). Rusty Blackbird is designated as Special Concern federally (COSEWIC, 2012) and Not At Risk provincially (MNR, 2013).

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

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

habitats with milkweed (*Asclepius* spp.) (Opler, 1992). Milkweed is not present in the proposed local study area (Table 2.8).

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

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

A number of insect species considered to be significant by the MNR were listed in the Abitibi River WMP (see Table 2.15). None of these species are considered to be Endangered, Threatened, or Special Concern by COSEWIC (2012) or COSSARO (MNR, 2013). Based on examination of the NHIC (2012) database, none of these significant species have been recorded within a 5-km radius of the proposed Project site, nor were any of these species documented during site-specific field investigations.

2.7.5 Significant Wildlife Habitat

Significant wildlife habitat includes seasonal wildlife concentrations areas, rare vegetation communities, specialized wildlife habitat, habitat for species of conservation concern (not including Endangered or Threatened species), and animal movement corridors. Table 2.16 provides a list of significant wildlife habitat in Ecoregion 3E and indicates what types of wildlife habitat were identified by MNR NRVIS and by Beacon within the proposed Project local study area, as well as what types of significant wildlife habitat may be present in the area given what is known about its vegetation and physiography.

NRVIS data and mapping related to significant wildlife habitat were reviewed for the proposed Project area. Data layers that were provided by MNR and screened for the area include:

- wintering areas;
- fish spawning areas;
- nesting areas;
- Moose aquatic feeding areas; and
- wildlife staging areas.

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

Table 2.15 Significant Insect Species Recorded in the Abitibi River Watershed[1]

Common Name	Scientific Name	Habitat Requirements	Provincial Rank[2]
Lepidoptera			
Red-disked Alpine	*Erebia discoidalis*	Large open grassy bogs, other areas with acidic soils	S3
Large Marble	*Euchloe ausonides*	Valleys, hillsides, fields, meadows, other open sunny areas	S3
Purplish Copper	*Lycaena helloides*	Disturbed areas including roadsides, open fields, wet meadows, marshes, streamsides and valleys	S3
Noctuid Moth	*Syngrapha altera*	Likely bog and/or barrens; larvae feed on blueberries	S2?
Odonata			
Sedge Darner	*Aeshna juncea*	Sedge potholes, marshes and mossy fens	S3?
Zigzag Darner	*A. sitchensis*	Puddles in almost filled cold bogs	S4
Subarctic Darner	*A. subarctica*	Restricted to sphagnum bogs and deep fens dominated by aquatic moss	S1S2
Prairie Bluet	*Coenagrion angulatum*	No information available	SH
Subarctic Bluet	*C. interrogatum*	Quaking bogs	S4
Twin-spotted Spiketail	*Cordulegaster maculate*	Rapid streams in forests	
Elfin Skimmer	*Nannothemis bella*	Puddles and ponds in floating sphagnum bogs	S3
Boreal Snaketail	*Ophiogomphus colubrinus*	Rapid gravel streams	
Ringed Emerald	*Somatochlora albicincta*	Boggy places with slight water movement	S2S3
Forcipate Emerald	*S. forcipata*	Tiny boggy spring-fed stream, puddles in bogs	S2
Delicate Emerald	*S. franklini*	Puddles in spring-fed bogs	S4
Hudsonian Emerald	*S. hudsonica*	No information available	S2S3
Kennedy's Emerald	*S. kennedyi*	Cold bog ponds and puddles	S3
Ocellated Emerald	*S. minor*	Clear slow forest streams	S4
Muskeg Emerald	*S. septentrionalis*	No information available	S2S3
Brush-tipped Emerald	*S. walshii*	Small ditches in bogs	S3
Williamson's Emerald	*S. williamsoni*	Quiet shady forest streams and their outlets	S4
Least Clubtail	*Stylogomphus albistylis*	Small rapid gravel streams	S4
Black Meadowhawk	*Sympetrum danae*	Peaty marshes, bog ponds	S4
Ebony Boghaunter	*Williamsonia fletcheri*	Puddles in sphagnum bogs	S2

[1] Source: OPG *et al.* (2006).

[2] NHIC (2010): SH = possibly extirpated; S1 = critically imperiled; S1S2 = critically imperiled to imperiled; S2 = imperiled; S2? = imperiled, rank uncertain; S2S3 = imperiled to vulnerable; S3 = vulnerable; S3? = vulnerable, rank uncertain; S4 = apparently secure.

Table 2.16 Assessment of Significant Wildlife Habitat in the Proposed Project Local Study Area

	Identified by NRVIS	Observed during 2010-2011 Field Investigations	Potential for Habitat in the Proposed Project Local Study Area
Seasonal Concentration Areas			
Moose Late Winter Cover	No; three locations within 5 km of proposed Project area	No	Probable - in areas with high conifer cover
Waterfowl Stopover and Staging Areas (Terrestrial)	No	No	Unlikely - no suitable habitat
Waterfowl Stopover and Staging Areas (Aquatic)	No	No	Possible - several small open water features within proposed transmission line area
Shorebird Migratory Stopover Area	No	No	Unlikely - no suitable habitat
Bat Hibernacula	No	No	Unlikely - no suitable habitat
Bat Maternity Colonies	No	No	Possible, but unlikely given the young age of deciduous forests in the proposed Project study area
Bat Migratory Stopover Area	No	No	Unlikely
Turtle Wintering Areas	No	No	No (see Table 2.12)
Reptile Hibernacula	No	No	Possible
Colonially Nesting Bird Breeding Habitat (Bank and Cliff)	No	No	Possible along New Post Creek bluffs, but Bank Swallow and Cliff Swallow not reported in the area (see Table 2.10)
Colonially Nesting Bird Breeding Habitat (Tree/Shrubs)	No	No	Unlikely
Colonially Nesting Bird Breeding Habitat (Ground)	No	No	Unlikely
Rare Vegetation Communities			
Cliffs and Talus Slopes	No	Yes	Cliffs confirmed at New Post Creek waterfalls
Red and White Pine Community	No	No	Unlikely
Black Ash Community	No	No	Unlikely
Elm Community	No	No	Unlikely
Oak Community	No	No	Unlikely
Red Maple and Sugar Maple Community	No	No	Unlikely
Yellow Birch Community	No	No	Unlikely
Rock Barren	No	No	Unlikely
Sand Dunes	No	No	Not present
American Dune Grass Type	No	No	Not present

Table 2.16 Assessment of Significant Wildlife Habitat in the Proposed Project Local Study Area (Cont'd)

	Identified by NRVIS	Observed during 2010-2011 Field Investigations	Potential for Habitat in the Proposed Project Local Study Area
Seasonal Concentration Areas			
Great Lakes Arctic-Alpine Shoreline Type	No	No	Not present
Hardwood Swamps	No	Yes	Confirmed, Balsam Poplar community along New Post Creek
Specialized Wildlife Habitat			
Woodland Raptor Nesting Habitat	No; one location along Abitibi River approximately 1 km north of proposed Project footprint[1]	No	Possible, forested habitat
Bald Eagle and Osprey Nesting Habitat	No	No	Possible, along New Post Creek or Abitibi River
Waterfowl Nesting Area	No	No	Possible, in open water features within proposed transmission line area
Turtle Nesting Areas	No	No	No (see Table 2.12)
Seeps and Springs	No	No	Possible
Aquatic Feeding Habitat	No; two locations within 2 km south of proposed Project area	No	Possible, in open water features
Mineral Licks	No	No	Possible
Denning Sites for Mink, Otter, Gray Wolf, Eastern Wolf, Canada Lynx, Marten, Fisher and Black Bear	No	No	Probable for some species such as Mink
Wolf Rendezvous Sites	No	No	Possible - potential habitat exists
Amphibian Breeding Habitat (Wetlands)	No	No	Possible
Amphibian Breeding Habitat (Woodland)	No	No	Possible
Mast Producing Areas	No	No	Possible
Sharp-tailed Grouse Leks	No	No	Unlikely - Sharp-tailed Grouse not reported in area (see Table 2.10)

Table 2.16 Assessment of Significant Wildlife Habitat in the Proposed Project Local Study Area (Cont'd)

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

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

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

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

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

3.0 EFFECTS ASSESSMENT AND RECOMMENDED MITIGATION MEASURES

The available environmental baseline information and site-specific vegetation and forest resources inventories, including incidental wildlife observations, provided the basis for an assessment of potential construction and operational effects of the proposed New Post Creek Project on the terrestrial environment, e.g., due to vegetation clearing, soil erosion, noise, blasting, increased human activity, inundation, etc.

Recommended mitigation measures for the potential effects on the terrestrial environment considered best industry practices and various sources such as OWA (2012b) “Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction”, standard environmental construction guidelines, e.g., Cheminfo (2005), relevant government guidelines for proposed hydroelectric power plant development, e.g., MNR (1988), DFO Ontario Operational Statements, as well as government agency and other organization consultation.

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

1. Avoidance of sensitive areas, where practicable, through siting of towers, e.g., towers will not be located within watercourses or associated riparian vegetation.
2. Avoidance of temporary watercourse crossings, wherever practicable, e.g., by use of an existing nearby crossing, or access to the tower location obtained from either side of the watercourse, or use of off-corridor access.
3. Appropriate timing of construction activities, whenever practicable, to avoid sensitive time periods, e.g., vegetation clearing outside migratory bird nesting periods.
4. Construction in wetlands or areas too wet to access should be undertaken during frozen or dry conditions.
5. Implementation of conventional, proven mitigation measures during construction, e.g., DFO (2010) Ontario Operational Statement for maintenance of riparian vegetation in existing ROWs; Environment Canada “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” (Cheminfo, 2005); MNR (1988) “Environmental Guidelines for Access Roads and Water Crossings”; EPRI (2002) “Best Management Practices (BMPs) Manual for Access Road Crossings of Wetlands and Waterbodies”, OWA (2012b) “Best Management Practices Guide for the Mitigation of Impacts of Waterpower Facility Construction” and Hydro One (2008) “Environmental Guidelines for the Construction and Maintenance of Transmission Facilities”.
6. Implementation of conventional proven mitigation measures during operation, e.g., EPRI (1999) “Vegetation Dynamics Along Utility Rights-of-Way”; Cieslewicz and Novembri (2004) “Utility Vegetation Management. Trends, Issues, and Practices”; APLIC and USFWS (2005) “Avian Protection Plan (APP) Guidelines”; APLIC (2006) “Suggested Practices for Avian Protection on Power Lines: The State-of-the-Art in 2006” and Hydro One (2008).

7. Development of environmental enhancement/compensation measures to offset the unavoidable effects of construction and operation.

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

3.1 ATMOSPHERIC ENVIRONMENT

3.1.1 Climate

Climatic data of relevance to construction activities include the occurrence of wet soils after prolonged wet weather events, the flooding of excavated areas after a period of heavy rainfall and the generation of fugitive dust emissions due to high winds during dry conditions. Soil moisture levels are anticipated to be low during frozen conditions in the winter and the dry summer months.

During periods of excessive rainfall or saturated soil conditions, construction activities will be monitored to ensure that gullying does not occur on the relatively steep slope along the Abitibi River at the proposed powerhouse location, as well as on the more gently sloping area along the proposed penstock footprint between the proposed intake and powerhouse locations, and that excavated soils do not migrate off the work area. Eroded areas will be stabilized as soon as sufficiently dry conditions prevail and, where appropriate, excavated soils will be stabilized by the use of silt fencing enhanced with straw bales to be deployed prior to excavation. Additional information on mitigation of soil erosion is provided in Section 3.3.

Erosion associated with high winds, resulting in soil loss and nuisance dust, should be reduced or eliminated by stabilizing spoil piles with straw mulch. Dust generation will be controlled by watering dusty roads and the construction sites (Cheminfo, 2005).

The mean start and end of the growing season occur in early to mid-May and early to mid-October, respectively (see Table 2.1); therefore, revegetation/reseeding should occur within this period or be postponed until the following spring.

The implementation of the proposed mitigation measures should reduce the effect of inclement weather and is predicted to result in no net effects on the terrestrial environment affected by construction of the proposed New Post Creek Project and adjacent waterbodies.

3.1.2 Air Quality

The construction of the proposed New Post Creek Project will result in typical combustion and dust emissions.

Construction activities have the potential for short-term effects on air quality in the vicinity of the site. Emissions are primarily exhaust emissions (and associated odour) from construction

equipment and fugitive dust due to disturbance of dry fine-grained soils. As with any construction site, these emissions will be of relatively short duration and unlikely to have any effect on the surrounding airshed.

During construction, exhaust emissions from construction equipment and fugitive dust emissions will have localized, short-term and transitory effects on the surrounding airshed. Typical combustion emissions include nitrogen oxides (NO_x), CO, SO_2, volatile organic compounds (VOCs) and particulate matter (PM). NO_x can affect vegetation negatively by causing damage or death to leaves, altered photosynthesis, stunting, spindly growth, reduced fruit set and/or reduced yield (Taylor *et al*., 1975). CO is not readily taken up by vegetation (Bennett and Hill, 1975; Mudd, 1975). Soil microorganisms appear to be the major sink for CO (Bennett and Hill, 1975). Sulphur is an essential element for plant metabolism because it is an important component of amino acids, proteins and some vitamins; however, under acute SO_2 levels, foliage symptoms range from chlorosis to necrosis (Malhotra and Blauel, 1980). Elevated VOC levels can also result in foliage chlorosis and necrosis (Malhotra and Blauel, 1980). PM generally does not damage vegetation, possibly because the particles would be removed by rain before any adverse effect could occur (Lerman and Darley, 1975).

During construction, the practices and procedures outlined in the Cheminfo (2005) document "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities", prepared in conjunction with the Construction and Demolition Multi-Stakeholder Working Group for Environment Canada, will be followed, including:

- plans to minimize dust generation through planning, site layout and the proper use of materials, tools and equipment;
- use of wind fencing;
- compacting disturbed soil;
- activity scheduling;
- storage piles management;
- minimization of drop heights;
- barriers to prevent dispersion of materials;
- avoidance of blasting where feasible;
- work practices for loading debris;
- avoidance of prolonged storage of debris; and
- proper techniques for the use of materials that include VOCs.

The DBC and subcontractors will be required to maintain equipment in good working condition to minimize combustion emissions to the extent practicable (Cheminfo, 2005). To reduce fugitive dust emissions, effective dust suppression techniques, such as on-site and road watering, will be used.

The application of the recommended mitigation measures should minimize combustion emissions and limit fugitive dust emissions to the work area. As a result of the low

concentrations of the atmospheric pollutants generated during construction, no adverse effects on terrestrial vegetation due to these emissions are anticipated.

A PTTW will be obtained from the MOE if more than 50,000 L/day is withdrawn from a natural water source for dust suppression. Reseeding will be undertaken as soon as conditions permit after construction to reduce potential dust generation.

Emissions from the batch plant will meet the requirements of the ECA issued by the MOE under the *Environmental Protection Act*.

There will be no atmospheric emissions from the proposed powerhouse during operation. As ambient air quality will not be affected during the operation of the proposed New Post Creek Project and monitoring is not deemed necessary.

3.1.3 Environmental Noise

The construction of the proposed New Post Creek Project will be the source of short-term local noise. All work is expected to be completed using conventional construction methods. Construction activities such as site grading, ROW clearing, site preparation, pile driving, blasting and foundation work will be sources of noise generation. All of these activities, which are expected to take approximately 30 months, will require the use of various pieces of heavy equipment including bulldozers, front-end loaders, small trucks, backhoes, bobcats, dump trucks, compactors, ready-mix concrete trucks and cranes. Other construction activities, such as those related to the placement of the facility components (e.g., generator) and activities inside the building (once built) are expected to generate less noise. The movement of worker vehicles from the construction camp to the construction site will also result in minor increase in the background sound levels during the 30-month construction period.

The proposed New Post Creek Project will be constructed using standard construction BMPs (e.g., Cheminfo, 2005). Sound emission standards for various equipment are set according to the date of manufacture of the equipment as defined by the MOE in the NPC-115 publication, listed in the MOE (1978) Model Municipal Noise Control By-Law. This document stipulates specific sound emission standards for various pieces of construction equipment and will form the basis of a Noise Management Plan to be developed by the contractor. No mitigation is required as no unusual construction noise effects are anticipated at the nearest sensitive receptors:

- seasonal trapper's cabin located proximate to the ONR line approximately 500 m south of the transmission line connection and over 7 km from the proposed GS location;
- seasonal occupation of the Abitibi Canyon GS facilities approximately 13 km to the southwest; and
- seasonally occupied dwelling at Fraserdale, approximately 15 km south.

The construction disturbance should be sufficiently local that little displacement of wildlife is expected to occur. Any sensitive resident animals can relocate temporarily to avoid noise and disturbance associated with construction activities and return after construction activity cessation. In the unusual event of permanent displacement, other wildlife is expected to take advantage of the available habitat. Based on literature review, Kaseloo (2004) reported that small mammals do not appear to be adversely affected by road noise occurring in significant numbers in rights-of-way.

The behavioural response of wild birds to noise is variable. The response varies with species, sex, group, size, season, activities engaged in prior to disturbance, previous exposure to the noise source and distance from the noise source (Fitchko and Lang, 1999). Some species may be very sensitive and may abandon their nests because of anthropogenic noise or activities. Other species habituate to anthropogenic noise or activities, yet others may be attracted to them.

Kaseloo (2004, 2006) reported that a number of studies have indicated that road noise has a negative effect on bird populations (particularly during breeding) of a variety of species. This effect is based on increased bird densities with distance from the road with the effect distances increasing with increased traffic densities. Traffic noise has not been explicitly established as the primary causal factor for avoidance by these species. Moreover, not all species have shown this effect and some species show the opposite response, with increased numbers near roads. As indicated by Kaseloo (2004), there are large gaps in the existing knowledge of the impact of noise on wildlife populations with the need to determine why noise, the presumptive cause, has such variable effects and if the effect is attributable to noise alone or if other factors and/or interactions are present.

While a bird's first reaction to a new noise source appearing in a new ecological niche may be fear and avoidance, if its other sensory systems (optical, chemical) are not stimulated, the organism quickly learns to ignore the noise source (Busnel, 1978). However, avoidance of noise should occur if the organism is approached or chased by humans. For example, it is well known that flocks of crows and gulls will follow a tractor and tilling implement to feed on worms and insect larvae exposed by tilling, ignoring the noise from the tractor; however, they leave immediately if the driver stops the engine and walks away from the tractor.

Drilling activities to facilitate blasting will generate noise and vibration similar to any general construction operation. Potential effects due to noise and vibration will be minimized by proper maintenance and operation of drill rig equipment. In addition, noise baffling equipment can be provided, as recommended by the blasting engineer.

The abrupt loud noise associated with blasting may startle wildlife. In a review of the effects of sonic boom on wildlife, Bell (1972) and Cottereau (1978) reported that wild animals may show behavioural startle when they first experience a sonic boom; however, their reaction is usually slight and they seem to adapt readily to further boom. Lynch and Speake (1978) studied the

effect of sonic booms on the nesting behaviour of Wild Turkey (*Meleagris gallopavo silvestris*) and reported that sonic booms did not cause abnormal behaviour that would result in decreased productivity. Additional information on the effects of blasting is provided in Section 3.2.

As some wildlife species will relocate temporarily to avoid noise and disturbance associated with construction activities whereas others may become habituated to human activities and associated noise, no mitigation is recommended, with the exception of those provided for migratory birds during the nesting season (see Section 3.7.1).

During powerhouse operation, all sources of noise energy will be designed with noise limitations of 85 dBA inside the station (KGS Group, 2013c). The noise level within the station will be mitigated by the powerhouse walls and rapidly attenuate with distance from the station. Local resident wildlife are expected to become habituated to the noise emanating from the station.

3.2 GEOLOGY

As indicated in Section 1.2, the proposed penstocks will extend approximately 820 m from the intake to the powerhouse and will be buried with a minimum 2 m cover to provide thermal insulation during winter operation. Blasting of surface and near-surface bedrock along the initial 150 m distance from the intake will be required to facilitate penstock burial. Blasting will also be required at the intake location.

Explosives used in construction will be closely controlled in accordance with all government regulations, and their use restricted to authorized personnel who have been trained in the use of explosives in a manner so as to minimize impacts on the environment. Appropriate government agencies and the local trappers and tourism excursion operators will be informed of the blasting schedule in advance of construction, as well as just prior to the detonation program. All necessary permits will be obtained by the DBC, who will also comply with all legal requirements in connection with the use, storage and transportation of explosives, including, but not limited to, the *Canada Explosives Act* and the *Transportation of Dangerous Goods Act*. The DBC will be required to retain a consulting engineer with technical expertise in blasting to provide advice on maximum loading of explosives for all blasting, as well as an engineering report indicating recommended charges and blasting methods to be used at specific locations. All blasting will occur in such a way as to be in compliance with federal regulations and directions. Minimization of the physical effects of blasting will be ensured by following the recommendations of the blasting engineer and the DFO blasting guidelines, “Guidelines for the Use of Explosives in or near Canadian Fisheries Waters” (Wright and Hopky, 1998). Excess rock will be removed for suitable use or disposal. Sampling and analysis of bedrock indicated that it is not acid generating (see Aquatic Environment TSD).

A Site Development Plan will be prepared by the DBC, including planning considerations; site and design considerations; site development scheduling; selection of construction equipment; and site development details.

No effects on geology are anticipated beyond the intake and 150 m penstock footprints requiring blasting for construction. As these effects are localized relative to overall geology in the area, no mitigation measures are required beyond those set out in the Site Development Plan.

No effects on geology are anticipated as a result of the operation of the proposed New Post Creek Project; therefore, no mitigation is required.

3.3 PHYSIOGRAPHY

As indicated in Section 2.3, lands along the proposed penstock footprint between the proposed intake and powerhouse locations are gently sloping, with a relatively steep slope along the Abitibi River at the proposed powerhouse location. The physiography at the proposed intake/earth dam, penstock and powerhouse sites will be altered due to requisite grading and slope stabilization, as well as at proposed laydown/assembly areas due to requisite grading.

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

No effects on physiography are anticipated as a result of the operation of the proposed New Post Creek Project; therefore, no mitigation is required.

3.4 SOILS

Soils on the proposed Project site consist primarily of sillty clay loam, with some organic soil (see Section 2.4).

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

As indicated in Section 3.1.1, during periods of excessive rainfall or saturated soil conditions, construction activities will be monitored to ensure that gullying does not occur on the relatively steep slope along the Abitibi River at the proposed powerhouse location, as well as on the more gently sloping area along the proposed penstock footprint between the proposed intake and powerhouse locations, and that excavated soils do not migrate off the work area. Exposed areas will be stabilized as soon as sufficiently dry conditions prevail and, where appropriate, excavated soils will be stabilized by the use of silt fencing enhanced with straw bales, stockpile covers, berms, controlled compaction, etc.

Erosion associated with high winds, resulting in soil loss, will be reduced or eliminated by stabilizing spoil piles with straw mulch or more stable materials.

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

- fitting of proposed works to the terrain (i.e., using the natural topography of the land in the placement and organization of the construction site);
- timing of grading and construction activities to minimize soil exposure;
- retention of existing vegetation where feasible;
- restriction of the use of heavy construction equipment to within the approved work areas to minimize soil disturbance and vegetation destruction;
- storage of stripped soil at upland locations with a minimum of 5 m from the edge of the Abitibi River and New Post Creek and beyond the inundation area;
- implementation of erosion control measures, e.g., rip-rap berms underlain by filter geotextile, straw bales used as filters, silt fencing along the shoreline and/or mulching for interim stabilization;
- diversion of runoff away from exposed areas;
- minimization of the length and steepness of slopes;
- maintenance of low runoff velocities;
- design of drainage works, such as ditches and outfalls, to handle concentrated runoff;
- retention of sediment on site;
- routine inspection and maintenance of erosion and sediment control measures; and
- revegetation of disturbed areas by seeding and/or planting following construction as soon as seasonal conditions permit.

The site-specific Erosion and Sediment Control Plan will be part of a broader Environmental Management Plan for the proposed Project.

For the clearing of the reservoir, stumps are to remain in the ground so as to maintain root mat, limit soil disturbance and lower the risk of erosion and total suspended solids released to the reservoir.

After construction, the disturbed sites will be rehabilitated. A Site Rehabilitation Plan including planning considerations, soil stabilization and re-vegetation (using only native vegetation and planting of tree species typical of the specific ecosite) will be prepared for the proposed Project.

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

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

A Hazardous Materials Management Plan, Waste Management Plan and a Spills Emergency Preparedness and Response Plan will be developed by the DBC for the proposed Project as part of the broader Environmental Management Plan.

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

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

3.5 VEGETATION

3.5.1 Forestry Resources

As indicated in Section 2.5.1, forestry operations have been undertaken previously within the local study area. However, forestry operations are not proposed in the current FMPs. More than one-quarter (27%) of the area has been disturbed due to harvesting and extensive road development.

The proposed New Post Creek Project will involve the clearing of approximately 249 ha of disturbed and undisturbed land, of which approximately 181 ha is productive forest (Fleming, 2012; see Appendix A). The majority of this forest will be lost from production. Temporary work areas will be re-planted with native tree species appropriate for each ecosite.

Based on clearing of approximately 181 ha, the FRI timber volumes in Net Merchantable Cubic Metres (NMm^3) are estimated to be 11,372 NMm^3, consisting mainly of Black Spruce, Balsam Poplar, Balsam Fir and White Spruce. The marketable volume will be significantly less given the lack of markets for many species and products. In addition, a significant volume of very small wood from younger stands (i.e., less than 50 years old) will likely not be marketable and require chipping or crushing for disposal.

A total of 9.6 ha of plantation will be affected by clearing the proposed transmission line ROW. Normally, silviculture liability charges of approximately $8,160 would be recoverable to the Forest Renewal Trust Fund for plantation loss (see Appendix A).

Early involvement and regular consultation will be undertaken by the DBC with the MNR Fire Management Headquarters in Cochrane to maintain situational awareness, ensure compliance and seek clarification on procedures. Specific concerns to be addressed by the DBC include the handling and storage of hazardous materials on site; vegetation management procedures related to the construction and maintenance of temporary and permanent facilities, transmission line ROW and access roads; and access to the site for fire response purposes with consideration for ease of access turnarounds and egress. If access is to be controlled procedures should be in place in advance to afford local fire response staff reasonable access to the site. Fire management should also be aware of any hazards that they may encounter in the event that they are dispatched to a fire on site and any relevant communications procedures.

Certain forest operations, such as road construction and land clearing, may be subject to the Modifying Industrial Operations Protocol if the fire hazard warrants imposing specific conditions within the annual fire season (April 1-October 31). The restrictions associated with operating in accordance to the protocol are directly correlated to the daily fire hazard. Specific conditions may include ensuring fire suppression equipment is on site and immediately available for deployment by trained staff, as well as the use of spark arrestors, cleaning machinery and smoking in the forest environment.

A Fire Protection Plan will be developed by the DBC. This Plan will provide an inventory of available fire suppressant equipment, fire brigade set-up, response plans and contingency plans. The Plan will also include fire reporting and procedures for obtaining fire permits and prohibitions on materials to be burned on-site. The conditions of any burning permits will be acknowledged in the Plan. If the burning of slash and unmerchantable timber is required, the Plan will outline the communication process with the MNR to obtain approval to proceed based on fire bans and weather forecasts, as well as to confirm availability of rapid fire response resources, if required. The Fire Protection Plan will be part of the broader Environmental Management Plan.

3.5.2 Terrestrial Constraints Analysis

A terrestrial constraints analysis was undertaken by Beacon for the purpose of assessing the effects of the proposed New Post Creek Project, evaluating alternative solutions (e.g., alternative transmission line routes from the proposed powerhouse to potential interconnection locations) and recommending mitigation measures. Terrestrial features were categorized as low, moderate and high constraint based on the criteria described below. Constraints were applied to ELC polygons to assist with the spatial identification of potentially sensitive terrestrial features (see Table 3.1 and Figures 3.1a, b, c and d). These constraint ratings are intended for general consideration purposes only and should be interpreted within the context of other development constraints.

High Constraint Areas generally include areas with significant ecological features and functions, including SAR, landform/vegetation (L/V) associations that are under-represented in Ecodistrict 3E-1, waterbodies and confirmed locations of significant wildlife habitat.

Moderate Constraint Areas support moderate to high quality ecological features and functions, notably wetlands, riparian vegetation, and mature forests and swamps that may be sensitive to disturbance, but are considered common and widespread throughout the boreal region and are adequately represented in Ecodistrict 3E-1.

Low Constraint Areas include features that provide basic ecological functions. These features are typically disturbed or capable of adapting to disturbance, or not natural in origin. Areas of low constraint include recent cutovers, plantations, roads, and young/secondary forests and thickets that are capable of withstanding and adapting to disturbances. Development can generally occur in such areas with limited requirements for mitigation.

Table 3.1 Terrestrial Constraints Summary

Map Unit	Ecosite	Constraint	Constraint Rationale
1	Fresh, Silty to Fine Loamy: Aspen-Birch Hardwood	Low	Young-mid aged secondary forest, common ecosite in 3E-1
2	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
3	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
4	Organic Thicket Swamp	Medium	Mature swamp, common ecosite in 3E-1
5	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
6	Organic Shallow Marsh	Medium	Riparian wetland, common ecosite in 3E-1
7	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
8	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
9	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
10	Sparse Treed Bog	Medium	Mature bog, common ecosite in 3E-1
11	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
12	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
13	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
14	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
15	Organic Thicket Swamp	Medium	Riparian wetland, common ecosite in 3E-1
16	Black Spruce Plantation	Low	Young plantation
17	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Conifer	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
18	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
19	Spruce-Fir Conifer	Medium	Mature swamp, common ecosite in 3E-1
20	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
21	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
22	Sparse Treed Bog	Medium	Mature bog, common ecosite in 3E-1
23	Organic Thicket Swamp	Medium	Riparian wetland, common ecosite in 3E-1
24	Black Spruce Plantation	Medium	Young plantation
25	Sparse Treed Bog	Medium	Mature bog, common ecosite in 3E-1
26	Poor Fen	Medium	Wetland, common ecosite in 3E-1
27	Sparse Treed Fen	Medium	Mature fen, common ecosite in 3E-1
28	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
29	Organic Rich Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
30	Black Spruce Plantation	Low	Young plantation
31	Moist, Fine: Aspen-Birch Hardwood; Moist, Fine: Pine-Black Spruce Conifer	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
32	Poor Conifer Swamp	Medium	Mature swamp, common ecosite in 3E-1
33	Moist, Fine: Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
34	Moist, Fine: Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
35	Black Spruce Plantation	Low	Young plantation
36	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1

Table 3.1 Terrestrial Constraints Summary (Cont'd)

Map Unit	Ecosite	Constraint	Constraint Rationale
37	Black Spruce Plantation	Low	Young plantation
38	Open Water Marsh: Organic	Medium	Wetland, well represented L/V association in 3E-1
39	Open Water Marsh: Organic	Medium	Wetland, well represented L/V association in 3E-2
40	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
41	Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
42	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
43	Fresh, Clayey: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
44	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
45	Mineral Thicket Swamp	Medium	Riparian wetland, common ecosite in 3E-1
46	Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
47	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
48	Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
49	Mineral Thicket Swamp	Medium	Riparian thicket, common ecosite in 3E-1
50	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
51	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
52	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
53	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
54	Intolerant Hardwood Swamp	High	Considered significant wildlife habitat in 3E-1
55	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
56	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
57	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
58	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
59	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
60	Active Bluff	Medium	Riparian
61	Moist, Coarse: Aspen-Birch Hardwood; Moist, Coarse: Spruce-Fir Conifer	Medium	Riparian forest, common ecosite in 3E-1
62	Active Bluff	Medium	Riparian
63	Active Bluff	Medium	Riparian
64	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
65	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
66	Active Bluff	Medium	Riparian
67	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
68	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
69	Active Bluff	Medium	Riparian
70	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
71	Active Bluff	Medium	Riparian
72	Active Bluff	Medium	Riparian
73	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1

Table 3.1 Terrestrial Constraints Summary (Cont'd)

Map Unit	Ecosite	Constraint	Constraint Rationale
74	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
75	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
76	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
77	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
78	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
79	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
80	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
81	Active Bluff	Medium	Riparian
82	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
83	Active Bluff	Medium	Riparian
84	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
85	Fresh, Silty to Fine Loamy: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
86	Moist, Coarse: Spruce-Fir Conifer	Medium	Riparian thicket, common ecosite in 3E-1
87	Pine-Black Spruce Conifer	Medium	Mature forest, common ecosite in 3E-1
88	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
89	Mineral Thicket Swamp	Medium	Riparian swamp, common ecosite in 3E-1
90	Bluff	Medium	Riparian
91	Active Bluff	Medium	Riparian
92	Moist, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
93	Active Bluff	Medium	Riparian
94	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
95	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
96	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
97	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
98	Moist, Coarse: Aspen-Birch Hardwood	Medium	Riparian forest, common ecosite in 3E-1
99	Dry-Fresh, Coarse: Shrub	Medium	Riparian thicket, common ecosite in 3E-1
100	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
101	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
102	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
103	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
104	Moist, Coarse: Aspen-Birch Hardwood	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
105	Aspen-Birch Hardwood	Low	Young to mid-aged secondary forest, common ecosite in 3E-1
106	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
107	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
108	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
109	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
110	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1

Table 3.1 Terrestrial Constraints Summary (Cont'd)

Map Unit	Ecosite	Constraint	Constraint Rationale
111	Organic Shallow Marsh	High	Marsh wetland under-represented L/V type in 3E-1
112	Organic Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
113	Organic Meadow Marsh	High	Marsh wetland under-represented L/V type in 3E-1
114	Organic Meadow Marsh	High	Marsh wetland under-represented L/V type in 3E-1
115	Sparse Treed Fen	Medium	Mature fen, common ecosite in 3E-1
116	Organic Meadow Marsh	High	Marsh wetland under-represented L/V type in 3E-1 Ontario Parks
117	Active Bluff	Medium	Riparian
118	Active Cliff	High	Considered significant wildlife habitat in 3E-1
119	Organic Poor Conifer Swamp	low	Young to mid-aged conifer regeneration following logging
120	Mineral Thicket Swamp	Medium	Wetland, common ecosite in 3E-1
121	Fresh, Clayey: Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
122	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
123	Moist-Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
124	Moist-Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
125	Dry-Fresh, Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
126	Dry-Fresh, Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
127	Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
128	Dry-Fresh, Coarse Spruce-Fir Conifer	Medium	Mature forest, common ecosite in 3E-1
129	Dry-Fresh, Coarse: Jack Pine-Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
130	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging
131	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
132	Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated	Medium	Mature forest, common ecosite in 3E-1
133	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging
134	Open Water Marsh: Organic	High	Marsh wetland under-represented L/V association in 3E-1
135	Organic Shallow Marsh	High	Marsh wetland under-represented L/V association in 3E-1
136	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging
137	Fresh, Clayey: Jack Pine-Black Spruce Dominated	Low	Young to mid-aged secondary forest-regeneration following logging

[1] See Figures 3.1a, b, c and d for map unit locations.

Figure 3.1a Constraints Mapping – Transmission Line Study Area

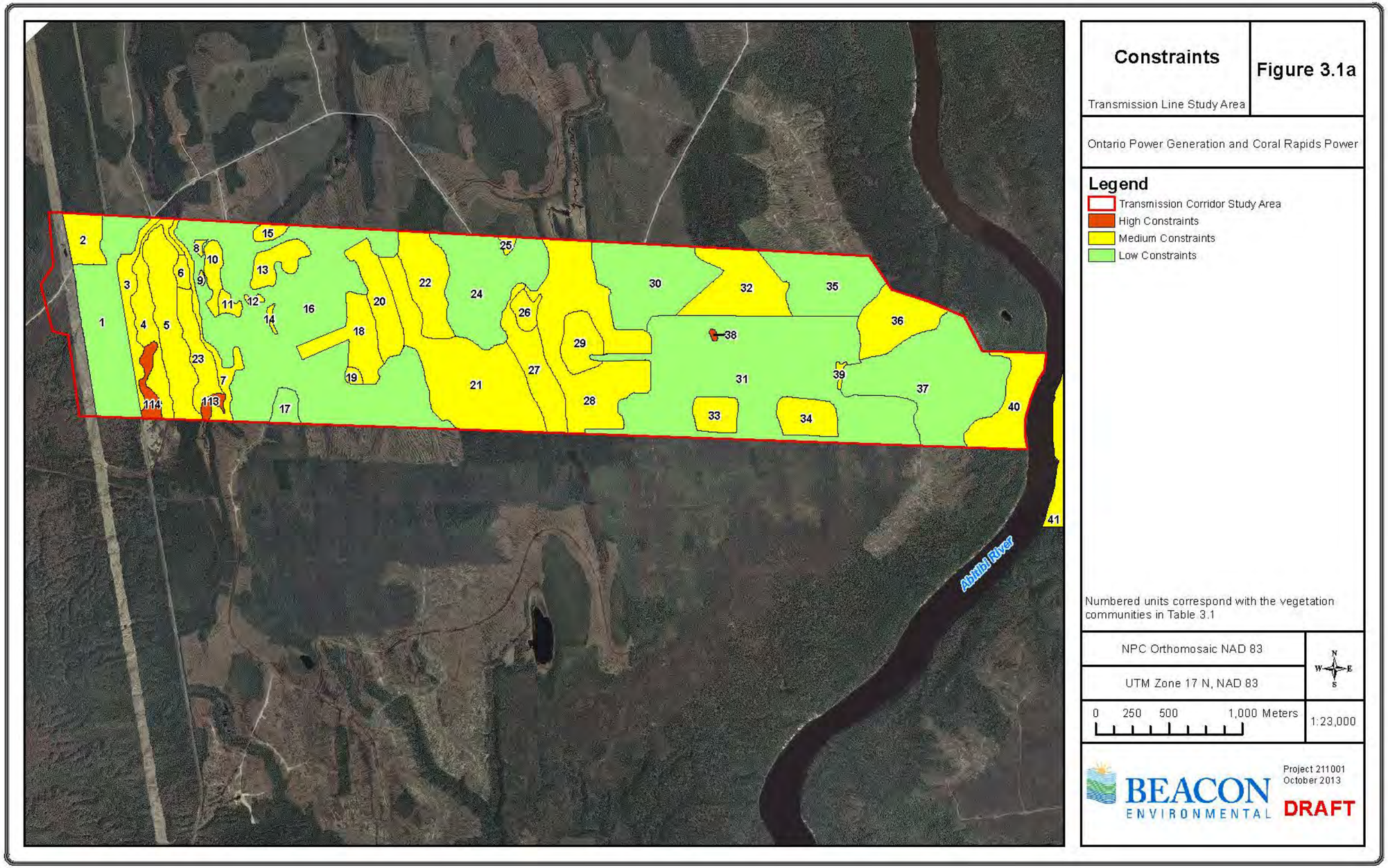


Figure 3.1b Constraints Mapping – Work Area/Laydown Zone and Downstream Riparian Study Area

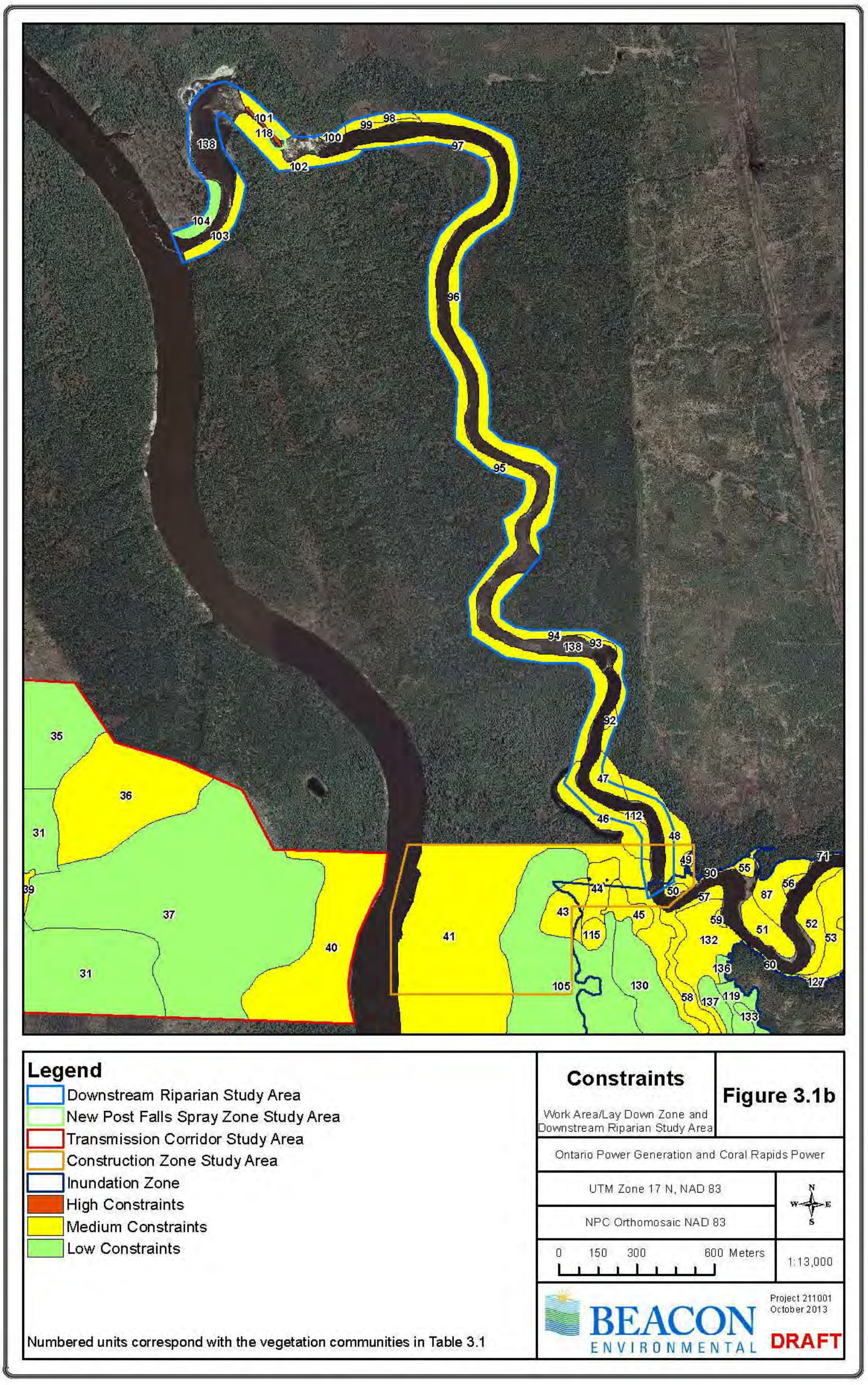


Figure 3.1c Constraints Mapping – Access Road Study Area

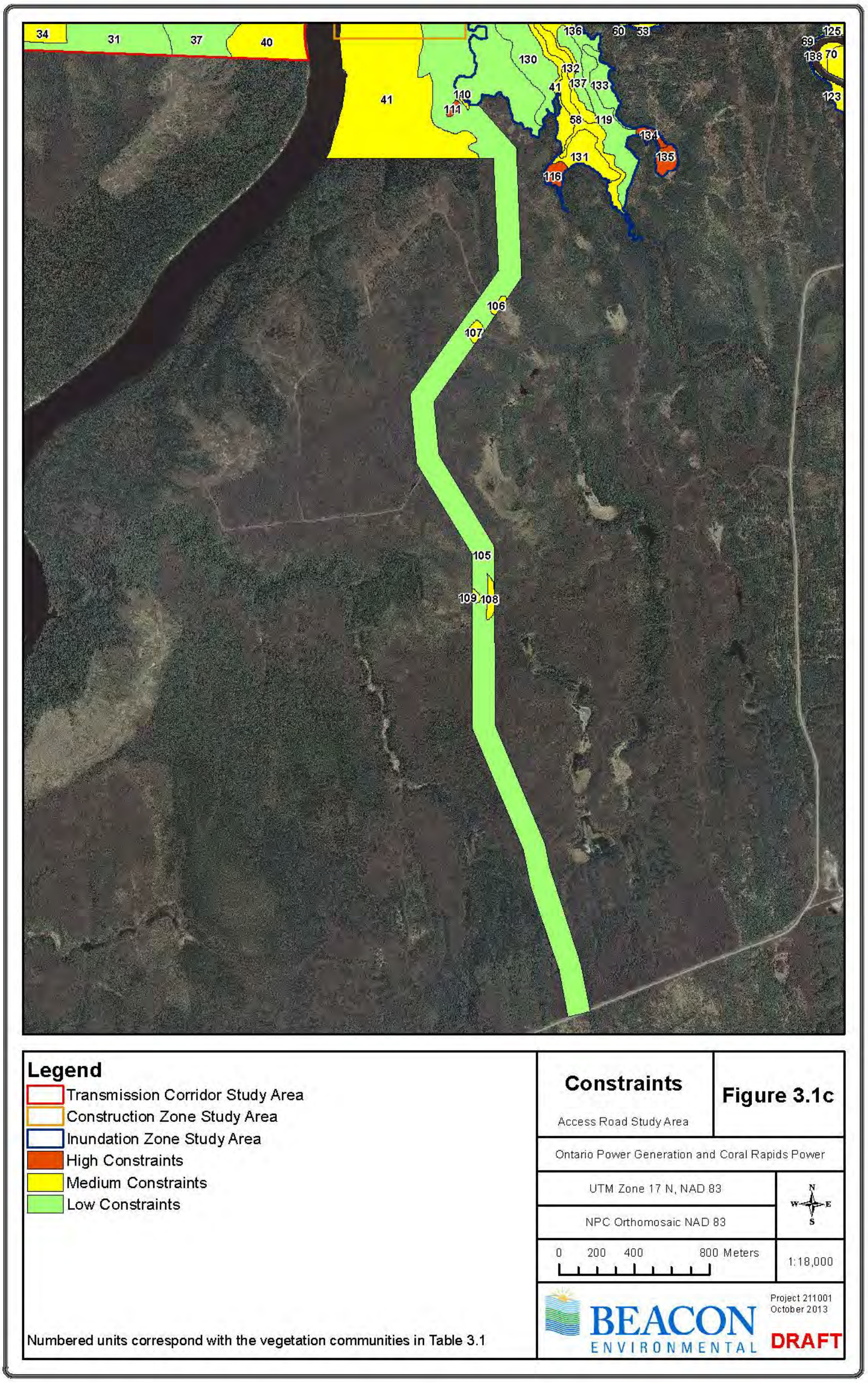
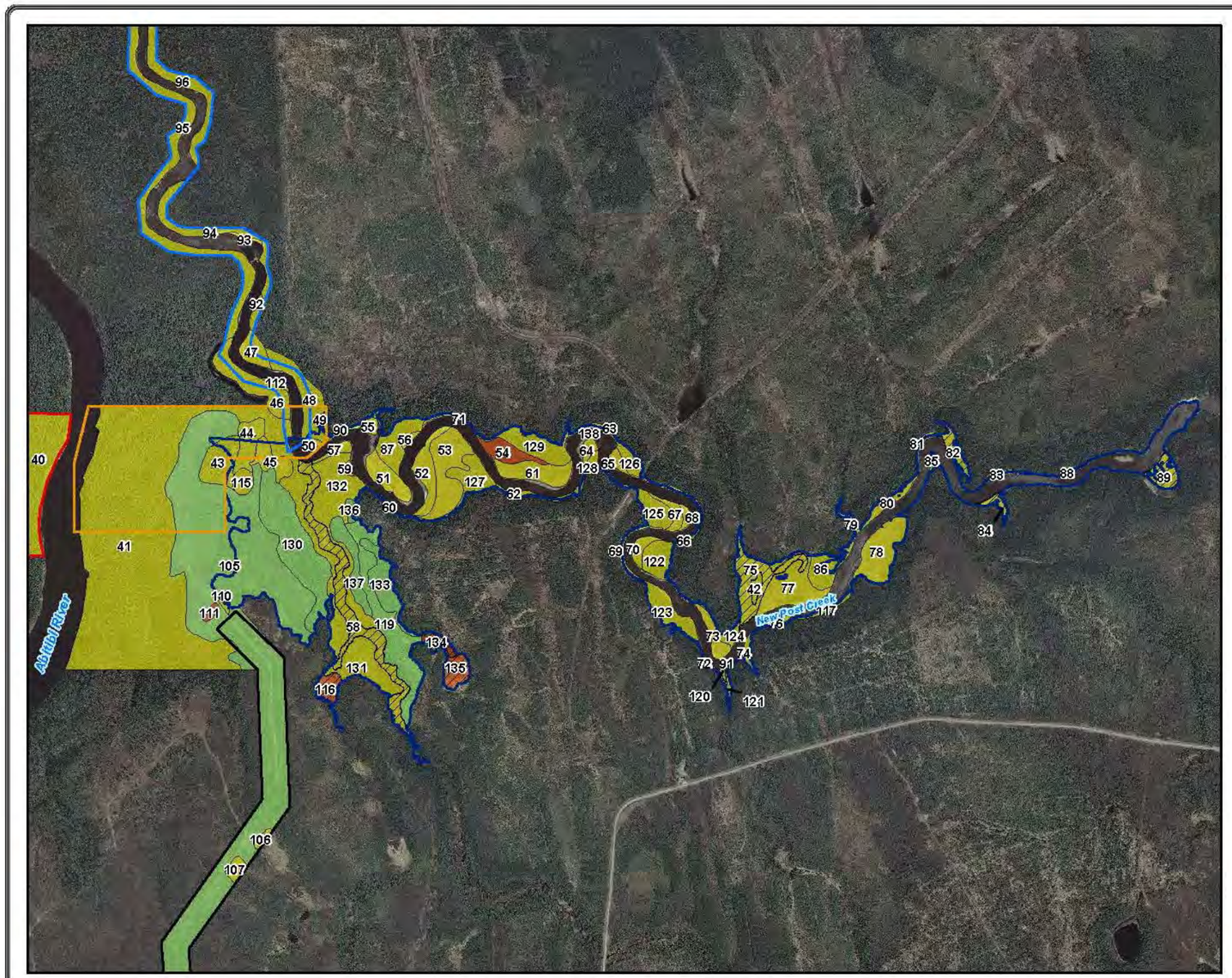


Figure 3.1d Constraints Mapping – Inundation Zone and Upstream Riparian Study Area



Constraints

Inundation Zone

Figure 3.1d

Ontario Power Generation and Coral Rapids Power

Legend

- Access Road Study Area
- Downstream Riparian Study Area
- Transmission Corridor Study Area
- Construction Zone Study Area
- Inundation Zone Study Area
- Tributary Wetlands
- High Constraints
- Medium Constraints
- Low Constraints

Numbered units correspond with the vegetation communities in Table 3.1

NPC Orthomosaic NAD 83

UTM Zone 17 N, NAD 83

0 200 400 800 Meters

1:18,000

BEACON ENVIRONMENTAL

Project 211001
October 2013

DRAFT

3.5.3 Effects of Proposed Project Components on Vegetation Communities/Ecosites

This section describes the effects of the construction of the proposed New Post Creek Project components on vegetation communities/ecosites. Table 3.2 summarizes the areas of vegetation types that will be affected by the proposed Project. Affected areas associated with the various proposed Project components, including the transmission line, laydown areas, construction/building areas and associated grading/earthworks, access roads and inundation zone are shown on Figures 3.2a, b and c.

Table 3.2 Areas of Vegetation Types Affected by the Proposed New Post Creek Project

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Aquatic	Open Water	0.2
Bluff	Active Bluff	2.4
Bog	Sparse Treed Bog	1.4
Conifer Forest	Spruce-Fir Conifer, Pine-Black Spruce Dominated	73.6
Conifer Plantation	Black Spruce Plantation	11.2
Conifer Swamp	Organic Poor Conifer Swamp, Intermediate Conifer Swamp, Rich Conifer Swamp	14.5
Deciduous Forest	Aspen-Birch Hardwood	56.1
Deciduous Swamp	Intolerant Hardwood Swamp	1.8
Fen	Poor Fen, Sparse Treed Fen	1.2
Marsh	Organic Shallow Marsh, Organic Meadow Marsh, Open Water Marsh	4.17
Mixed Forest	Aspen-Birch Hardwood/Spruce-Fir Conifer/ Pine-Black Spruce Dominated	10.1
Thicket	Alder Thicket, Willow Thicket	14.5
Thicket Swamp	Organic Thicket Swamp, Mineral Thicket Swamp	17.13
Total		**208.3**

The total area of natural vegetation types to be affected is approximately 208 ha with deciduous forest and conifer forest together comprising approximately 62% of the affected area.

3.5.3.1 Proposed Work Area and Laydown Zone Effects

A 0.5 ha forest area, consisting predominantly of Balsam Fir and Black Spruce (Map Unit 41), will be permanently displaced by the new powerhouse adjacent to the Abitibi River. Construction of the proposed penstocks and intake structure and maintenance of a 10 m ROW along the penstocks will displace the following:

- 1.8 ha of conifer forest (including portions of Map Units 41, 43, 44);
- 0.6 ha of deciduous forest (Map Unit 105); and
- 0.14 ha of thicket swamp (Map Unit 45).

Figure 3.2a Constraint Mapping – Proposed Transmission Line Project Component

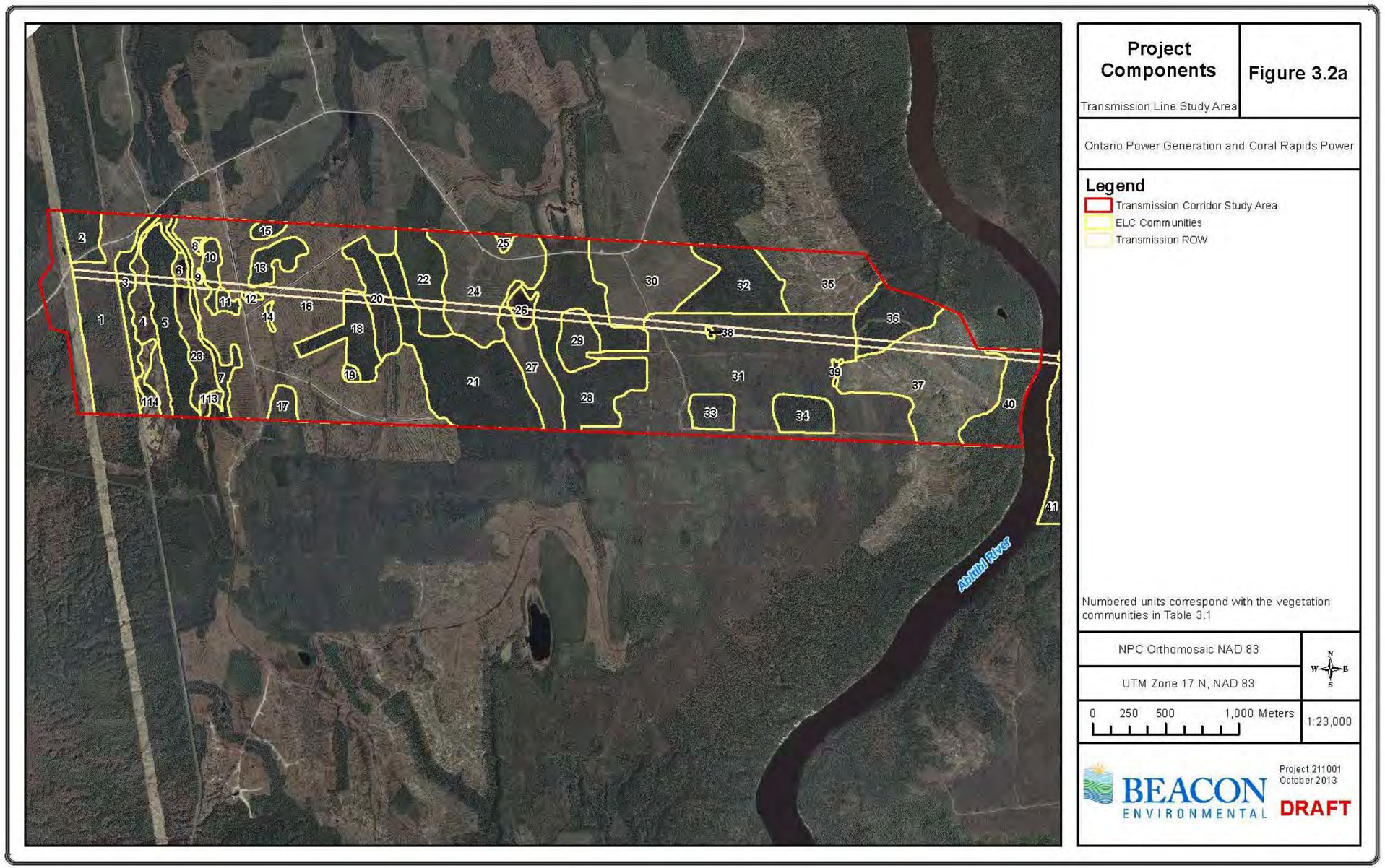


Figure 3.2b Constraint Mapping – Proposed Work Area/Laydown Zone Project Component

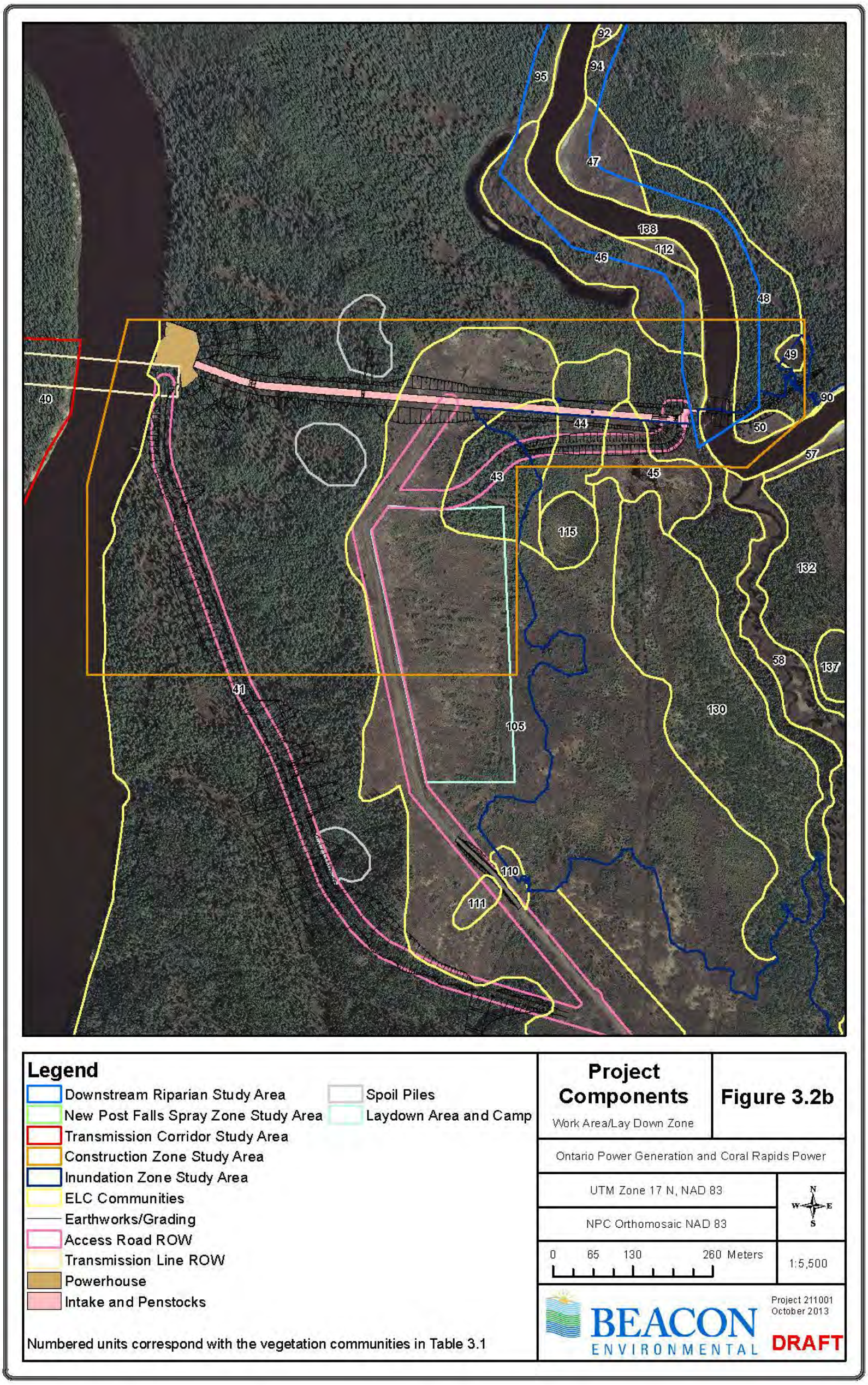
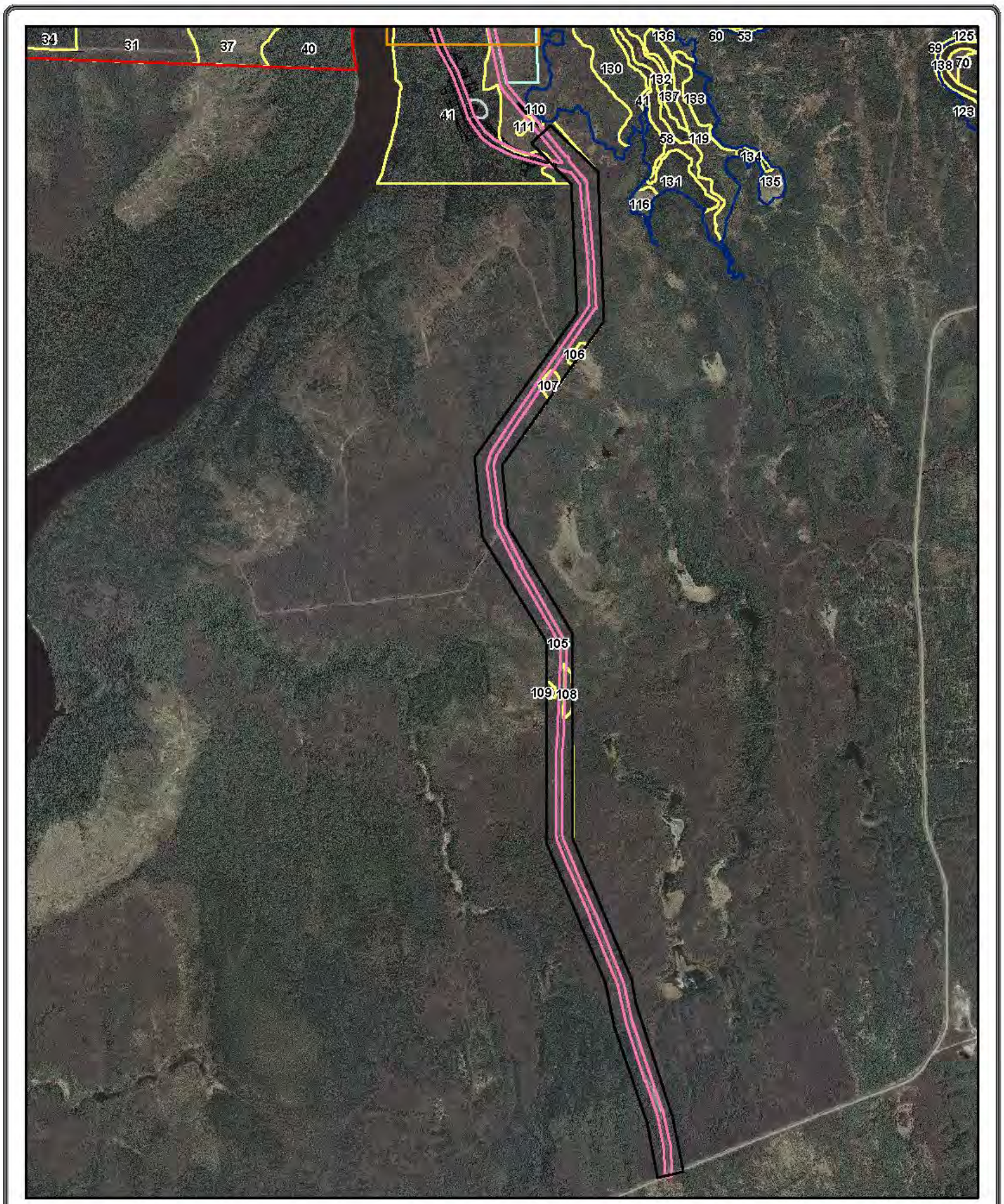


Figure 3.2c Constraint Mapping – Proposed Access Road Project Component



Legend

- Transmission Corridor Study Area
- Construction Zone Study Area
- Access Road
- Inundation Zone Study Area
- ELC Communities
- Earthworks/Grading
- Access Road ROW
- Spoil Piles
- Laydown Area and Camp

Numbered units correspond with the vegetation communities in Table 3.1

Project Components

Access Road Study Area

Figure 3.2c

Ontario Power Generation and Coral Rapids Power

UTM Zone 17 N, NAD 83

NPC Orthomosaic NAD 83

N W E S

0 200 400 800 Meters

1:18,000

BEACON ENVIRONMENTAL

Project 211001
October 2013

DRAFT

Spoil piles will displace approximately 2.3 ha of mature Black Spruce forest (Map Unit 41). This disturbance will be temporary as vegetation will regenerate and/or be replanted on the spoil pile locations following construction completion.

The proposed laydown area and camp will affect a 7.74 ha area of young to mid-aged Aspen-Birch Hardwood forest (Map Unit 105). This is a relatively disturbed area recovering from past logging. Additionally, a small 0.42 ha area of mature Spruce-Fir Conifer forest (Map Unit 43) may be cleared for the proposed laydown area and camp. The disturbance to these communities will be temporary as the area will be revegetated naturally or through active reforestation following construction completion.

Grading and earthworks associated with the construction of the proposed access roads, the powerhouse, penstocks and intake will require the removal of vegetation from several vegetation communities. The total area of vegetation that will be disturbed by the proposed earthworks is approximately 8.4 ha, with the areas of the different vegetation types potentially affected summarized in Table 3.3. It is estimated that approximately 60% of the area disturbed by the proposed earthworks will be maintained as permanently cleared areas. The remaining 40% of the area will be revegetated naturally or through active restoration after construction completion.

Table 3.3 Areas of Vegetation Types Affected by Proposed Grading/Earthworks

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Conifer Forest	Spruce-Fir Conifer, Jack Pine-Black Spruce Dominated	6.6
Deciduous Forest	Aspen-Birch Hardwood	0.7
Thicket Swamp	Organic Thicket Swamp, Mineral Thicket Swamp	1.09
Open Marsh	Organic Shallow Marsh	0.013
Total		**8.403**

The total area of vegetation types affected by the proposed powerhouse, penstocks ROW, intake structure, spoil piles, laydown area, camp and grading/earthworks is approximately 20.9 ha, of which approximately 7.5 ha will be permanently displaced.

Vegetation clearing will adhere to standard construction practices as outlined in Section 3.5.5.

3.5.3.2 Proposed Inundation Zone Effects

Water levels will be raised upstream of the proposed intake weir location up to 187.00 m.a.s.l. This amounts to an increase of about 5 m given that topographic elevations within the inundation zone range between 182 and 187 m.a.s.l.

Table 3.4 summarizes the area of vegetation types affected by the proposed inundation. The total area affected is approximately 130 ha.

Table 3.4 Areas of Vegetation Types Affected by Proposed Inundation

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Conifer Forest	Spruce-Fir Conifer, Jack Pine-Black Spruce Dominated	54
Conifer Swamp	Organic Poor Conifer Swamp	7.5
Thicket Swamp	Mineral Thicket Swamp, Organic Thicket Swamp	16
Deciduous Forest	Aspen-Birch Hardwood	27
Marsh	Organic Meadow Marsh, Organic Shallow Marsh, Open Water Marsh	3.7
Mixed Forest	Aspen-Birch Hardwood, Spruce-Fir Conifer	3
Bluff	Active Bluff	2.4
Thicket	Alder Thicket, Willow Thicket	14.5
Deciduous Swamp	Intolerant Hardwood Swamp	1.8
Total		**129.9**

Existing vegetation communities within the inundation zone will be inundated with water levels ranging from approximately 1 to 5 m, depending on the elevations at which the communities occur. Vegetation communities situated between 182 and 185 m.a.s.l, which accounts for approximately 113 ha or 66% of the inundation zone, will be flooded by 2 to 5 m of water. It is unlikely that the existing terrestrial vegetation within that zone will persist or adapt to the predicted level of flooding; therefore, the result will be the conversion of a terrestrial environment dominated by thickets and Aspen forest to an open water aquatic community.

It is expected that vegetation communities occurring between 186 and 187 m.a.s.l will experience flooding of 1 m or less. These communities may shift in form and composition to adapt to the increased water levels. Depending on the extent and duration of flooding, shrub thickets may transition to thicket swamp or open marsh. Prolonged flooding of existing forest and plantation will likely result in tree mortality and a transition to thicket swamp, marsh, or open water.

The majority of the vegetation communities that will be impacted by the inundation are common and widespread throughout the boreal range and within Ecodistrict 3E-1. However, there are several significant vegetation communities that will be impacted by the inundation, which include:

- Map Unit 54: Intolerant Hardwood Swamp;
- Map Unit 116: Organic Meadow Marsh;
- Map Unit 134: Open Water Marsh: Organic; and
- Map Unit 135: Organic Shallow Marsh.

Map Unit 54 is an intolerant hardwood swamp dominated by Balsam Poplar situated along New Post Creek. Intolerant hardwood swamp is considered to be a rare community in Ecoregion 3E and for that reason it is designated as significant wildlife habitat according to the Draft

Ecoregion 3E Significant Wildlife Habitat Criterion Schedule (MNR, 2012b). The extent of flooding predicted for this area will likely result in tree mortality and conversion to an aquatic environment.

Map Units 116, 134 and 135 are open marsh communities that developed due to flooding caused by beaver dams. Open marsh on glaciofluvial outwash is an L/V association that is considered to be under-represented in Ecodistrict 3E-1 (Morris, 2010). These communities occur at the furthest extent of the inundation; therefore, flooding will be minimal in this area. No significant changes are expected to occur in these wetlands as a result of the additional flooding resulting from the proposed Project.

The wetland area for each New Post Creek tributary to be affected by the proposed inundation is summarized in Table 3.5 and demarcated (with hatch overlay) in Figure 3.1d. It should be noted that the total areas to be inundated in Tributaries 8, 9 and 10 are wetlands.

Table 3.5 Wetland Areas of New Post Creek Tributaries to be Affected by the Proposed Inundation

Tributary	Total Watershed Area (km^2)	Total Area Classified by MNR as Swamp/Lake[1] (km^2)	Percent Watershed as Swamp/ Lake	Wetland Area to be Inundated (km^2)	Percent Wetland Area to be Inundated[2]
1 (MNR ID#523)	36.6	13.83	37.8	0.110111	0.80
2 (MNR ID#491)	0.73	0.068	9.3	0	0
3 (MNR ID#554)	0.24	0.007	2.8	0	0
4 (MNR ID#550)	5.95	1.005	16.9	0.001031	0.10
5 (MNR ID#545)	0.60	0.012	2.0	0	0
6 (MNR ID#520)	1.99	0.715	36.0	0.034560	4.83
7 (MNR ID#505)	2.66	0.617	23.2	0	0
8 (MNR ID#489)	1.27	0.204	16.0	0.003717	1.82
9 (MNR ID#509)	4.65	1.801	38.7	0.003283	0.18
10 (MNR ID#495)	0.35	0.033	9.3	0.013241	40.12

[1] Swamp = wetlands; some of the tributaries drain beaver ponds.
[2] Percentage based on total swamp and lake area classified by MNR.

As indicated in Table 3.5, approximately 16.6 ha of wetland associated with six of the ten tributaries will be inundated. Table 3.4 provides the areas of vegetation types affected by the proposed inundation. Of the total terrestrial inundation area of 129.9 ha, only 3.7 ha consist of organic meadow marsh, organic shallow marsh and open water marsh. An additional 16 ha consist of mineral thicket swamp and organic thicket swamp. Therefore approximately 84% of the total wetland area (19.7 ha) to be inundated is associated with the ten tributaries (16.6 ha). During pulsing, the wetland areas to be inundated at the minimum and maximum operating levels are 12.5 ha and 16.4 ha, respectively, a difference of only 3.9 ha.

All trees and significant vegetation (large woody shrubs) will be cleared from the proposed inundation area (see Section 3.5.5).

3.5.3.3 Effects on Downstream Riparian Environment

Erosion and sediment deposition are expected to decrease overall as a result of the reduced flows downstream of the proposed GS. It is anticipated that the overall reduction in flows (which can vary considerably within and between years) will result in the shorelines and banks being more exposed for greater periods of time, as well as some areas of the streambed being more exposed at certain times of the year. Where streambed is exposed, it will be coarse material that will provide a new, harder shoreline for the reduced stream width. Most of the finer substrate that is more prone to erosion occurs higher up along the banks, and will be subject to eroding flows less often than it is under current conditions. Where exposed areas of finer substrate are subject to erosion in periods and/or years where flows are higher, the resulting erosion is expected to stabilize over time as this creek section moves toward a new state of equilibrium under the altered flow regime. The implementation of minimum flows will help achieve a new state of equilibrium, and as the shorelines stabilize over time, vegetation such as willow and alder will become established as part of natural successional processes, further contributing to soil stabilization and erosion control.

Existing downstream shoreline and floodplain vegetation communities are expected to adapt to the change in flows and/or shift in structure and species composition in response to the changes in disturbance patterns and moisture regime. Some areas along the creek that are subject to seasonal or periodic flooding under the existing flow regime will not be flooded to the same extent under the post-development flow regime. As a result, plant species less tolerant of flooding and the associated disturbance may move into these areas. For example, alder and willow thickets currently maintained by the disturbance associated with the current flooding regime may transition to forest, while the thickets may gradually expand into open areas exposed by the reduction in water levels.

Surveys for breeding amphibians were not within the scope of the field studies for the proposed Project, therefore, data on the specific locations of amphibian breeding sites in the downstream environment and the specific species present are not available. However, based on analysis of 32 years of historical flow data, our knowledge of the site, and knowledge of amphibian species known to occur in this area, some general assumptions can be formulated about anticipated effects to downstream amphibian populations.

Under current conditions, the volume and frequency of downstream flows can vary considerably within years as well as between years. Based on 32 years of historic data, flow in May range between 30 and 235 m^3/s. As a result of the dynamic nature of this hydraulic system, amphibians that breed in the area are naturally adapted to substantial variations in the frequency and timing of flooding in the spring and throughout the year. Based on the historic flow data, an approximately 40% reduction in May flow volumes is expected to occur on

average, with a consequent reduction in flooding; however, the data indicate that in most years the predicted spring flows will exceed the 50 m^3/s to be diverted to the proposed GS. Breeding sites located at higher elevations or further inland from New Post Creek that depend on periodic flooding under the existing flow regime will be more vulnerable to the proposed reduction in flows in some years, however, these sites may be sustained by other processes such as rainfall, overland runoff and tributary inputs. Furthermore, given the dynamic nature of riverine ecosystems, it is expected that the amphibian populations present in New Post Creek have the capacity to adapt to the predicted flow reductions resulting in negligible, if any, effect.

3.5.3.4 Effects on New Post Creek Waterfalls Spray Zone

It is expected that the spray zone at the New Post Creek waterfalls will be reduced, but not eliminated, as a result of the reduction of flows downstream of the proposed spillway (see Photograph 3.1). The spray zone has created a somewhat unique microclimate in the area of the waterfalls, potentially supporting unique assemblages of species on the rock cliff and surrounding tableland. During field investigations conducted in accessible areas of the spray zone, no provincially or regionally rare plant species or communities were identified. It is not expected that the floral species composition in the area will change significantly as a result of the reduction in flows; however, the habitat for certain species that may be dependent on mist conditions will be slightly reduced.

Photograph 3.1 New Post Creek Waterfalls, September 17, 2011, Average Daily Flow of 9.17 m^3/s

3.5.3.5 Proposed Transmission Line Effects

Installation of the proposed transmission line will require clearing of vegetation within a maximum 50 m wide corridor extending from the proposed powerhouse switchyard directly west over a distance of approximately 7 km to the existing Otter Rapids GS/Abitibi Canyon GS transmission line.

Vegetation communities impacted by the transmission line include: young Black Spruce plantation (Map Units 16, 24, 30, 37), mid-aged mixed forest (Map Unit 31) and Aspen deciduous forest (Map Unit 1), mature conifer swamp/bog (Map Units 3, 5, 7, 9, 10, 11, 12, 13, 18, 20, 21, 22, 28, 29), and mature conifer forest (Map Units 36, 40).

Installation and maintenance of the transmission line will require localized removal of trees and other vegetation from these communities. The area of vegetation affected by the proposed transmission corridor is summarized in Table 3.6. The total loss of vegetation along the transmission line is approximately 33.4 ha, with Black Spruce plantation greatest affected (11.2 ha).

Table 3.6 Areas of Vegetation Types Affected by the Proposed Transmission Line ROW

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Aquatic	Open Water	0.2
Bog	Sparse Treed Bog	1.4
Conifer Forest	Spruce-Fir Conifer, Pine-Black Spruce Dominated	3
Conifer Plantation	Black Spruce Plantation	11.2
Conifer Swamp	Organic Poor Conifer Swamp, Intermediate Conifer Swamp, Rich Conifer Swamp	7
Deciduous Forest	Aspen-Birch Hardwood	1.5
Fen	Sparse Treed Fen, Poor Fen	1.2
Marsh	Organic Shallow Marsh	0.4
Mixed Forest	Aspen-Birch Hardwood, Pine-Black Spruce Dominated	7.1
Thicket Swamp	Organic Thicket Swamp	0.4
Total		**33.4**

It is expected that the DBC selected for this work will execute the construction of the transmission line likely in the winter to minimize the impact on the natural environment, particularly wet areas. Vegetation clearing along the proposed transmission line ROW will adhere to standard construction practices as outlined in Section 3.5.5.

3.5.3.6 Proposed Access Road Effects

The areas of vegetation types affected by the proposed access roads are summarized in Table 3.7. The areas of vegetation types affected by proposed earthwork/grading required for access road construction is summarized in Table 3.3.

Table 3.7 Areas of Vegetation Types Affected by Proposed Road Construction

Vegetation Class	Vegetation Types/Ecosites	Area (ha)
Conifer Forest	Spruce-Fir Conifer, Pine-Black Spruce Dominated	4.8
Deciduous Forest	Aspen-Birch Hardwood	18.6
Marsh	Organic Shallow Marsh	0.07
Thicket Swamp	Organic Thicket Swamp, Mineral Thicket Swamp	0.5
Total		**23.97**

The location of the main access road is aligned with an existing logging road, which leads to the proposed GS site from Otter Rapids Road. To improve access, the existing logging road will be upgraded. Vegetation along the logging road is comprised predominantly of young to mid-aged Aspen-Birch forest (Map Unit 105). Aligning the access road with an existing road will minimize disturbance and direct effects to vegetation; however, upgrades to the existing logging road will require the removal of trees and other vegetation from the Map Unit 105, as well as some small areas of thicket swamp (Map Units 107, 108, 110).

The main access road ROW occupies approximately 18 ha of Aspen-Birch forest, of which approximately 5 ha are occupied by the existing logging road, which will form the new road bed. The ROW also contains approximately 0.5 ha of alder and willow thicket swamp. It is assumed that 50% of the ROW area will be cleared for line-of-sight safety maintenance and 50% will be naturally re-vegetated. Therefore, the total permanent loss of forest and thicket swamp is approximately 9.25 ha.

A very small area (0.07 ha) of Map Unit 111 (Cattail Organic Shallow Marsh) falls within the access road ROW; however, only 0.013 ha (132 m^2) will be directly affected by grading associated with road construction (see Table 3.3). This community is considered significant as it is an open marsh situated on glaciofluvial outwash, which is an under-represented L/V association in Ecodistrict 3E-1 (Morris, 2010). The required grading associated with road upgrades will have a very minor effect on the wetland, and will not affect the overall functioning of the wetland provided that there are no prolonged or permanent disruptions to wetland hydrological connections.

In addition to the upgrades to the existing logging road, a new access road will be constructed within the western portion of Map Unit 41 connecting to the proposed powerhouse site. This area is comprised of mature Black Spruce mixed with Balsam Fir and occasionally Jack Pine. Some cut-and-fill is required to complete road construction in this area (effects of earthworks summarized in Table 3.3). A new access road will also be constructed to the proposed intake

weir location through Map Units 43 and 44 (Spruce-Fir conifer forest), and Map Unit 45 (Mineral Thicket Swamp). A total of 5 ha of conifer forest will be removed to create the new roads to the proposed powerhouse and intake weir location; however, it is assumed that 50% of the ROW area will be naturally re-vegetated. A small area (0.2 ha) of thicket swamp (Map Unit 45) will be permanently removed from the ROW along the proposed intake weir access road.

As indicated in Section 1.3.1.2, Parliament Loop Road may be used to access the east bank of New Post Creek at the proposed intake weir location. If it is to be used, the DBC will be responsible for the completion of a comprehensive ground-truthing of vegetation communities along the road.

Vegetation clearing along the access roads will adhere to standard construction practices outlined in Section 3.5.5.

3.5.4 Significant Plant Species

No floral species documented at the construction locations during the field surveys or within the local study area based on examination of the NHIC (2012) and Environment Canada, CWS (2010/2011) databases are designated to be at risk by COSEWIC (2012) or COSSARO (MNR, 2013). Similarly, no significant plant species listed in the Abitibi River WMP were documented in the local study area (see Table 2.10). The majority of the plant species observed during the field surveys were ranked by NHIC (2010) as S5 (secure), while several were ranked S4S5 (apparently secure to secure), S4 (apparently secure), S4? (apparently secure; rank uncertain), or SNA (conservation status rank not applicable). Removal of these plant species will have negligible effect on their overall populations in Ontario.

As indicated in Section 2.5.5, a number of plant species in the proposed Project study area are listed as “rare” or “scarce” by Baldwin (1958) and Riley (2003). Most of these will be directly or indirectly affected by the proposed Project, as discussed below.

Beaked Hazel, Pussy Willow, Bracken Fern, American Mountain-ash and Longstalk (Peduncled) Sedge are considered “rare” by Riley (2003) in the Hudson Bay Lowlands. However, these species were occasionally or frequently encountered during field surveys within the proposed Project area as well as surrounding lands. These species likely occur more frequently south of the Hudson Bay Lowlands. In some cases Tea- (Flat-) leaved Willow may have been misidentified as Pussy Willow. Individuals and populations of these species will be affected by the proposed Project; however, there is not expected to be a significant decrease in the regional numbers of these species as a result of the proposed Project.

Black (Bear) Sedge was recorded in Plot 40 along the proposed access road and will likely be removed by upgrades to the existing logging road. This species is listed as “frequent” by Baldwin (1958) and “rare” by Riley (2003). It likely occurs more frequently south of the Hudson Bay Lowlands.

Canada Yew was recorded in Plot 23. It is listed as "rare" and "occasional" by Riley (2003) and Baldwin (1958), respectively. The distribution of this species within the Project area is unknown. This species in Plot 23 will be removed due to construction of the proposed powerhouse.

Kentucky Fescue, while considered "rare" by Riley (2003), is an exotic species and not a conservation concern.

Daisy (Hyssop-leaved) Fleabane was observed in the spray zone near the top of New Post Creek waterfalls. This species will be indirectly affected by a possible reduction in the quantity of mist in the area and perhaps longer periods of drought. Prolonged periods of drought may have a negative effect on this species in the area; however, the species will likely persist.

Dwarf Rattlesnake-plantain was recorded in Plots 26, 29 and 66. These plants will be directly removed as a result of construction-related activities and flooding. This species is listed as "scarce" by Baldwin (1958) and "occasional" by Riley (2003).

Scouring Rush, listed as "rare" and "occasional" by Riley (2003) and Baldwin (1958), respectively, was observed in Plots 47 and 74 within the proposed inundation zone, and likely occurs elsewhere along the shores of New Post Creek. These occurrences will be lost as a result of the flooding.

Variegated Horsetail was recorded in Plot 81 at the furthest extent of the inundation zone. It was also observed in other areas that will not be directly affected by the proposed Project; as a result, effects to this species will be insignificant.

Leafy White (Tall White Bog) Orchid and Nagoonberry (Stemless Raspberry) were recorded in Plot 11, south of the proposed transmission line ROW, and will not be affected by the proposed Project. Water Dock was recorded in Plot 4, also south of the proposed transmission line ROW, and therefore, will not be affected.

3.5.5 Standard Vegetation Clearing Construction Practices

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

- Vegetation clearing should be avoided during the migratory bird nesting season, if possible (see Section 3.7);
- Vegetation clearing should be restricted to the minimum necessary for construction activities;
- Brush and trees should be felled into the area to be cleared to prevent damage to adjacent vegetation;
- Branches overhanging the cleared area should be cut (pruned) cleanly and stubs shall not be dressed;
- Merchantable timber is to be sorted and stacked according to the MNR requirements on the acquired Forest Resource Licence (FRL);

- Residual non-merchantable timber could be left in piles for public fuelwood use subject to MNR's direction;
- All remaining slash material will either be burned or chipped according to MNR directives at the time of harvesting;
- Chipped material should be spread so as to lower the incidence of forest fire; and
- Slash material should not be stored near any water bodies.

Along with the above general vegetation clearing measures additional direction is provided for CRP/OPG's plan to clear the reservoir (flooded) area associated with the proposed GS. This is being done to:

- reduce mercury effects (a detailed discussion of mercury effects is provided in the Aquatic Environment TSD);
- eliminate trees, vegetation and related material as barriers to navigation and/or safety hazards in the flooded areas;
- ensure harvest (including wood supply directives) are appropriately permitted;
- reduce the amount of debris collecting at the proposed GS; and
- protect the riparian edge.

CRP/OPG will ask the DBC to follow the Ontario Provincial Standard (OPS201) definition of "Close cut clearing", i.e., the cutting of all standing trees, brush, bushes and other vegetation at original ground level and the removal of felled material and windfalls.

The following is a preliminary description of the proposed headpond/reservoir clearing to be given to the DBC to minimize the amount of available organic material available for promotion of mercury methylation:

- clearing, cleaning and removal of all trees and significant vegetation (large woody shrubs) from the proposed inundated area;
- trees should be harvested using full-tree logging method with branches and tops removed at landings rather than in the proposed inundated area;
- clearing to the high water mark of the proposed reservoir plus an additional 1 m back to prevent trees and vegetation from falling into the reservoirs;
- all cleared material to be removed from the potential inundated area;
- all merchantable timber to be stacked to roadside;
- harvest to be conducted in the winter to lessen the amount of site disturbance;
- the DBC to obtain a FRL for the authority to cut the wood;
- as the FRL is issued under the *Crown Forest Sustainability Act,* all specified conditions and requirements to be followed by the DBC (note that it is expected that the DBC will hire a qualified and experienced sub-contractor forest harvesting company in Ontario);
- the FRL to also indicate where wood is to be directed including rights of refusal on the wood (it is impossible to know the specifications at this point as this would be based on the market/industry conditions at the time of the clearing);

- all non-merchantable material (slash, such as tops and branches, vegetation, stumps and other woody material) to be utilized as firewood, ground to mulch or burned with approval to be obtained by MNR;
- all sorting, grinding and/or burning to be done away from the inundated area and preferably at or near roadside; and
- all access roads and skidder paths used to gain access to the proposed reservoir to be decommissioned so as to prevent public access to the new reservoir area, including the destruction of all roads, removal of all water crossings (including culverts) and the successful re-planting of road beds.

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

3.5.6 Transmission Line ROW Vegetation Control

Vegetation control will be required along the transmission line ROW to ensure that specified minimum safety clearances from conductors are maintained. As indicated in Section 1.3.2.3, vegetation control will involve a combination of manual and mechanical approaches. Based on commitments made to the Aboriginal communities, no chemical treatment will be utilized for vegetation management. Vegetation management will be infrequent and performed on six or seven year cycles.

3.6 WETLANDS AND ENVIRONMENTALLY SIGNIFICANT AREAS

As indicated in Section 2.6, the nearest designated natural area is LAPP, located proximate to the proposed Project property. The Replacement Lands regulated into LAPP increased Park size by approximately 212 ha and enhanced its overall ecological integrity. However, land deregulation to permit the proposed Project to proceed resulted in the disjunction of LAPP as the waterway class portion is no longer a continuous system.

The Pinard Moraine CR, located west of the Abitibi River approximately 8 km from the proposed GS location and 30 m west of the proposed transmission line interconnection with the existing 115 kV transmission line connecting Otter Rapids GS with Abitibi Canyon GS. This large 18,201 ha protected area was regulated on April 21, 2005 (MNR, 2005b). This earth science feature is very prominent, rising up to an elevation of 54 m above its surroundings. A timber haul road bisects the Pinard Moraine CR. Upon regulation, this road continues to be used by the forestry industry for access to areas north of the CR as per agreements made between MNR and the industry. CRP/OPG proposes to use this road for access to the interconnection location of the proposed transmission line with the existing Hydro One 115 kV transmission line. An AoC prescription for use of this road may be required from the MNR.

Due to the geographic separation, construction and operation of the proposed New Post Creek Project will have no effect on other more distant environmentally significant areas.

Based on the Provincial Policy Statement (OMMAH, 2005), development and site alteration shall not be permitted in significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. There are no significant wetlands within the local study area (NHIC, 2012); however, wetland evaluations have not been undertaken in northern Ontario to the extent in southern Ontario.

3.7 WILDLIFE

The potential effects of environmental noise on wildlife are presented in Section 3.1.2.

3.7.1 Proposed Inundated Area Creation

The area to be inundated above the proposed intake weir covers 170 ha of which 37 ha is existing New Post Creek and its tributaries. A summary of terrestrial habitat area to be inundated is presented in Table 3.4.

A number of terrestrial bird species utilize the proposed inundation area as nesting habitat. Most of these species are protected under the Migratory Birds Convention Act. The Canadian Wildlife Service (CWS) has stipulated that vegetation clearing shall not be undertaken during the breeding season of migratory birds in order to avoid the destruction of any occupied bird nests. Specifically, clearing shall not take place between about May 1 and July 31 in northern Ontario. Otherwise, a breeding bird survey must be conducted by a qualified avian biologist and any nests found must not be disturbed by the clearing activity until the young have fledged. A species-specific buffer zone restricting active construction activities is usually applied around a nest. The CWS will be consulted for the appropriate mitigation measures. To preclude the potential institution of a buffer zone that may affect construction activities, it is recommended that vegetation (including grubbing) be removed prior to nesting season initiation (May 1), and/or after nesting season completion (July 31).

As indicated in the Aquatic Environment TSD, reservoir creation results in decomposition of flooded organic matter and increased rates of mercury methylation. The methylmercury (MeHg) can be transferred from aquatic food webs to terrestrial organisms. For example, Gerrard and St. Louis (2001) reported increased MeHg concentrations in nestling Tree Swallows near an experimental reservoir; however, no overt toxicological effects were observed. In fact, an increase in dipteran productivity (the primary food source) after reservoir creation resulted in earlier nest initiation, larger eggs, and faster growth rates of wing and bill length in nestlings reared during the post-flood years.

Similarly, Des Granges *et al.* (1994) reported that total mercury (THg) concentrations were significantly higher in the feathers of adult Osprey and nestlings proximate to reservoirs. Despite this much higher THg exposure, the number of young fledged was not statistically different between nests located near reservoirs and located near lakes and rivers. The results

suggested that growing feathers, either in molting adults or in nestlings, provide an excretion pathway for THg.

Weech and Scheuhammer (2006) assessed reproductive success and productivity of Bald Eagle nesting proximate to Pinchi Lake historically impacted by mercury mining activities, including the direct deposition of mercury mining-related wastes. Reproductive success and average productivity of the Bald Eagles over the study period were 62% and 0.98 chicks/territory on Pinchi Lake compared to 64% and 1.17 chicks/territory on five unaffected lakes. Despite elevated THg concentrations in adult eagle blood, the birds from Pinchi Lake appeared to be in excellent condition. The adult eagle with the highest THg concentration was one of the most productive birds in the study area, having successfully raised two eaglets in each of the summers of 2001 and 2002.

A Human Health Risk Assessment (HHRA) was undertaken as part of the EA of the proposed Keeyask Generation Project (KGP), a 695 MW hydroelectric GS on the Nelson River in northern Manitoba (Wilson, 2012). The proposed KGP will result in a new reservoir approximately 93 km^2 in area consisting of 48 km^2 in existing waterway and 45 km^2 of newly inundated lands. Based on the HHRA, Muskrat was the only mammal that was predicted to have increased tissue concentrations of mercury following impoundment. However, the predicted increases were considered to be very minor, i.e., from 0.02 to 0.04 µg/g. No measurable changes in mercury tissue concentrations under post-impoundment condition were predicted in Moose, Beaver and Snowshoe Hare.

Grassy Narrows First Nation (2010) reported low mercury concentrations in the flesh of herbivorous wildlife (White-tailed Deer, Moose, Snowshoe Hare, Beaver, Muskrat, Partridge (Spruce Grouse) and Ruffed Grouse) from the mercury-contaminated Wabigoon-English River watershed, i.e., generally below the detection limit of 0.005 µg/g. Mercury concentrations were higher in kidney and liver samples of White-tailed Deer, Moose and Beaver that were analyzed. Mercury concentrations in the flesh of carnivorous mammals was generally higher, e.g., ranging from <0.005 to 0.38 µg/g in Marten, 0.49 to 4.4 µg/g in Mink, 0.57 µg/g in Raccoon and 1.0 to 2.6 µg/g in River Otter. As the extent of mercury availability due to the proposed Project headpond is significantly smaller, similar or lower mercury concentrations in local mammals are expected.

3.7.2 Proposed Project Construction

Areas to be disturbed by construction encompass approximately 208 ha (Table 3.2). Part of this area consists of temporary disturbance (camps, borrow pits, laydown areas) that will be rehabilitated following construction. As indicated in Section 3.4, a Site Rehabilitation Plan will be developed by the DBC. Rehabilitation will include planting native tree species typical of the specific ecosite.

A number of proposed borrow pits have been identified as potential aggregate sources (see Figure 1.19). Upon selection of the sites to be used by the DBC, terrestrial surveys will be

undertaken of the borrow areas and associated access. No fieldwork was conducted at these sites.

As indicated in Section 2.7.1, the lands around the proposed Project are designated as Classes 4 and 6 with moderate and severe limitations, respectively, for the production of Moose. According to NRVIS data, there are no season wildlife concentration areas within the proposed Project area; however, the NRVIS data show a Moose late wintering area approximately 1 km west of the existing Otter Rapids GS/Abitibi Canyon GS transmission line. With the exception of the Moose late wintering area and two Woodland Caribou wintering areas (see Section 3.8), no other significant wildlife habitat was identified within or proximate to the local study areas based on review of the MNR NRVIS database (see Section 2.7.5).

As indicated in Section 3.1, the construction disturbance will be sufficiently local that little displacement of wildlife will occur. Any resident animals can relocate temporarily to avoid noise and disturbance associated with construction activities. Once construction of the proposed Project is completed, any displaced animals could reoccupy the habitat created on the rehabilitated areas and the habitat not directly affected by construction activities.

All construction workers will be given an orientation on environmental management including a focus on non-harassment of wildlife. Moreover, construction workers as a term of their employment agreement will not be allowed to hunt, fish or trap. All sanitary waste and food sources will be properly managed so as to reduce the incidence of wildlife feeding.

During operation, noise will be generated from the proposed Project powerhouse. This steady noise from the proposed plant is not expected to elicit an adverse reaction from wildlife due to habituation.

Overall, the construction and operation of the proposed New Post Creek Project will have minimal effect on wildlife populations or wildlife-carrying capacity of the areas.

3.7.3 Construction Traffic

Any large scale resource development in northern Ontario could lead to road development and resultant increased access for hunters and other resource users to exploit or disturb wildlife. Most of the proposed GS development can be constructed based on the existing road network. The exception to this is approximately 530 and 1,450 m of new road that will be constructed to the proposed intake and powerhouse locations, respectively.

Increased road traffic has the potential to increase disturbance to wildlife and animal mortality due to vehicle accidents (road kills).

Vehicular traffic along Highway 634 to the proposed Project site will include: delivery trucks for equipment and supplies, waste haul vehicles, occasional visits in personal vehicles by management and technical staff, stakeholders, etc. Daily vehicle traffic rates will be mitigated

as most workers will be living in the construction camp. Because of these mitigation measures, CRP/OPG would expect the total number of vehicles to the site every day to be less than 50.

There would also be some significant truck traffic from the proposed borrow areas to the main proposed Project site. This could result in a couple hundred truck movements per day for up to a year.

All drivers who will regularly transport workers, equipment and materials to the site will be given a training session on the importance of road speeds and wildlife, particularly with respect to Moose and Black Bear. In addition, close tracking of vehicle/wildlife incidents should be undertaken to investigate, develop and implement corrective/preventative measures on an ongoing basis throughout the construction period.

Increased road kill of birds will likely occur with the increased traffic. However, traffic volume and speed along the access roads will be relatively lower than that on highways; and therefore, additional mortality can be expected to be small.

CRP/OPG does not plan on permanently staffing the proposed GS. However, periodic visits are made by staff for inspections, maintenance and repair. Overall, CRP/OPG expects that this would result in less than one vehicle per day.

3.7.4 Proposed Project Operation

As indicated in Section 3.7.2, once construction of the proposed Project is completed, any displaced animals could reoccupy the habitat created on the rehabilitated areas, and the habitat not directly affected by construction activities. The steady noise from the proposed Project powerhouse during operation is not expected to elicit an adverse reaction from wildlife due to habituation.

The proposed GS facilities footprint (including the headpond) will result in the permanent loss of approximately 121 ha of forest cover, whereas clearing of the proposed transmission line ROW will result in loss of approximately 30 ha of forest cover that will be replaced by graminoid, forb and shrub communities depending on vegetation management. The overall effect of loss of forest habitat on bird populations is uncertain because breeding habitat may not be limiting for some species (e.g., species limited by wintering habitat or other mortality factors) and displaced birds may be able to occupy vacant territories nearby. Habitat removal will affect local bird species, but the largely boreal forest habitat that will be removed is common in the local study area and adjacent landscape. Songbirds that breed in the boreal forest are adapted to large-scale disturbances such as wildfire. The permanent conversion of forest to open and aquatic habitats represents approximately 1% of the forestry resources assessment broad study area.

Two significant wildlife habitats were confirmed by Beacon during site-specific field investigations, i.e., Cliffs and Talus Slopes (at the New Post Creek waterfalls); and Hardwood Swamps (Balsam Poplar community along New Post Creek). The Cliffs and Talus Slopes

habitat will likely be affected by decreased flows in New Post Creek downstream of the proposed Project resulting in diminution of its area. The Hardwood Swamps habitat will also likely diminish in size due to the proposed upstream inundation (headpond).

Electrocution and collisions with transmission lines have been reported for large bird species. However, electrocution and collisions is expected to be minimal due to the short length of the transmission line and the implementation of the following mitigation measures:

- markers (e.g., marker cones and/or coloured spiral markers) will used to increase the visibility of the proposed transmission line crossing the Abitibi River; and
- appropriate "Suggested Practices" outlined in APLIC (2006), e.g., minimizing the use of guy wire.

After construction of the proposed transmission line ROW, shrub- and ground-nesting migratory birds could potentially be affected by vegetation management practices (manual and/or mechanical). Based on commitments made to the Aboriginal communities, no chemical treatment will be utilized for vegetation management. To mitigate negative effects, vegetation management activities will take place outside the main breeding season (May 1 to July 31). If this is not possible, a breeding bird survey prior to vegetation management activities must be conducted by a qualified avian biologist to determine if any nests are present, and any nests found must not be disturbed by the clearing activity until the young have fledged. A species-specific buffer zone restricting active maintenance activities is typically applied around a nest location.

The potential effects of electric and magnetic fields (EMF) on wildlife, much like the effects of EMF on humans, are a subject of continuing debate. The World Health Organization report on environmental effects of EMF concluded that effects of EMF associated with major electric technologies are few, generally minor in nature and confined to the vicinity of high-powered sources (Foster and Repacholi, 2002). It was further concluded that "human EMF exposure limits recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) would also be protective of the environment." The proposed Project will be well within the recommended ICNIRP limits.

3.8 SPECIES AT RISK

As indicated in Section 3.5.4, no SAR plant species were documented during the field surveys or within the local study area based on examination of the NHIC (2012) and Environment Canada, CWS (2010/2011) databases.

As indicated in Section 2.7.1, the proposed Project is located within the "Kesagami Caribou Range". No Woodland Caribou, designated as Threatened federally (COSEWIC, 2012) and provincially (MNR, 2013), have been recorded within 5 km of the proposed Project GS site (M. Gauthier, MNR, 2011, pers. comm.), likely due to the presence of roads and clearings.

According to NRVIS data, Woodland Caribou wintering areas occur approximately 4 km north and 3 km south of the proposed transmission line. The MNR will use a caribou habitat screening tool to assess the cumulative impacts of the proposed Project on the local caribou population and range (R. Stewart, MNR, 2011, pers. comm.).

As indicated in Tables 2.9 and 2.10, most native mammal and avian species likely present in the local study area are ranked by the NHIC (2010) as S5 and S4, i.e., secure and apparently secure in Ontario, respectively. All of the herptofauna species are ranked by the NHIC (2010) as S5 and S4.

Bald Eagle, designated Special Concern provincially (MNR, 2013) but Not At Risk federally (COSEWIC, 2012), was observed in the summer of 2011 along the Abitibi River shoreline near the proposed Project powerhouse location (see Table 2.11). However, the only recorded raptor nest is located approximately 1 km north of the proposed Project within LAPP along the Abitibi River.

Canada Warbler, designated as Threatened federally and Special Concern provincially, and Rusty Blackbird, designated Special Concern federally but Not At Risk provincially, have been recorded as possibly breeding in the 10-km by 10-km grids overlapping the New Post Creek Project area (Table 2.10). Olive-sided Flycatcher, designated as Threatened federally and Special Concern provincially, may also be present in the proposed Project area (Beacon, 2010). Two additional avian SAR have distribution ranges overlapping the Project area, i.e., Short-eared Owl, designated Special Concern federally and provincially, and Golden Eagle, designated of Special Concern provincially but Not At Risk federally (Environment Canada, CWS, 2010/2011). As indicated in Section 3.7.1, the CWS has stipulated that vegetation clearing should not be undertaken during the breeding season of migratory birds in order to avoid the destruction of any bird nests (May1 to July 31). Otherwise, a nest survey must be undertaken prior to clearing with a buffer established for any nests located that would be maintained until the young have fledged. Adherence to this requirement will mitigate any potential adverse effects on these avian SAR.

The distribution range of Monarch, designated Special Concern federally and provincially, also overlaps the proposed Project area. With the absence of milkweed, the proposed Project site does not provide preferred habitat for the Monarch which has not been recorded within the local study area (NHIC, 2012).

4.0 SUMMARY AND CONCLUSIONS

This TSD provides a terrestrial environmental baseline, as well as the potential environmental effects of the proposed New Post Creek Project on the terrestrial environment and the recommended mitigation measures to minimize these effects. The report also includes an evaluation of potentially significant natural heritage resources to evaluate compliance with federal and provincial legislation and policies.

During proposed Project construction, potential effects on the terrestrial environment may occur due to fugitive dust; combustion emissions, noise, blasting, soil erosion, incidental spills, hazardous materials use, waste generation, vegetation clearing, partial plantation loss, increased human activity and displacement of nesting birds. Based on an assessment of the available baseline information and potential effects, as well as the implementation of the recommended mitigation measures, it is concluded that effects during construction will be minimal, localized and short-term.

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

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

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

During construction and operation, an Environmental Compliance Monitoring Programs will be implemented to ensure all construction and operation related commitments are met. Details on the Environmental Compliance Monitoring Programs are provided in the ER, and include monitoring of vegetation growth along the transmission line ROW and the success of re-planting programs on areas temporarily disturbed during construction after one complete growing season with subsequent monitoring of any sites requiring additional re-planting.

Table 4.1 summarizes potential construction and operation effects, the recommended mitigation/remedial measures to minimize or obviate these effects and the net effects.

Table 4.1 Summary of Potential Effects and Recommended Mitigation/ Remedial Measures

Effect	Recommended Mitigation/Remedial Measure	Net Effect
Construction		
Air quality/fugitive dust	• Use of well-maintained equipment to minimize combustion emissions. • Use of water trucks and/or sprinklers (e.g., Cheminfo, 2005).	Negligible effect
Noise	• Use of well-maintained equipment and noise silencers (as required).	Negligible effect
Blasting	• Adherence to blasting engineer recommendations.	Negligible effect
Soil erosion	• Adherence to Erosion and Sediment Control Plan.	Negligible effect
Incidental spills of oil, gasoline and other liquids during construction	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect
Hazardous materials/ waste	• Adherence to Hazardous Materials Management Plan and Waste Management Plan. • Waste disposal in accordance with regulatory requirements.	Negligible effect
Vegetation clearing	• Adherence to standard construction practices. • Implementation of the Site Rehabilitation Plan.	Negligible effect
Partial plantation loss	• Forest Renewal Trust Fund compensation.	Negligible effect
Loss of productive forest	• None recommended: permanent loss represents approximately 1% of productive forest in the local study area.	Negligible effect
Organic Meadow Marsh disturbance	• Avoidance by proposed transmission line routing	Negligible effect
Increased human activity	• No harassment of wildlife. • No fishing, hunting or recreational ATV use.	Negligible effect
Displacement of nesting birds	• Vegetation clearing to be undertaken outside the migratory bird breeding season (01 May to 31 July).	Negligible effect

Table 4.1 Summary of Potential Effects and Recommended Mitigation/ Remedial Measures (Cont'd)

Effect	Recommended Mitigation/Remedial Measure	Net Effect
Operation		
Noise	• Ambient noise levels will be localized.	Negligible effect
Incidental spills of oil, gasoline and other liquids during operation	• Adherence to Spills Emergency Preparedness and Response Plan.	Negligible effect
Inundation	• None recommended: dominant vegetation communities adapted to disturbance and water level fluctuations; some communities may transition to other type. • None recommended: significant wildlife habitat associated with Intolerant Hardwood Marsh (Map Units 113 and 114; see Figure 3.1a) will likely increase in size due to inundation. • None recommended: significant wildlife habitat associated with Hardwood Swamp (Map Unit 54; see Figure 3.1d) will likely diminish in area due to the proposed inundation.	Negligible effect Net benefit Minor effect
Flow reduction	• None recommended: significant wildlife habitat associated with Active Cliff (Map Unit 118; see Figure 3.1b) will likely diminish in size due to flow reduction.	Minor effect

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6.0 ACRONYMS AND ABBREVIATIONS

Acronyms

~	Approximately
$	Dollar
=	Equals
≥	Greater than or equal to
>	Greater than
<	Less than
≤	Less than or equal to
-	Minus
#	Number
+	Plus
A	Abundant or Abundant to Common
ACNBC	Associate Committee on the National Building Code
AES	Atmospheric Environment Service
AMEC	AMEC Earth & Environmental
AoC	Area of Concern
APLIC	Avian Power Line Interaction Committee
ARF	Abitibi River Forest
ARFMI	Abitibi River Forest Management Inc.
ATV	All-terrain vehicle
Beacon	Beacon Environmental
BMP	Best Management Practice
B.P.	Before present
c.	Chapter
C	Common
CEAA	*Canadian Environmental Assessment Act*
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
cf.	confer (compare with)
Cheminfo	Cheminfo Services Inc.

CLI	Canada Land Inventory
CO	Carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CR	Conservation Reserve
CRP	Coral Rapids Power Inc.
CWS	Canadian Wildlife Service
DBC	Design Build Contractor
DFO	Department of Fisheries and Oceans
Dr.	Doctor
EA	Environmental Assessment
EA Act	*Environmental Assessment Act*
EBR	Environmental Bill of Rights
Ed.	Editor
e.g.	For example (exempli gratia)
ELC	Ecological Land Classification
EMF	Electric and magnetic fields
EPRI	Electric Power Research Institute, Inc.
ER	Environmental Report
ESA	*Endangered Species Act*
et al.	And others (et alia)
etc.	And so on (et cetera)
F	Frequent
FMP	Forest Management Plan
FRI	Forest Resource Inventory
FRL	Forest Resource Licence
FSL	Full Supply Level
FTG	Free-To-Grow
Golder	Golder Associates Limited
GPS	Global Positioning System

GS	Generating Station
H	Horizontal
HBC	Hudson's Bay Company
HHRA	Human Health Risk Assessment
Hydro One	Hydro One Networks Inc.
ICNIRP	International Commission on Non-Ionizing Radiation Protection
i.e.	That is (id est)
IESO	Independent Electricity System Operator
Inc.	Incorporated
KGP	Keeyask Generation Project
KGS Group	Kontzamanis, Graumaun, Smith, MacMillan Inc.
LAPP	Little Abitibi Provincial Park
LP	Limited Partner
L/V	Landform/vegetation
Max.	Maximum
MeHg	Methylmercury
MNR	Ontario Ministry of Natural Resources
MOE	Ontario Ministry of the Environment
MoU	Memorandum of Understanding
N	North
na	Species not listed or no status provided
NA	Not applicable
NECC	North East Control Centre
NEFEC	Northeastern Ontario Forest Ecosystem Classification
NHIC	Natural Heritage Information Centre
NO_x	Nitrogen oxides
NRVIS	Natural Resources Values Information Centre
NW	Northwest
O	Occasional or Occasional to Infrequent
OBM	Ontario Base Map

OGS	Ontario Geological Survey
OMMAH	Ontario Ministry of Municipal Affairs and Housing
ONR	Ontario Northland Railway
OPG	Ontario Power Generation Inc.
OPIAM	Ontario Parks Inventory and Monitoring Program
OWA	Ontario Waterpower Association
OWA Class EA	Class Environmental Assessment for Waterpower Projects
pers. comm.	Personal communication
PM	Particulate matter
PPCRA	*Provincial Parks and Conservation Reserves Act*
Project	New Post Creek Hydroelectric Project or New Post Creek Project
PTTW	Permit-To-Take-Water
R	Rare
ROW	Right-of-way
S	South or Scarce
S1	Critically imperiled – due to extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the Province
S1S2	Critically imperiled to imperiled
S2	Imperiled – because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the Province
S2?	Imperiled, rank uncertain
S2S3	Imperiled to vulnerable
S3	Vulnerable – due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
S3?	Vulnerable, rank uncertain
S3S4	Vulnerable to apparently secure
S4	Apparently secure – uncommon but not rare with some cause for long-term concern due to declines or other factors
S4?	Apparently secure, rank uncertain
S4S5	Apparently secure to secure

S5	Secure – common, widespread and abundant in the Province
SAR	Species at risk
SARA	*Species at Risk Act*
SARO List	Species at Risk in Ontario List
S.C.	Statutes of Canada
SENES	SENES Consultants
SH	Possibly extirpated (historical) – species occurred historically in the Province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20 to 40 years.
SIA	System Impact Assessment
SNA	Not applicable – a conservation status rank not applicable because the species is not a suitable target for conservation activities
SNR	Not ranked, conservation status not yet assessed
SO_2	Sulphur dioxide
sp.	One species
spp.	Two or more species
ssp.	Subspecies
SW	Southwest
THg	Total mercury
TSD	Technical Support Document
TTN	Taykwa Tagamou Nation
V	Vertical
var.	Variety
VC	Very common
VOCs	Volatile organic compounds
W	West
WMP	Water Management Plan
WMU	Wildlife Management Unit
USFWS	United States Fish and Wildlife Service

Measurement Units

°	Degree
‘	Minute
“	Second
cm	Centimetre
dBA	A-weighted sound pressure level
°C	degree Celsius
°F	degree Fahrenheit
GWh	gigawatt-hour
h	Hour
ha	hectare
km	Kilometre
km^2	square kilometre
km/h	kilometre per hour
kV	Kilovolt
L	Litre
m	Metre
m.a.s.l.	metre above sea level
mm	Millimetre
m^2	square metre
m^3	cubic metre
m^3/s	cubic metre per second
MW	Megawatt
µg/g	microgram per gram
NMm^3	net merchantable cubic metres
%	Percent
rpm	revolution per minute

7.0 GLOSSARY

Alluvium	Material deposited by rivers.
Amphibole	A group of double chained inosilicate minerals whose basic chemical unit is the tetrahedron (SiO_4); they are common rock forming minerals and are found in most igneous and metamorphic rocks.
Anode Cathodic Protection	Technique use to control corrosion of a metal surface by making it a cathode of an electrochemical cell by connecting the metal to be protected with another more easily corroded metal to act as the anode of the electrochemical cell.
Anthropogenic	Man-caused; due to man's activities.
AoC Prescription	Mitigation direction prescribed by the MNR to minimize or obviate a potential adverse effect on a habitat value or feature.
Argillaceous	Describing rocks or sediments containing particles that are silt- or clay-sized, <0.625 mm in size.
Avifauna	Birds.
Basalt	A fine-grained, dark-coloured volcanic rock, the extrusive equivalent of gabbro.
Bedload	The solid debris transported in a stream on or near its bed; because this material is too heavy to be carried in suspension, it is moved by rolling, sliding or saltation (sudden jumps) along the bottom.
Biotite	Common rock-forming mineral of the mica group
Bog	Peatland with the water table at or near the surface with the surface often raised above the surrounding terrain; strongly acidic and extremely nutrient-poor; ground cover of *Sphagnum*, usually with ericaceous shrubs (of the family Ericaceae).
Boreal	Of the north.
Breccia	A clastic rock composed of broken, angular rock fragments larger than 2 mm in diameter and enclosed in a fine-grained matrix.

Bulkhead	A steep or vertical wall retaining an embankment, often used to line shorelines, maintain embankment stability and absorb the energy of waves and currents.
Cambrian Period	The oldest period of the Paleozoic Era; it began about 600 million years ago and lasted perhaps 100 million years; during this time, the seas teemed with primitive invertebrate fish.
Canal	A channel dug or built to carry water.
Capacity	The greatest load which a unit, station or system can supply (usually measured in kilowatts, megawatts, etc.).
Cenozoic Era	The most recent geologic era which began with the end of the Cambrian Period, about 70 million years ago.
Cervid	Pertaining to the deer family (Cervidae).
Chlorophyll	A class of pigments found in all photosynthetic organisms; chlorophyll molecules are the principal sites of light absorption in the light reaction of photosynthesis.
Chlorosis	Loss or reduction of green plant pigment or chlorophyll; generally, yellowing.
Clastic	Rock typically composed of broken rock fragments, e.g., conglomerate and sandstone.
Cofferdam	A temporary dam made of concrete, rockfill, sheet-steel piling, timber/timber-crib or other non-erodible material and commonly utilized during construction to exclude water from an area in which work is being executed.
Conglomerate	A clastic sedimentary rock consisting of more or less rounded rock particles at least 2 mm in diameter, embedded in a fine-grained matrix of sand or silt.
Coniferous Forest	The largest terrestrial biome on earth (also known as the Taiga or boreal forest) extending in a broad band across North America, Europe and Asia to the southern border of the arctic tundra and usually dominated by one or two species of evergreen trees.
Crepuscular	Appearing (active) in twilight.

Crest gate (control gate)	The gate that controls water flow into a hydroelectric dam.
Dam	A concrete or earthen barrier constructed across a river and designed to control water flow or create a reservoir.
Deciduous Forest	In the Northern Hemisphere, this forest type occurs to the south of the coniferous forest and is dominated by broadleaved deciduous hardwood trees typically with a five- to six-month growing period.
Diabase	Fine-grained intrusive igneous rock of a composition similar to basalt, but is slightly more coarse-grained.
Dike	The vertical veins of igneous rock that form when magma enters and cools in fractures found within the crust.
Draft tube	The flared passage leading vertically from a water turbine to its tailrace.
Dyke	Embankment against flooding.
Ecodistrict	A subdivision of an ecoregion based on distinct assemblages of relief, geology, landform, soils, vegetation, water and fauna; an ELC system mapping unit usually mapped at a scale of 1:500,000 to 1:125,000.
Ecological Land Classification (ELC)	The Canadian classification of lands from an ecological perspective; an approach that attempts to identify ecologically similar areas.
Ecoregion	An area characterized by a distinctive regional climate as expressed by vegetation; an ELC system mapping unit usually mapped at a scale of 1:3,000.000 to 1:1,000,000.
Ecosite	A landscape area consisting of typical, recurring associations of vegetation types and substrate types combinations; an ELC system mapping unit usually mapped at a scale of 1:50,000 to 1:10,000.
Electric and Magnetic Fields (EMF)	Electric fields are produced by voltage and increase in strength as the voltage increases. Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as current increases.
Endangered	A species facing imminent extirpation (no longer existing in the wild in Canada, but occurring elsewhere) or extinction (no longer exists).

End (Terminus) Moraine	Ridge of till deposited at the terminus of a glacier.
Ericaceous	Plants belonging to the Heath (Ericaceae) family; require acidic soil with pH less than 7
Esker	A long, narrow ridge of poorly stratified glaciofluvial sand and gravel, usually deposited by a subglacial stream between banks of ice.
Extirpation	Elimination of a species in the wild of a particular area (e.g., Canada), but occurring elsewhere.
Feldspar	A group of common aluminum silicate minerals that contains potassium, sodium or calcium; the most important group of rock-forming minerals, making up about 60% of the rocks in the earth's crust.
Feldspathoid	A mineral chemically similar to feldspar but containing less silica.
Felsic Igneous	An igneous rock having abundant light-coloured minerals (quartz, feldspars, feldspathoids, muscovite) in its mode.
Fen	Peatland with water table at or just above the surface and with very slow internal drainage by seepage; more nutrient-rich than bogs; sometimes occurs as a floating mat; vegetation consists of sedges, mosses, shrubs and sometimes a sparse tree layer.
Ferro-humic Podzols	Well and imperfectly drained soils that have developed under coniferous and mixed-forest vegetation and intermediate moisture conditions and usually found in cold to temperate climates on acid parent materials.
Fluvial	Of watercourses.
Forb	A herbaceous flowering plant that is not a graminoid (rushes, grasses and sedges).
Forebay	The part of a dam's reservoir that is immediately upstream from the powerhouse.
Freshet	High flows caused by snow melt, runoff, heavy rains and/or high inflows.
Gabbro	A coarse-grained plutonic rock containing plagioclase feldspar, most commonly labradorite.

Garnetiferous	Exhibiting a common crystal structure but varying in occurrence and also in chemical and physical properties.
Generator	A machine that changes water power, steam power, or other kinds of mechanical energy into electricity.
Geotechnical	Concerned with the physical properties of soil, rock and groundwater usually in relation to the design, construction and operation of engineered works.
Glaciofluvial	Of glacial watercourses.
Glaciolacustrine	Of glacial lakes.
Gleysol	An order of soils developed under wet conditions and permanent or periodic reduction.
Gneiss	A coarse-grained metamorphic rock commonly composed of quartz and feldspar, with lesser amounts of mica.
Graminoid	Includes rushes (Juncaceae), grasses (Poaceae) and sedges (Cyperaceae).
Granite	Medium to coarse grained igneous rock that is rich in quartz and potassium feldspar.
Granodiorite	A plutonic rock consisting essentially of quartz, sodic plagioclase and lesser amounts of hornblende and biotite.
Granulite complex	Metamorphic rock formation composed of equal-sized interlocking grains.
Head	The difference in elevation between the water surface at the intake and tailrace.
Headpond	The reservoir from which the hydroelectric facility draws water flow for generation.
Headwater	The section of a river or stream with the highest elevation above sea level.
Herb (Herbaceous)	A non-woody vascular plant.
Hibernacula	A protected area with stable non-freezing temperatures, such as a burrow, where snakes survive the winter.

Holocene Epoch	The last (recent; postglacial) epoch of the Quaternary Period; it began at the end of the Pleistocene Epoch, about 10 million years ago and continues to the present.
Hornblende	Dark green to black rock-forming mineral of the amphibole group found in both igneous and metamorphic rocks.
Hydraulic	Of water conveyed through a pipe or channel.
Hydric	Containing water.
Igneous	Rocks formed from the solidification of molten magma either beneath (intrusive igneous rock) or at (extrusive igneous rock) the earth's surface.
Intake	A structure which regulates the flow of water into a water-conveying conduit.
Ion	An atom that is either negatively or positively charged.
Labradorite	A plagioclase feldspar that is the major constituent of gabbro and basalt.
Lacustrine	Of lakes.
Lek	A communal display ground or mating arena where males of a species display to attract females during the breeding season.
Lentic	Slow flowing or still water, e.g., in ponds and lakes.
Lithification	Process by which sediments are consolidated into sedimentary rock.
Lotic	Flowing water, e.g., in streams and rivers.
Luvisols	Well and imperfectly drained soils that have developed under deciduous or mixed forest cover in moderate and cool climates.
Mafic	Rock that is rich in calcium, magnesium and iron content.
Magma	Molten or fluid material generated from rock deep within the earth that may force its way upward into the crust (as igneous rock) or onto the surface (as lava).
Marsh	Standing or slow-moving water with emergent plant cover >25%, permanently flooded, intermittently exposed, or seasonally flooded.

Mesozoic Era	The era of geologic time from the end of the Paleozoic, 225 million years ago, to the beginning of the Cenozoic, about 70 million years ago (called the “Age of Reptiles”).
Metamorphic	A rock that forms from the recrystallization of igneous, sedimentary or other metamorphic rocks through pressure increase, temperature use, or chemical alteration.
Metamorphism	A process that produces a change in the chemistry, structure or mineralogic composition of solid rock, usually due to temperature and/or pressure changes.
Metasedimentary	Metamorphosed sedimentary rock (despite metamorphism, the original sedimentary rock protolith can be recognized).
Metavolcanic	Metamorphosed volcanic rock (despite metamorphism, the original igneous rock protolith can be recognized).
Mica	Silicate mineral that exhibits a platy crystal structure and perfect cleavage.
Migmatite	A rock of both metamorphic and igneous origin that exhibits characteristics of both rocks, probably formed through the heating (but not melting) of rocks in the presence of abundant fluids.
Mixwoods Forest	A mixture of coniferous and deciduous forests.
Moraine	A landform generally composed of till and created by glacial action.
Muscovite	A mineral, hydrous potassium aluminum silicate, a member of the mica group of minerals and commonly known as white mica.
Muskeg	A term describing a type of landscape, environment, vegetation and deposit; peatland and organic terrain are equivalent terms generally referring to northern landscapes characterized by a wet environment and vegetation (e.g., Black Spruce) botanically classified as mire (subdivided into bogs and fens).
Necrosis	Death of living tissues, characterized by browning and drying.
Organic	Soils that have developed from accumulations of organic materials such as grasses, reeds, rushes, sedges, mosses and ferns.
Outwash	Detritus and waste materials carried away by the water of melting glaciers.

Overburden	The soil, rock and other material which lies on top of the underlying mineral or other deposit, e.g., bedrock
Paleozoic Era	The era of geologic time from the end of the Precambrian, 600 million years ago, to the beginning of the Mesozoic Era, about 225 million years ago; the beginning of Paleozoic time, which marks the start of the first accurate records in geologic history, is characterized by the appearance and development of the major types of invertebrates.
Passerines	Perching birds (of the Order Passeriformes).
Peat	Partly decomposed plant material; refers to soil containing >30% organic matter by weight.
Pegmatite	An extremely coarse-grained igneous body closely related genetically to large masses of fine-grained plutonic rocks; it may be present as a vein or a dike in the granular igneous rock, but more commonly is found completely enclosed within the neighbouring country rock.
Peneplain	A low almost featureless surface reflecting a base level of erosion.
Penstock	A structure associated with a hydroelectric station, designed to carry water from the intake to the turbine.
Perennial	Continuing, enduring or growing through the year or through many years.
pH	Indicates the balance between the acids and bases in water and is a measure of the hydrogen ion concentration in solution.
Photosynthesis	The process which takes place in green plants by which simple sugars are manufactured from carbon dioxide, water and mineral nutrients with the aid of chlorophyll within the plant cells in the presence of light.
Pier	As part of a hydroelectric station, an abutment extending from the station, either upstream or downstream, and lending foundation support and directionality to water passed through the structure.
Plagioclase	A type of feldspar that is rich in sodium and calcium.
Pleistocene Epoch	The earliest epoch of the Quaternary Period; it began 2 to 3 million years ago and lasted until the Holocene Epoch, approximately 10,000 years ago and was a time of widespread continental glaciation.

Pluton	Any rock of molten origin that forms a large body within the earth's crust when it solidifies.
Pneumatic	Involving the mechanic properties associated with air or other gas pressure.
Powerhouse	A primary part of a hydroelectric facility where the turbines and generators are housed and where power is produced by falling water rotating turbine blades.
Precambrian	Encompasses the time between the origin of the earth and the appearance of complex forms of life about 600 million years ago, and is believed to be equivalent to as much as 90% of the earth's 405-billion-year history.
Proglacial Lake	Formed either by the damming action of a moraine or ice dam during the retreat of a melting glacier, or one formed by meltwater trapped against an ice sheet due to isostatic depression of the crust around the ice.
Protolith	Pertaining to the previous mineralogical composition/structure.
Pyroxene	One of a group of minerals closely related in structure, chemical composition and physical properties; the pyroxenes are inosilicates in which the SiO_4 tetrahedrons are linked into chains by sharing oxygens.
Quartz	A mineral: an oxide of silicon which is abundant and widespread occurring as an important constituent in many igneous, sedimentary and metamorphic rocks.
Quaternary Period	The second and youngest period of the most recent Cenozoic Era (also called the Age of Mammals); the Quaternary Period began 2 to 3 million years ago and consists of two epochs, the Pleistocene and the Holocene (known also as Recent).
Reservoir	A body of water collected and stored in an artificial lake behind a dam.
Rhizome	Prostrate root like stem emitting roots; rootstock.
Riparian	Of or on a river bank.
Runner	An enclosed water wheel that transforms the static and kinetic energy of the water into useful work.

Sandstone	A type of sedimentary rock that contains a large quantity of weathered quartz grains.
Sedimentary	Rock formed by the deposition, alteration and/or compression and lithification of weathered rock debris, chemical precipitates, or organic sediments.
Sluice	An open channel designed to divert excess water which could be within the structure of a hydroelectric dam or separate of the main dam (see spillway).
Sluice gate	Gate used to regulate the flow of water through an opening usually used to pass water over or around dams.
Sodic	Containing sodium.
Special Concern	A species with characteristics that make it particularly sensitive to human activities or natural events.
Species	A group of closely related individuals which can and normally do interbreed to produce fertile offspring.
Sphagnum	Moss.
Spillway	A passageway, or channel, located near or at the top of a dam through which excess water is released or “spilled” past the dam without going through the turbine(s); as a safety valve for the dam, the spillway must be capable of discharging major floods without damaging the dam while maintaining the reservoir level below some predetermined maximum level.
Stop log	A gate (sometimes made from squared lumber) which can be placed into an opening to shut off or regulate the flow of water.
Swamp	Wooded mineral wetland or peatland.
Tailrace	A channel through which the water flows away from a hydroelectric plant following its discharge from the turbine(s).
Tailwater	The water from a generating station after it has passed through the turbine.
Talus	A sloping heap of loose rock fragments lying at the foot of a cliff or steep slope.

Terrestrial	Belonging, living on or growing in the earth or land.
Threatened	A species likely to become endangered if limiting factors are not reversed.
Till	Material derived from bedrock and overlying unconsolidated material and deposited directly by glacial ice with its characteristics dependent on the source rocks.
Trash rack	Bar screen with larger space openings installed to prevent logs, stumps and other larger solids from penetrating the intake.
Turbine	A mechanism in an electrical generation facility which converts the kinetic and potential energy of water (in the case of hydroelectric turbines) into mechanical energy which is then used to drive a generator converting mechanical to electrical energy.
Varved	Characterized by a pair of thin sedimentary layers, one thicker and one thinner, deposited within a one-year period.
Vascular	Made up of vessels or ducts for conveying water.
Weir	A dam in the river to stop and raise the water.

APPENDIX A

FOREST RESOURCES ASSESSMENT REPORT (Fleming, 2012)

Forest Resources Assessment
for
TERRESTRIAL ENVIRONMENT TECHNICAL SUPPORT DOCUMENT FOR THE NEW POST CREEK HYDROELECTRIC PROJECT

Prepared for:
SENES Consultants Limited

Prepared by: 

April 18, 2012

_____ _____

Mark Fleming, R.P.F. Date
Forester, Fleming Forestry

TABLE OF CONTENTS

LIST OF TABLES

Page No.

LIST OF FIGURES

Page No.

1.0 INTRODUCTION

This report provides the baseline conditions, effects assessment and mitigation measures for the forest resources component of the New Post Creek Hydroelectric Project (New Post Creek Project or Project) proposed by Coral Rapids Power Inc. (CRP), a wholly owned corporation of the Taykwa Tagamou Nation (TTN), and Ontario Power Generation Inc. (OPG). The information presented in this report has been summarized in the Terrestrial Environment Technical Support Document (TSD) for the proposed Project.

1.1 PROPOSED DEVELOPMENT

Table 1.1 and Figure 1.1 present the area affected by the proposed Project components and their locations, respectively.

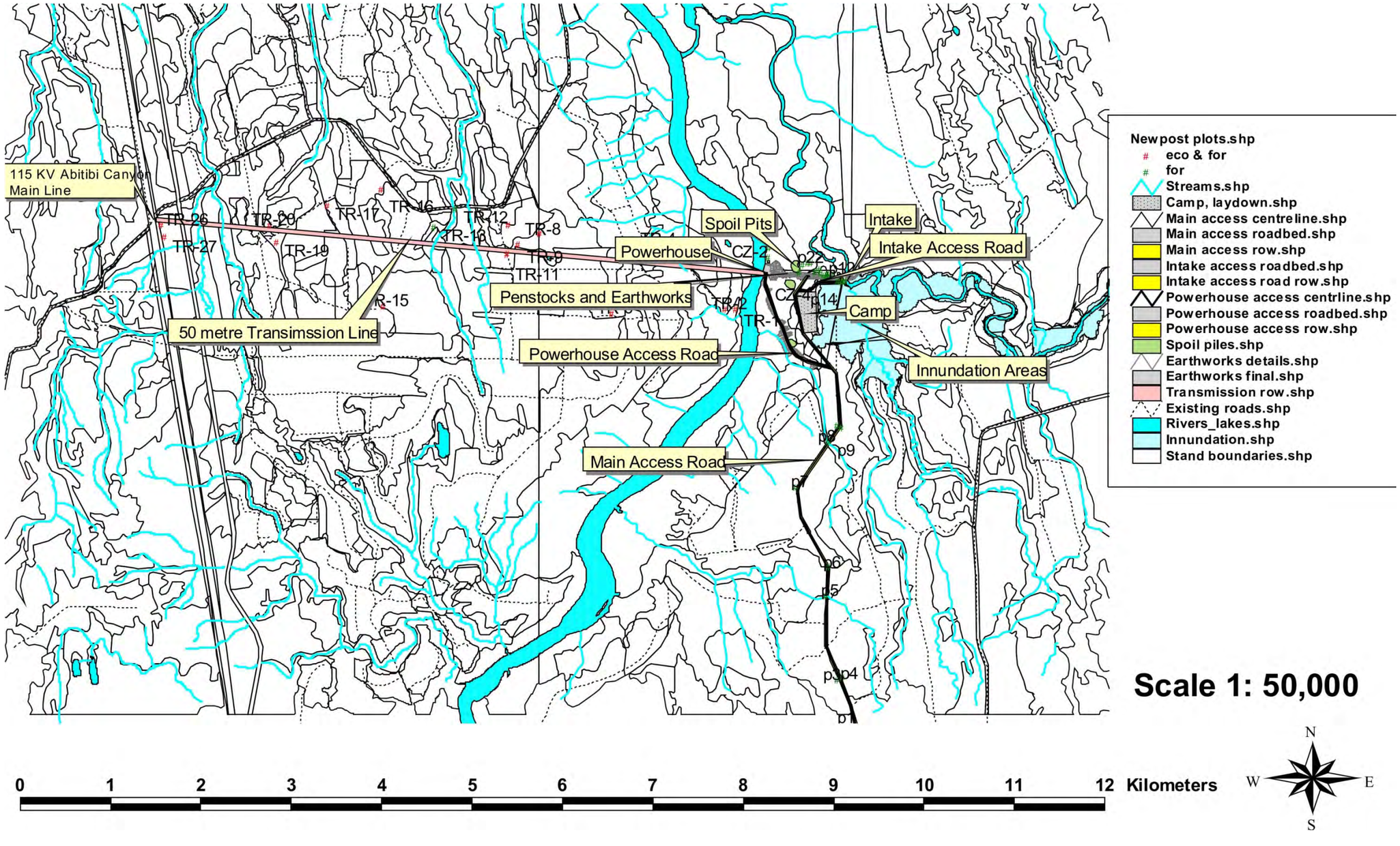
Table 1.1 Quantification of Areas Affected by Proposed Project Components (ha)

Project Component	Permanent Loss of Area[1]	Temporary Loss of Terrestrial Area[1]	Creation of New Water Area
Camps (maximum)	NA[2]	8	NA
Borrow Areas (maximum)	NA	NA	NA
Access Roads	15	9	NA
Intake and Spillway Structures	<1	<1	
Power Canal, Penstocks, Powerhouse and Tailrace	7	7	NA
Switchyards and Substations	<1	<1	NA
Inundation	169	NA	131
Transmission Line ROW (maximum)[3]	34	NA	NA
Total	225	24	131

[1] Includes New Post Creek, associated tributaries and land base.
[2] NA=not applicable.
[3] Based on 50 m width.

A broad study area (12,003 ha) was delineated that is used as a reference to depict the broader ecosystem and forest conditions surrounding the proposed Project. The transmission line right-of-way (ROW) width was assessed based on the maximum tree heights in the area. Given a maximum tree height of 26.5 m, a 50 m ROW would be adequate.

Figure 1.1 Proposed New Post Creek Hydroelectric Project



The transmission ROW, main access road and work areas, which include the site access road, parking areas and laydown areas, would be cleared of vegetation for the proposed Project. This provides a total cleared area of 56 ha.

Existing access to the proposed Project is excellent. Provincial Highway 634 (Fraserdale Highway) and Otter Rapids Road provide all-weather access to Fraserdale and the Otter Rapids Generating Station (GS), respectively. To reach the proposed Project site, there is existing 6.1 km clay-topped operational road extending north from Otter Rapids Road to New Post Creek and the Abitibi River. This is a single-lane road that was constructed by grubbing and heaping the clay soil to create a sub-grade, with portions topped with sand or gravel. This road is assumed to have been constructed in 1980 to provide access for harvesting and has subsequently not received maintenance.

This operational road would have to be brought up to branch road standards by widening the ROW to approximately 45 m for line of sight, as well as widening the sub-grade and traveled surface to accommodate two-lane travel, large floats, equipment and construction materials. Since the area has already been harvested in 1980, the trees are generally not merchantable so they can be crushed or chipped to widen the ROW. Road upgrade would involve sub-grade widening, ditching, culvert replacements and re-surfacing with crushed gravel.

The operational road has two permanent water crossings, i.e., Ontario Ministry of Natural Resources (MNR) water crossings ID#589 and ID#635, of unnamed watercourses discharging into the Abitibi River. In addition, there are six cross-drainage culverts to facilitate seasonal water flows and preclude pooling along the road. Culvert replacements would require permits from the MNR.

Aggregate material is in short supply in the area and would have to be obtained either from aggregate areas licensed to OPG or another operator. Otherwise, a new gravel pit or quarry would have to be permitted, which requires a minimum of six months to one year for MNR approval. Aggregate would also be required to construct the 833 m site access road between the powerhouse and the intake, to construct parking lots at the powerhouse and intake, and for construction footings at both locations.

Work areas will be cleared of trees and the construction, laydown, camp and concrete batch plant areas would be grubbed and levelled. Upon construction completion, the temporary work areas will be restored and re-vegetated with native tree species appropriate for the ecosite.

The inundation area will be approximately 170 ha based on a Full Supply Level of 187.00 m.

1.2 STUDY APPROACH

The terrestrial resources affected by the proposed New Post Creek Project were assessed using two types of plots: ecological and forest resources plots. Two ecologists, two forest technicians and one forester collected the ecological and forest resources assessment plot information during eight field days (i.e., June 18, 19, 20 and 21, September 26, 27 and 28 and October 12, 2011). To ensure calibration between Fleming Forestry and Beacon Environmental (Beacon) staff, ecological plots were completed conjointly during the first four days.

1.2.1 Ecological Assessment Plots

The intent of the ecological plots was to assess the range of forest ecosystems (i.e., landform and vegetation type) potentially affected by the proposed Project. A forest ecosystem is comprised of individual forest stands. Ecological plots follow the sampling methodologies outlined in the Ontario Parks (2010) "Inventory and Monitoring Program (OPIAM): Guidelines and Methodologies".

1.2.2 Forest Resources Assessment Plots

The intent of the forest resources plots was to assess the specific forest stands to be affected by the proposed Project. The cruise plot information was used to assess the accuracy of the Forest Resource Inventory (FRI) and to estimate timber volume lost due to the proposed transmission line ROW clearing, access road ROW widening and construction site clearing.

Forest resources assessment plots followed normal forest evaluation sampling procedures used for assessing Crown timber in Ontario i.e., MNR Procedure FOR 05 05 45 – "Valuation of trees reserved to the Crown on patented lands for release of tree reservations, November 24, 2010" and "MNR Timmins District Cruise Procedures for Tree Release – November 2003". A 5.64 m radius circular plot was established within a sampled stand providing a 0.01 ha sample size for each plot. All tree species less than 10 cm in diameter were counted by species and all species greater than 10 cm were tallied by 2 cm diameter classes and recorded on a Plot Tally Form. The height and age of the dominant tree canopy species were recorded. A GPS location was also recorded for each plot to allow the plot locations to be mapped. Any unique stand conditions, fish and wildlife values or First Nation values sites or evidence of human activity were also noted.

Table 1.2 provides a summary of the 58 ecological and 29 forest resources assessment plots that were completed to evaluate the potential effects of the proposed Project on terrestrial resources. Beacon (2010) completed 18 ecological plots in 2010 which were used to assess the deregulation of the small area of the proposed Project within Little Abitibi Provincial Park (LAPP) adjacent to New Post Creek and regulation of suitable Replacement Lands outside LAPP in order to allow the proposed Project to proceed. Although these plots were outside of

the proposed Project site-specific study area, they were useful in describing similar ecosystems within the study area. Beacon completed an additional 25 ecological plots in June 2011 mainly concentrating on the proposed Project footprint aquatic zones, construction zone, the access road and the inundation zone. Fleming Forestry completed 15 ecological and forest resources assessment plots, and 29 forest resources assessment plots, for a total of 44 forest resources assessment plots.

Table 1.2 Summary of Ecosystem and Forest Resources Plots

Year	Firm	Type	Number of Plots	Purpose
2010	Beacon	Ecological	18	Assess LAPP deregulation/regulation lands
2011	Beacon	Ecological	25	Assess effects of proposed Project
2011	Fleming Forestry	Ecological and Forest Resources	15	Assess effects of proposed Project
2011	Fleming Forestry	Forest Resources	29	Assess effects of proposed Project
			87	

1.2.3 Ecological Sampling

The findings of the ecological sampling are described in the Terrestrial Environment TSD.

1.2.4 Forest Resources or Stand Sampling

The forest stands were nested within the broader ecosystems and ecosites. There were a total of 44 ecological and forest resources plots used to assess the forest resources for a total of 27 stands representing 838 ha within the study area. Figure 1.2 shows the forest resources and ecological plot locations.

The field measurements are compared to the FRI data for each stand in Table 1.3. Appendix 1 provides pictures taken at each plot. The results of the stand sampling of forest resources are described in Section 3.0 of this report.

Figure 1.2 Forest Resources and Ecological Plot Locations

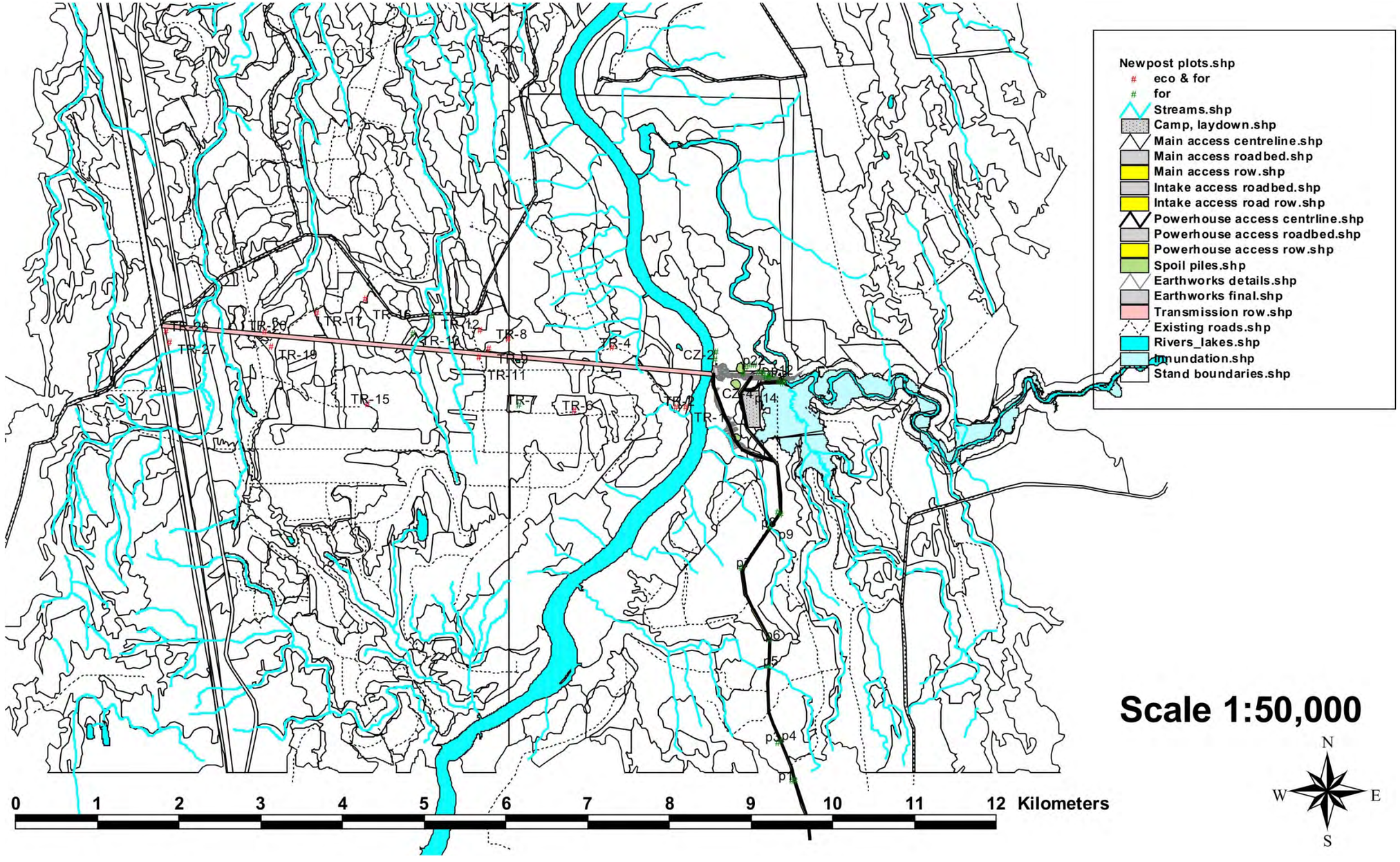


Table 1.3 Summary of Stand Sampling – FRI Versus Sample Data

Plot #	Stand# (polyid)	Elev (m)	# Plots	Sample Area (ha)	Stand Area (ha)	Sample (%)	Data	Yr Dep/Origin	FU[1]	SI[2]	Species Composition[3] (%)	1994 NEFEC[4]	Ht (m)	Stk[5] (%)	SC[6]	Age (y)	Pj Vol (NMm^3)	Sb Vol (NMm^3)	Sw Vol (NMm^3)	Bf Vol (NMm^3)	Ce Vol (NMm^3)	La Vol (NMm^3)	Po Vol (NMm^3)	Bw Vol (NMm^3)	DBHs[7] (cm)	Description
TR1	4655318280	140	1	0.01	36.73	0.03	FRI	1915 natural	Sf1	Exten	Bf30Po30Sw30Sb10	NE6	19.0	0.5	x	95	0	14.2	42.8	32.4	0	0	49.9	0	na[8]	natural forest
							Cruise		Sf1	Exten	Bf100	eco 9r V16	20.0	0.5	1	58	0	0	0	209.7	0	0	0	0	12-30 Bf	natural succession, small sample
TR2	4655320450	154	1	0.01	1.49	0.67	FRI	1934 natural	Sf1	Exten	Bf70Sw20Sb10	NE9	13.0	0.8	1	76	0	13	32.2	78.4	0	0	0	0	na	un-cut forest
							Cruise	1890 natural forest	Sf1	Prsnt	Sw60Bf30Po10	eco 7f V16	22.6	0.7	x	120	0	0	179.7	12.2			59.9			ok
TR-4	4655314510	185	1	0.01	21.21	0.05	FRI	1910 natural	Sf1	Prsnt	Bf60Sw20Sb10Po10	NE9	11.0	0.7	x	55	0	10.4	20.9	59.2	0	0	16.9	0	na	natural forest
							Cruise	1920 natural	Sf1	Prsnt	Bf90Sw10	eco 9r V14	22.8	0.5	x	90	0	0	0	148.4	0	0	0	0	<10-30 Bf	
TR6	4655307450	208	1	0.01	8.57	0.12	FRI	1885 residual	Sb1	Prsnt	Sb80Bf20	NE11	13.0	0.9	2	135	0	134.6	0	8.1	0	0	0	0	na	residual forest
							Cruise	1918 residual	Sb1	Prsnt	Sb80Bf20	eco 6f V15	17.0	0.6	1	92	0	135.2	0	12.1	0	0	0	0	<10-14 Bf, 22-32 Sb	residual forest
TR7	4655301450	214	1	0.01	5.75	0.17	FRI	1875 residual	Sb1	Prsnt	Sb80Bf10Po10	NE11	16.0	0.7	2	135	0	103.6	0	0	0	0	1.3	0	na	residual forest
							Cruise	1920 residual	Sb1	Prsnt	Sb100	eco 12 V27	22.7	0.6	x	90	0	220.4	0	0	0	0	0	0	<10-12 Bf, 14-28 Sb	residual forest
TR8, TR11	4555396510	199	2	0.02	14.14	0.14	FRI	1880 residual	Sb1	Prsnt	Sb100	NE11	15.0	0.7	2	130	0	130.2	0	0	0	0	0	0	na	residual forest
							Cruise	1925 residual	Sb1	Prsnt	Sb60La30Ce10	eco 12 V24	14.5	0.7	2	86	0	23.95	0	0	0	57.05	0	0	<10-20 La, <10-20 Sb	residual forest
TR9	4655303530	200	1	0.01	21.44	0.05	FRI	1880 natural	Sb1	Prsnt	Sb100	NE11	2.0	0.7	1	130	0	130.2	0	0	0	0	0	0	na	
							Cruise	1920 natural	Sb1	Prsnt	Sb90Ce10	eco 13r V25	14.5	0.5	1	86	0	124.8	0	0	1.9	0	0	0	<10-22 Sb, <10-12 Ce	
TR10	4555398530	205	1	0.01	15.39	0.06	FRI	1995 seeded plant	Sb1	Basc1	Sb100	NE11	1.5	0.8	2	15	0	0	0	0	0	0	0	0	na	Sb seeded plantation
							Cruise	2000 seeded plant	Sb1	Basc1	Sb100	eco 12 V24	2.5	0.8	1	11	0	0	0	0	0	0	0	0	<10 Sb and La	Sb seeded plantation
TR12	4555393460	200	1	0.01	41.93	0.02	FRI	1885 residual	Sb3	Prsnt	Sb90Po10	NE11	12.0	0.9	3	125	0	90.7	0	0	0	0	6.2	0	na	residual forest
							Cruise	1905 natural	Sb1	Prsnt	Sb100	eco 11 V27	14.5	0.7	2	105	0	102.8	0	0	0	0	0	0	<10-22 Sb	
TR13	4555389540	204	1	0.01	2.72	0.37	FRI	1880 natural	Sb3	Prsnt	Sb100	NE11	13.0	0.7	3	130	0	79.8	0	0	0	0	0	0	na	residual forest
							Cruise	1942 natural	Sf1	Prsnt	Sb80Bf20	eco 11	12.0	0.5	2	72	0	57.1	0	12.5	0	0	0	0	<10-16 Bf, <10-24 Sb	residual forest
TR15	4555386450	212	1	0.01	50.65	0.02	FRI	1875 natural	Sb3	Prsnt	Sb80Bf10Po10	NE11	13.0	0.9	3	135	0	81.4	0	0.5	0	0	1.2	0	na	residual forest
							Cruise	1895 natural	Sb1	Prsnt	Sb100	eco 12 V24	18.0	0.6	2	115	0	131.2	0	0	0	0	0	0	12-24 Sb, <10 Bf	
TR16	4555380530	203	1	0.01	40.28	0.02	FRI	1880 natural	Sb3	Prsnt	Sb100	NE11	13.0	0.7	3	130	0	79.8	0	0	0	0	0	0	na	residual forest
							Cruise	1910 natural	Sb1	Prsnt	Sb100	eco 11 V27	14.0	0.7	2	100	0	74.3	0	0	0	0	0	0	<10-20 Sb	residual forest
TR17	4555378530	203	1	0.01	9.89	0.10	FRI	1885 natural	Lc1	Prsnt	La70Sb20Ce10	NE12	12.0	0.7	3	132	0	15.7	0	0	4.9	36.3	0	0	na	residual forest
							Cruise	1905 natural	Lc1	Prsnt	La50Ce30Sb20	eco 13r V24	18.0	0.7	3	105	0	12	0	0	19.7	116.4	0	0	<10-16 Ce, 16-32 La, <10-16 Sb	

Table 1.3 Summary of Stand Sampling – FRI Versus Sample Data (Cont'd)

Plot #	Stand# (polyid)	Elev (m)	# Plots	Sample Area (ha)	Stand Area (ha)	Sample (%)	Data	Yr Dep/Origin	FU[1]	SI[2]	Species Composition[3] (%)	1994 NEFEC[4]	Ht (m)	Stk[5] (%)	SC[6]	Age (y)	Pj Vol (NMm^3)	Sb Vol (NMm^3)	Sw Vol (NMm^3)	Bf Vol (NMm^3)	Ce Vol (NMm^3)	La Vol (NMm^3)	Po Vol (NMm^3)	Bw Vol (NMm^3)	DBHs[7] (cm)	Description
TR19	4555372550	205	1	0.01	23.71	0.04	FRI	2007 plantation	Sb1	Inten	Sb100	NE11	0.0	0	2	3	0	0	0	0	0	0	0	0	na	plantation
							Cruise	1930 residual La	Lc1	Exten	La100	eco 12 V24	23.0	0.6	2	80	0	0	0	0	0	60.4	0	0	<10-34 La	unmapped residual forest within plantation
TR20	4555371560	203	1	0.01	7.85	0.13	FRI	1855 natural	Sb1	Prsnt	Sb60La30Ce10	NE12	14.0	0.5	2	155	0	52.8	0	0	3.6	11.4	0	0	na	residual forest
							Cruise	1915 natural	Sb1	Prsnt	Sb80Ce20	eco 13r V23	11.0	0.6	2	95	0	51.3	0	0	0	0	0	0	<=10 Ce, <10-18 Sb	
TR26, TR27	4555360520	206	2	0.02	19.42	0.10	FRI	1985 natural regen	Mwd	Exten	Po50Sb30Bf10Sw10	NE6	6.0	0.5	1	26	0	0	0	0.1	0	0	15.2	0	na	natural regen
							Cruise	1990 natural regen	Mwd	Exten	Po70Bf20Bw10	eco 6m V24	9.0	0.9	1	21				29.3			6.9		10-18 Po, 10-26 Bf	
CZ-1, CZ-2	4655327510	140	2	0.02	14.52	0.14	FRI	1910 natural	Sf1	Prsnt	Bf40Po20Sb20Sw20	NE9	18.0	0.7	x	100	0	41.3	41.3	61.3	0	0	46.5	0	na	natural forest
							Cruise	1910 natural	Sf1	Prsnt	Bf80Sw10Po10	not collected	23.0	0.8	x	100	0	0	61.9	67.55	0	0	0	0	<10-24 Bf, 64 Sw	Sf1 flood plain, big old po, sw, bf, bf under
CZ-4, P11	4655326440	201	2	0.02	25.64	0.08	FRI	1910 natural	Sf1	Prsnt	Po60Bf20Sb10Bw10	NE9	18.0	0.7	x	100	0	41.3	41.3	61.3	0	0	46.5	0	na	natural forest
							Cruise	1935 natural	Sf1	Exten	Bw50Bf30Po20	not collected	18.5	0.5	1	74	0	0	0	93.8	0	0	0	24.6	24-32 Bf, <10-24 Bw, 12-14 Po	
P1, P2, P3, P4	4655335110	225	4	0.04	25.64	0.16	FRI	1985 natural regen	Po1	Exten	Po70Bf10Sb10Sw10	NE6	5.0	1	1	25	0	0	0	0.2	0	0	42.7	0	na	natural regen
							Cruise	1981 natural regen	Po1	Exten	Po70Bw20Bf10	not collected	13.5	1	1	26	0	0	0	23.45	0	0	7.9	6.28	24-32 Bf, <10-24 Bw, <10-18 Po	
P5	4655331150	207	1	0.01	44.71	0.02	FRI	1981 natural regen	Sp1	Exten	Sb70Po30	NE6	1.7	0.6	2	29	0	0	0	0	0	0	11.9	0	na	natural regen
							Cruise		Sp1	Exten	Sb80Po20	not collected	8.0	0.6	1	30	0	21.6	0	0	0	0	0	0	<10-18 Sb, <10-12 Po	natural regen
P6, P7, P8	4655326220	212	3	0.03	170.72	0.02	FRI	1981 natural	Po1	Exten	Po70Bf20Sb10	NE6	5.0	0.9	2	29	0	0	0	0	0	0	41.6	0	na	
							Cruise	1982 natural	Po1	Exten	Po90Sw10	not collected	13.0	0.8	2	28	0	0	0	0	0	0	46.5	0	<10-20 Po, <10 Sw	
P9, P10	4655333360	215	2	0.02	68.03	0.03	FRI	1994 natural regen	Po3	Exten	Po80Bf10Sb10	NE10	4.0	0.8	3	29	0	0	0	0	0	0	0	0	na	natural regen
							Cruise	1983 natural regen	Mwd	Exten	Pj50Po50	not collected	12.5	0.9	1	27	91.3	0	0	0	0	0	4	0	<10-20 Pj and Po	natural regen, small clump pj in Po1
P12, P19	4655331480	193	2	0.02	25.64	0.08	FRI	1994 natural regen	Po3	Exten	Po60Bf20Sb10Bw10	NE6	3.0	0.6	3	16	0	0	0	0	0	0	0	0	na	natural regen
							Cruise	1981 natural regen	Po1	Exten	Bf70Po20Sb10	not collected	11.5	0.8	2	27	0	4.25	0	53.55	0	0	2.67	0.25	<10-30 Bf, <10-14 Po	edge of new post creek reserve
P13, P14, P18	4655334400	193	3	0.03	25.64	0.12	FRI	1981 natural regen	Pj2	Exten	Pj60Sb30Po10	NE4	3.0	0.6	3	29	4.3	0	0	0	0	0	1	0	na	natural regen
							Cruise	1981 natural regen	Sb1	Exten	Sb60Bf30Po10	not collected	4.5	0.8	1	19	0	13.43	0	13.57	0	1.83	0	0	<10-18 Bf and Sb, mostly <10	natural regen Sb not Pj, FRI wrong
P15, P16, P17	4655333490	194	3	0.03	5.77	0.52	FRI	1910 natural	Sf1	Prsnt	Bf40Po20Sw20Sb20	NE9	18.0	0.7	x	100	0	41.3	41.3	61.3	0	0	46.5	0	na	
							Cruise	1940 natural	Sf1	Prsnt	Sb8Pj15Sb5	not collected	14.0	0.6	1	70	22.2	90.8	0	0	0	0	0	0	<10-24 Sb, 16-28 Pj	natural forest, FRI wrong
P20	4655331490	191	1	0.01	0.256	3.91	FRI	1981 natural regen	Po3	Exten	Po80Bf10Sb10	NE10	4.0	0.8	3	29	0	0	0	0	0	0	10.2	0	na	
							Cruise	1987 natural regen	Po3	Prsnt	Sb80Pj15Sb5	not collected	7.0	0.8	3	23	0	0	0	0	0	0	0	0	<10 Po	natural regen
P21, P22, P23	4655327650	191	3	0.03	110.34	0.03	FRI	1955 natural	Sf1	Prsnt	Bf50Po20Sw20Sb10	NE9	11.0	0.7	x	55	0	10.4	20.9	49.3	0	0	33.9	0	na	natural forest
							Cruise	1900 natural	Sf1	Prsnt	Bf50Sw40Po5Sb5	not collected	26.5	0.6	x	110+	0	12.97	127.3	79.23	0	0	47.2	0	<10-32 Bf, 28-66 Sw, po Sb	Sf1 mature Abitibi River reserve
			44	**0.44**	**838.08**																					

[1] Fu = Forest Unit: Sf1 = Spruce Fir Mixedwood; Sb1 = Lowland Black Spruce Pure Rich; Sb3 = Lowland Black Spruce Pure Poor; Lc1 = Lowland Conifer; Mwd = Conifer Hardwood Mixedwood; Po1 = Poplar Pure Rich Sites; Po3 = Popular Pure Poor Sites; Pj2 =Pine Spruce Mixedwood.
[2] SI = Silviculture intensity.
[3] Bf = balsam fir; Po = poplar; Sw = white spruce; Sb = black spruce; La = larch (tamarack); Ce = cedar; Bw = white birch; Pj = jack pine.
[4] See Appendix 2.
[5] Stk = Stocking.
[6] SC = Site Class.
[7] DBH = diameter at breast height (of tree trunk).
[8] na = not applicable.

2.0 FOREST RESOURCES BASELINE

Baseline forest resources information was defined for a broad study area to facilitate comparison with the areas to be affected by the proposed Project.

2.1 GENERAL LOCATION AND ADMINISTRATION

The proposed New Post Creek Project occurs within and south of LAPP in Pinard Township and just south of Parliament Township on the former Cochrane-Moose River Management Unit. This area is currently designated as the Abitibi River Forest (ARF), which was formed from the amalgamation of the former Iroquois Falls Forest with the Nighthawk, Smooth Rock Falls and Cochrane Moose River Forests. The ARF is 3.6 million ha in size, consisting mainly of Crown land and is managed by Abitibi River Forest Management Inc. (ARFMI), a new cooperative-based management company comprised of three large forest industry producers, i.e., Resolute Forest Products (formerly AbitibiBowater), Tembec Inc. and Georgia Pacific, 15 small producers, forest harvesting companies, First Nations and five third party licensees. The ARF is administered by the MNR Cochrane District and Northeast Region offices.

The proposed Project occurs entirely on Crown land in OBMs 45553 and 46553 and within TTN Traditional Territory. The original TTN reserve lands are located approximately 20 km to the southeast west of Little Takwata Lake. The TTN community is located on reserve lands near Cochrane. The Town of Smooth Rock Falls is located approximately 100 km south of the proposed Project.

The MNR Cochrane District is ultimately responsible for the management of the Crown land, including values collection, and fish and wildlife resources protection. ARFMI holds the Sustainable Forest Licence for the ARF, which provides the right to conduct forest management (i.e., harvesting, renewal and road construction). ARFMI has contracted First Resource Management Inc., based in the Town of Englehart, to manage the ARF.

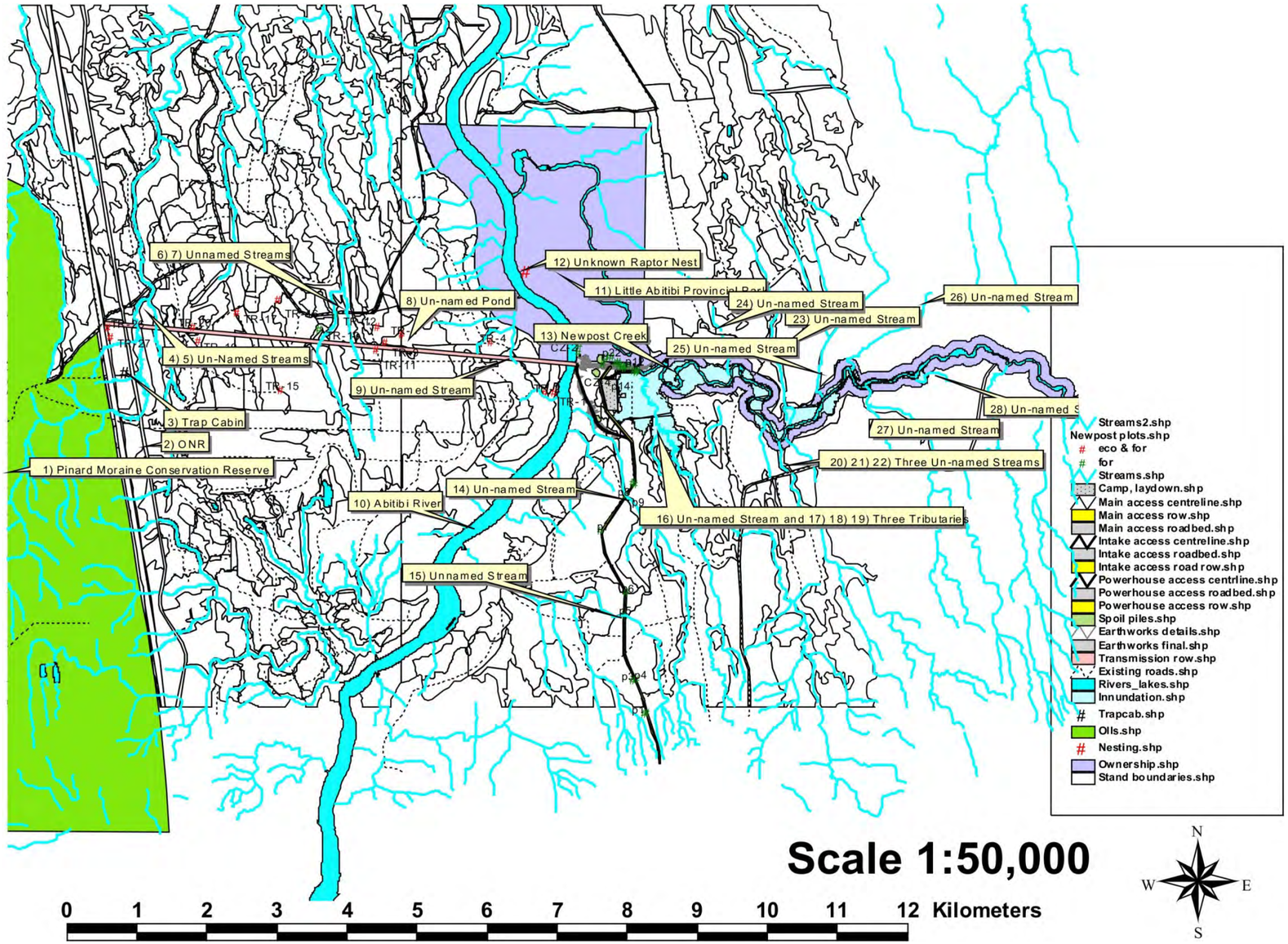
2.2 FOREST RESOURCES INVENTORY

The latest version of the FRI was obtained for the study. The FRI was for the former Moose River Management Unit and was quite dated. Portions of the forest were simply aged to 1994 based on the previous FRI and a portion was updated based on new 1994 photos. There was a limited amount of FRI cruising used to verify the FRI photo interpretation. The forest is partitioned into forest stands whose types are described by a total of 12 forest units. Each stand also has an ecosite assigned according to the McCarthy *et al*. (1994) Northeastern Ontario Forest Ecosystem Classification (NEFEC) based on the MNR Ontario Wildlife Habitat Analysis Model which estimates ecosites based mainly on the species composition for each stand.

2.3 POTENTIALLY AFFECTED MNR VALUES

Digital copies of the various MNR values maps were obtained as background information. Figure 2.1 shows the potentially affected values.

Figure 2.1 Potentially Affected Values



2.4 SURFICIAL GEOLOGY, TOPOGRAPHY AND SOILS

The proposed Project is located on the southern perimeter of the Hudson Bay Lowland and on the northern edge of the boreal forest. The landform is characterized by widespread, level surface deposits of water-worked tills and lacustrine materials.

The main types of surface geological deposits are described as follows:

(i) Glaciolacustrine deposits are very common, consisting primarily of varved clays and silts. Lacustrine sands occupy relatively small portions of the area. The lacustrine clay sediments are very thick resulting in a flat to gently sloping topography. Runoff and permeability are moderately slow. The dominant tree species occupying these sites is black spruce.

(ii) Glaciofluvial deposits are associated with elongated eskers and outwash plains. In this area all eskers are capped with clay. Outwash plains associated with eskers consist of sand and gravel. Jack pine predominates on the sandy outwash deposits and eskers.

(iii) Ground moraines consisting of thick sand and clay tills that are very stoney and bouldery are also present. The topography is rolling with numerous flats along the rivers and adjacent to lakes. The forest contains more hardwood and is more mixed in character, consisting of an association of black spruce, balsam fir and white birch with scattered white spruce and poplar.

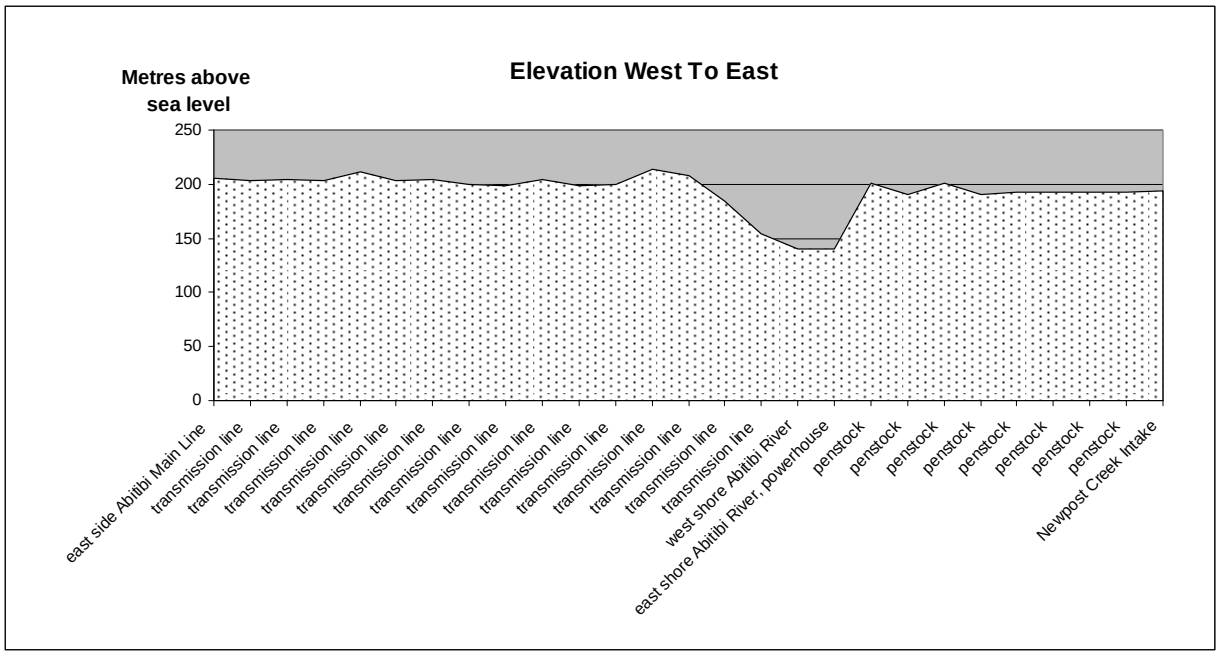
(iv) Organic (peat) soils consist of a complex of soils developed from organic materials in various stages of disintegration and humification and usually vary in depth from 0.3 to 5 m. These soils occupy large areas of the lowland portion of the study area. They also occur in small poorly drained depressions on upland sites. Vegetation on peat varies primarily with moisture. On wet sites the dominant species are black spruce and tamarack, appearing in a scattered pattern. On slightly better-drained sites the stocking of the stands is improved. On sites with lower water tables, merchantable stands are present.

There are extensive lowland areas of impeded drainage and only occasional hills or ridges owing to the lacustrine deposits. There are few lakes, extensive poorly drained flats and clay banked sluggish streams.

Figure 2.2 provides a depiction of the topography of the proposed development area from the existing Abitibi Canyon GS-Otter Rapids GS 115 kV transmission line on the west to the proposed Project intake on the east. The elevation at the existing transmission line is 206 m, ranging between 199 and 214 m along the proposed transmission line route, decreasing to 140 m at the proposed powerhouse location in the Abitibi River floodplain, and then increases to

between 191 and 201 m for the penstock and 194 m at the proposed intake location on New Post Creek. Except for the Abitibi River flood plain, the topography is generally flat resulting in poor drainage.

Figure 2.2 Topography of the Proposed Project Study Area



The soil types vary, ranging from sands, gravels, clays and boulder tills to mixtures of sand, clay and silts. Gray luvisols occur on the upland clays and there are large areas of shallow organic soils. Humo-ferric podzol soils occur on the sandy outwashs and eskers.

2.5 CLIMATE

Climatic data were provided by Environment Canada's National Climate Archives based on Canadian climate normals from 1971 to 2000 for Cochrane. The proposed Project area has a cool and wet climate with a mean annual temperature of 0.6°C. Temperature ranges from a daily average minimum of –24.7°C in January to a daily average maximum of 24°C in July. The area has an average of 144 days where the average minimum temperature is above freezing. The frost-free period and growing season would be shorter than 144 days. The last spring frost is mid-June and first fall frost is early September. The average annual precipitation is 880 mm with 583 mm falling as rain and 297 cm falling as snow. Prevailing winds are generally from the west.

2.6 FOREST SITE REGIONS AND DISTRICTS

The proposed Project occurs in the Northern Clay Forest Section of the Boreal Forest Region (Rowe, 1972). The key characteristics of the Northern Clay Forest Section are the extensive black spruce lowlands and wetlands. Black spruce occupies the gently rising uplands and low, poorly drained lacustrine flats that alternate with sedge fens and sphagnum bogs. Tamarack and cedar are commonly associated on the lowland sites. Improvement to drainage due to slight changes in relief and for sites along lakes and rivers results in more hardwood and mixedwood forest stands including trembling aspen, balsam poplar, paper birch, balsam fir, white spruce and black spruce. Jack pine and paper birch occur on dryer coarse sand and gravel sites resulting from outwash deposits and eskers.

The study area forest can be described in terms of site types according to the NEFEC (McCarthy *et al.,* 1994). A site type is a unique combination of soil, topographic and climatic factors abstracted from the forest landscape continuum for practical purposes, having a distinct set of probable responses to prescriptions and natural forces (Jones *et al.,* 1983).

NEFEC surveys are not available for the study area; therefore, the site types are estimated based on FRI criteria mainly based on species composition.

The proposed Project lies within Hill's site region 3E: Lake Abitibi and site district 3E1 (Hills, 1959). The site region is an area of land within which the response of vegetation to the features of landform (relief and geological materials) follows a consistent pattern. Site region 3E is characterized by moderately to gently rolling bedrock, generally covered by deep deposits of clay, silt and sand. Site district 3E5 is typified by gently rolling plains of thinly covered rock knobs, sandy outwash and silty depressions. The materials here are generally granite. All texture and drainage classes are found in 3E5, with only 18% of the area in peatland.

The geology, soil and site conditions have implications, which must be taken into account for the proposed Project setting. The topography is very conducive to hydroelectric development. It is relatively flat except in the Abitibi River flood plain where a sharp drop of approximately 60 m occurs. The steep grade down to the river particularly on the east side makes access to the river difficult for powerhouse construction.

The absence of suitable ecosites means a preponderance of clayey and organic soils and absence of sand and gravel in much of the development area. Aggregate materials will likely have to be obtained from outside of the proposed Project area. The key challenge in terms of locating the proposed transmission corridor will be accessing and crossing the various small creeks, wetlands and organic soils. Access through most of the proposed transmission corridor route and to both sides of most waterways is provided by the existing operational road network. Some improvements to these operational roads (i.e., cross-drainage culverts, sub-grade work and some graveling) may be required during construction and for transmission line maintenance. The steep slopes at the Abitibi River will require closer pole spacing to maintain the proper ground clearances.

3.0 FOREST RESOURCES EFFECTS ASSESSMENT AND MITIGATION MEASURES

3.1 ECOSITE EFFECTS

Table 3.1 provides a summary of NEFEC ecosite types (McCarthy *et al.,* 1994) affected by the proposed Project compared to the broader study area. There were sample plots within six of 13 ecosites. A total of 11 of 14 ecosites within the broad study area will be affected by the proposed development (i.e., NE2, NE3, NE4, NE5, NE6, NE8, NE9, NE10, NE11, NE12 and NE14). The proposed development would affect 249.1 ha and 2.1% of the broad study area. Based on ecosites, the percentages of the broad study area affected by the proposed development range from <1% for NE8, NE11 and NE14 to 19% for NE4.

Figure 3.1 shows the affected NEFEC ecosites. The greatest effects in terms of broad study area proportion were to NE3 and NE4. The NE3 and NE4 affected ecosites were located in a small pocket of sandier soils along New Post Creek. The NE9 represents the climax spruce/fir stands on fine loamy soils along and within the Abitibi River floodplain.

Table 3.1 Summary of Affected Ecosites (ha)

Ecosite[1]	Ecosystem Description	Description	# Stands Sampled	Broad Study Area	Transmission 50 m ROW	Spoil Piles	Camp and Laydown	Main Access Road	Intake Access Road	Powerhouse Access Road	Earthworks	Headpond	Total Affected Area	% of Broad Study Area
NE1	Very Shallow Soils	Conifer mixedwood on dry to fresh very shallow soil over bedrock		69.2										
NE2	Jack Pine Coarse Soils	Jack pine/conifer on deep to fresh sandy to coarse loamy soils		208.6								4.9	**4.9**	**2**
NE3	Mixedwood Medium to Coarse Soils	Poplar/jack pine mixedwood on fresh to moderately moist silty to loamy soils		313.5								43.1	**43.1**	**14**
NE4	Jack Pine Black Spruce Coarse Soils	Conifer on fresh to moist sandy to coarse loamy soils	1	79.3					0.2		0.7	13.9	**14.8**	**19**
NE5	Black Spruce Fine to Medium Soils	Conifer on fresh to moderately moist fine loamy, medium loamy to clayey and silty soils		108.1	0.1							3.0	**3.1**	**3**
NE6	Mixedwoods Fine to Coarse Soils	Poplar/spruce mixedwood on fresh to moist loamy to silty or clayey soils	6	3,355.9	7.7		6.9	11.6	0.2	0.7	2.6	12.6	**42.3**	**1**
NE7	Hardwood Fine to Medium Soils	Hardwood mixedwood on fresh to moist fine or medium loamy to clayey or silty soils		127.8										
NE8	Black Spruce Feathermoss Sphagnum	Black spruce feather moss sphagnum drained peaty soils on a variety of materials and landforms on lower slopes or on flat		1,332.7	1.7							0.3	**2.0**	**<1**
NE9	Conifer Moist Soils	Conifer on moist soil poorly drained soils, often peaty on slopes on a variety of materials and landforms	6	1,142.5	3.0	2.3	1.2	0.6	0.8	3.2	7.0	9.2	**27.3**	**2**
NE10	Hardwood Moist Soils	Hardwood on moist soil, glaciofluvial, lacustrine, silt pockets, lake bed silts and clays or clay tills	2	338.0			0.1	6.1	0.3	0.5	0.3	6.8	**14.1**	**4**
NE11	Black Spruce Labrador Tea	Black spruce labrador tea, deep fibric or mesic organic soils on flat terrain with limited drainage	10	3,491.8	14.5							11.5	**26.0**	**<1**
NE12	Black Spruce Speckled Alder	Black spruce, larch, and speckled alder on wet organic soils with thick fibric horizon associated with some lateral drainage	2	70.8	0.8								**0.8**	**1**
NE13	Conifer Speckled Alder	Black spruce, larch, cedar and speckled alder on shallow humic organic soils associated with strong drainage												
NE14	Black Spruce Leatherleaf	Poor black spruce on wet, poorly decomposed organic soils		349.7	2.6								**2.6**	**<1**
Non-Forest	na[2]	Nonforested wetlands and water		1,015.5	3.6			0.2			0.2	64.1	**68.1**	**7**
Total			**27**	**12,003.3**	**34.0**	**2.3**	**8.2**	**18.5**	**1.5**	**4.4**	**10.8**	**169.4**	**249.1**	**2.1**

[1] See Figure 3.1 for NEFEC ecosite location.
[2] na = not applicable.

Figure 3.1 Potentially Affected 1994 NEFEC Ecosites

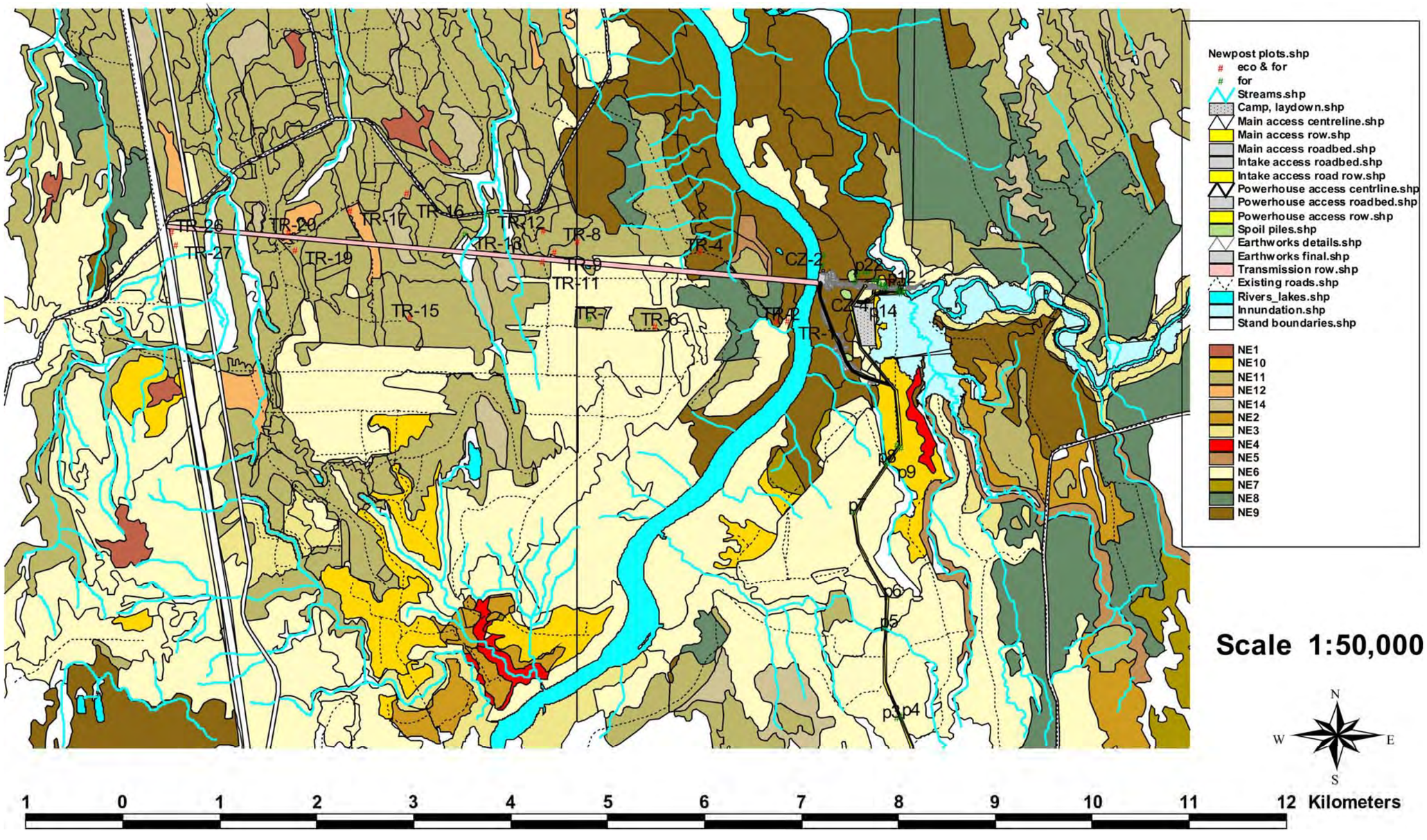


Table 3.2 provides a summary of the ecosite differences for the 16 stands sampled. Five stands were found to have the same ecosite as the FRI interpreted ecosite and 11 were different. However, the majority of differences were in the lowland black spruce ecosites 11 and 12 and these were found to have similar lowland black spruce ecosites (i.e., ecosite 12 and 13).

Table 3.2 Summary of Ecosite Differences

Forest Unit	Cruise Same	Cruise Different	Different Ecosites
NE6	1	1	9
NE9	1	1	7
NE11	3	7	6, 12, 13
NE12	0	2	13
Total	**5**	**11**	

3.2 FOREST UNIT EFFECTS

As indicated in Section 2.8, the proposed development area falls within the Northern Clay Forest Section of the Boreal Forest Region (Rowe, 1972), characterized by boreal tree species such as black spruce, jack pine, balsam fir, white spruce, cedar, tamarack, poplar and paper birch. However, due to its location in the northern portion of the boreal forest, pure black spruce stands predominate on lowland organic ecosites. The other boreal tree species occur in mixtures where suitable upland ecosites occur particularly along waterways where drainage is better.

Forest stands can also be described in terms of forest units which reflect the specific types of stands (e.g., jack pine pure, jack pine poplar mixedwood, pure poplar, etc.). Table 3.3 provides a summary of forest unit effects. Figure 3.2 provides a map of forest units potentially affected. The main forest units within the broad study area were Sp1, Sb1, Mwd, Po1 and Sf1. The main forest units affected by the proposed development were Sp1, Sf1, Po1, Pj2, Po3 and Sb1.

The forest units with the highest proportion of broad study area affected were Pj2 (with 16% of the broad study area), Po3 (6%) and Sp1 (3%). A total of nine of 12 forest units had sample plots. The Pj2 stand was in fact found to have naturally succeeded to a Sb1 stand with the jack pine overstorey declining and leaving the black spruce understory to dominate.

Table 3.3 Summary of Forest Unit Effects (ha)

Forest Unit[1]	Forest Unit Name	# Stands Sampled	Broad Study Area	Transmission 50 m ROW	Spoil Piles	Camp and Laydown	Main Access Road	Intake Access Road	Powerhouse Access Road	Earthworks	Headpond	Total Affected Area	% of Broad Study Area
Forested													
Bog	Lowland Black Spruce Bog		354.9	2.6								**2.6**	**<1**
Bw1	White Birch Poplar Mixedwood		77.6										
Lc1	Lowland Conifer	1	44.3	0.7								**0.7**	**2**
Mwd	Conifer Hardwood Mixedwood	1	1,577.1	1.2							0.7	**1.9**	**<1**
Pj1	Jack Pine Pure		269.0								4.9	**4.9**	**2**
Pj2	Pine Spruce Mixedwood	1	92.1					0.2		0.6	13.9	**14.7**	**16**
Po1	Poplar Pure Rich Sites	2	1,306.0	1.7		5.6	13.1	0.3	0.5	1.7	0.3	**23.2**	**2**
Po3	Poplar Pure Poor Sites	3	230.3			1.4	3.5	0.2	0.7	0.9	7.8	**14.5**	**6**
Sb1	Lowland Black Spruce Pure Rich	7	2,064.6	4.6							9.5	**14.1**	**<1**
Sb3	Lowland Black Spruce Pure Poor	4	901.5	3.8							2.0	**5.8**	**<1**
Sf1	Spruce Fir Mixedwood	7	1,259.8	3.0	2.3	1.2	0.6	0.8	3.2	7.0	9.2	**27.3**	**2**
Sp1	Spruce Pine Mixedwood	1	2,810.7	12.8			1.1			0.4	57.0	**71.3**	**3**
Non-Forested													
BRH	Non-Forest - Brush		242.8	1.3							7.2	**8.5**	**4**
OMS	Non Forest - Open Muskeg		95.2	0.7			0.1				8.0	**8.8**	**9**
TMS	Non-Forest - Treed Muskeg		98.1	0.5							10.9	**11.4**	**12**
UCL	Non Forest - Unclassified		268.2	0.3			0.1					**0.4**	**<1**
WAT	Non-Forest - Water		311.1	0.8						0.2	38.0	**39.0**	**13**
Total		**27**	**12,003.3**	**34.0**	**2.3**	**8.2**	**18.5**	**1.5**	**4.4**	**10.8**	**169.4**	**249.1**	**2.1**

[1] See Figure 3.2 for forest unit location.

Figure 3.2 Potentially Affected Forest Units

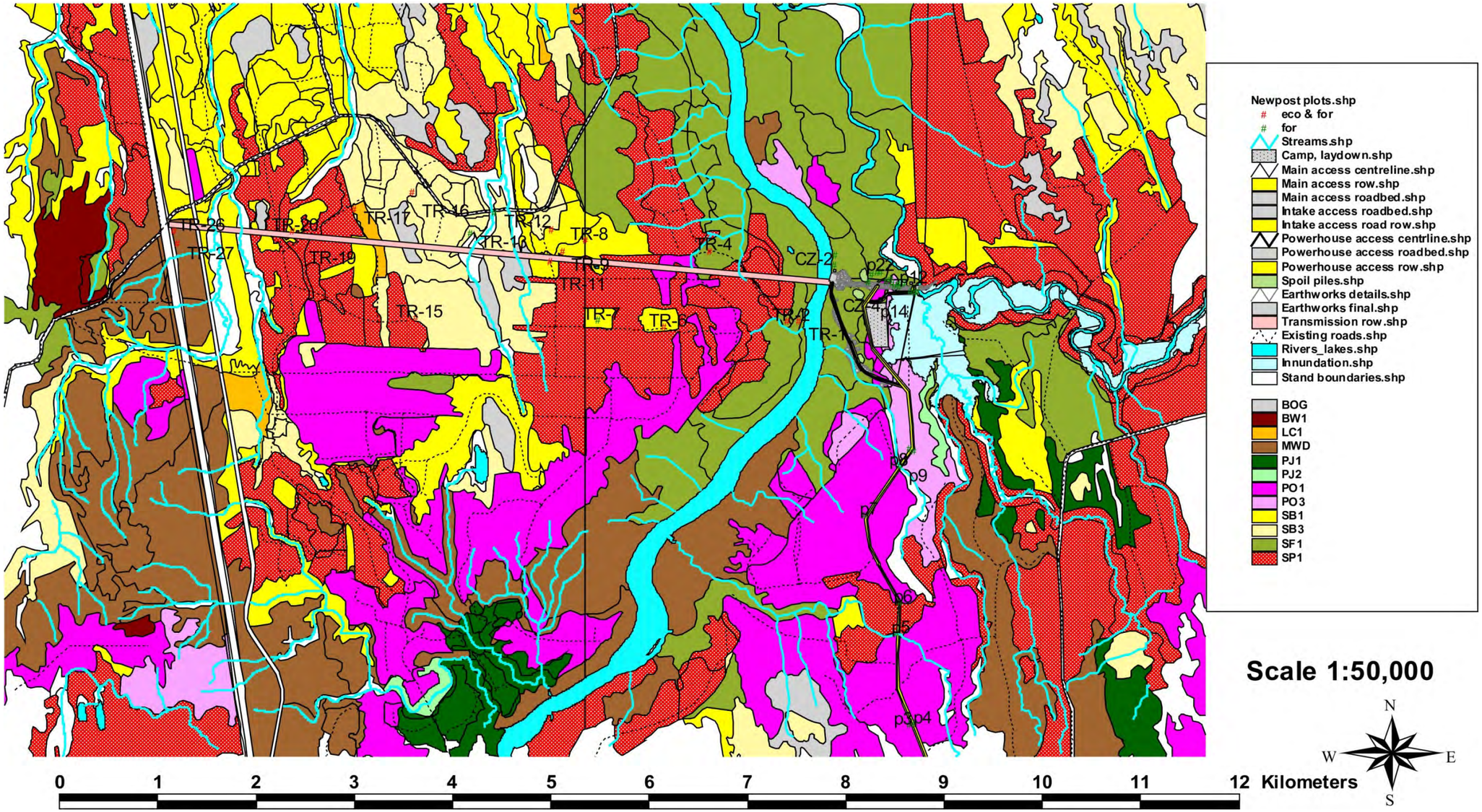


Table 3.4 provides a summary of the forest unit differences for the 27 stands sampled. The forest units were the same for 19 stands and different for eight stands. The majority of the differences were related to very similar forest units (i.e., Sb3 found to be Sb1 and Po3 found to be Po1). This is not surprising given the outdated FRI and lack of actual tree height information which has led to an underestimate of site class based on height. A portion of the differences could be a result of the limited number of samples.

Table 3.4 Summary of Forest Unit Differences

Forest Unit	Cruise Same	Cruise Different	Different Forest Units
Sf1	7		
Sb1	6	1	Lc1
Sb3		4	Sb1, Sf1
Lc1	1		
Mwd	1		
Po1	2		
Po3	1	2	Mwd, Po1
Sp1	1		
Pj2		1	Sp1
Total	**19**	**8**	

3.3 AGE CLASS EFFECTS

Table 3.5 provides a summary of age class area effects. Approximately 35.6% of the total affected area consists of younger previously disturbed areas (i.e., age ≤50 years), with 9.8% and 27.3% consisting of mature areas (i.e., 51-100 years) and older undisturbed areas (i.e., >100 years), respectively. The remaining 27.3% consists of non-forest area. The age class structure of the forest is a function of the natural forest processes, wildfire and natural succession, as well as man-made interventions such as harvesting and road development.

The year or origin and depletion years were investigated for the areas potentially affected in Table 3.6. The results indicated that the proposed development would affect 36% and 64% of the disturbed and undisturbed areas, respectively. Harvesting depletions were recorded in nine different years: 1980, 1981, 1982, 1984, 1985, 1994, 1995, 1996 and 2006. Figure 3.3 shows the disturbed and undisturbed areas. More than a third of the proposed development area has already been disturbed through harvesting. The proposed development area has been harvested or depleted with operating roads constructed throughout to provide access for harvesting and the remaining undisturbed areas represent reserves and residual forest applied to protect values, particularly forested areas along New Post Creek and its tributaries affected by headpond creation.

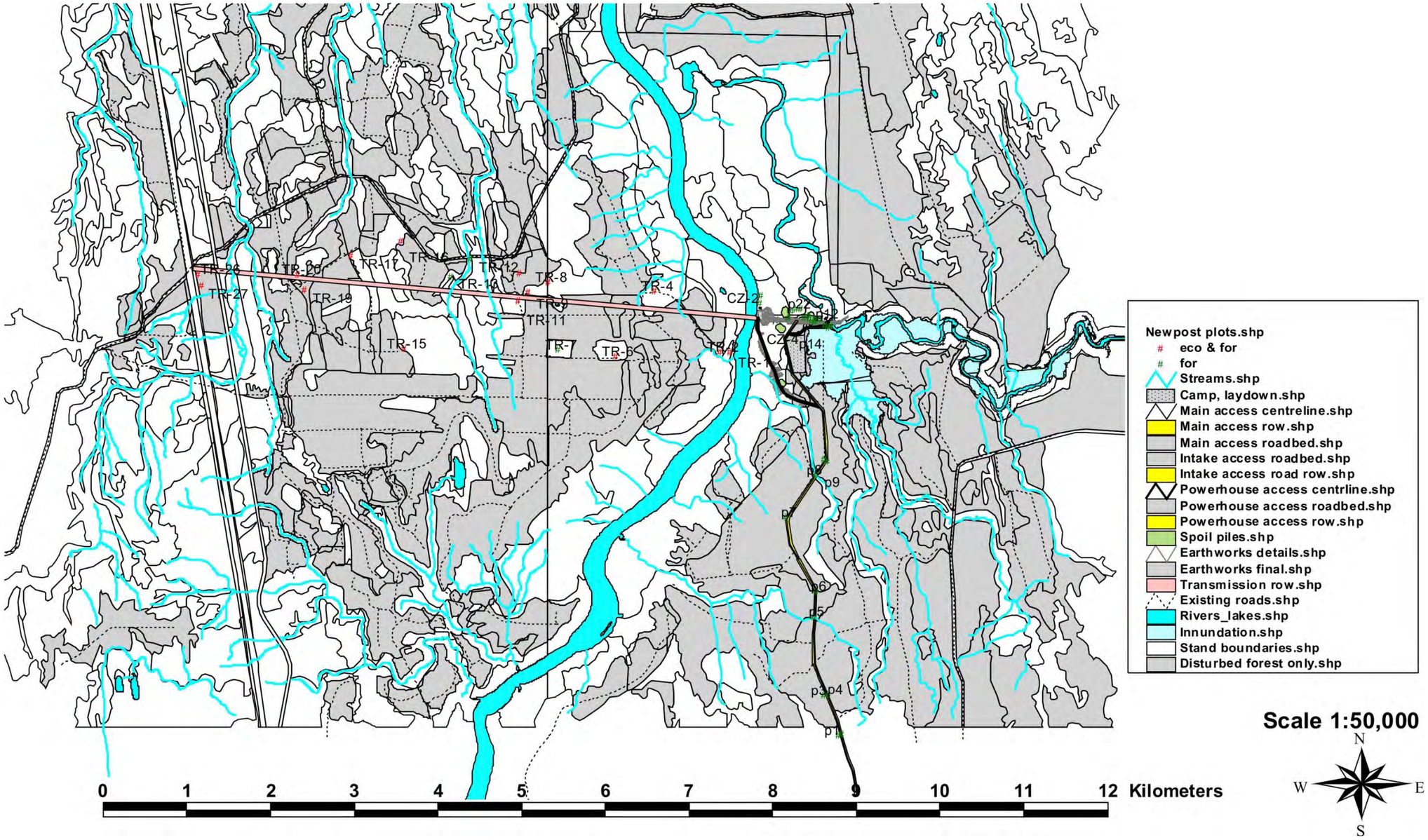
Table 3.5 Summary of Age Class Area Effects (ha)

10 Year Age Class	Broad Study Area	Transmission 50 m ROW	Spoil Piles	Camp and Laydown	Main Access Road	Intake Access Road	Powerhouse Access Road	Earthworks	Headpond	Total Affected Area	% of Broad Study Area
1-10	877.4	7.9								**7.9**	**<1**
11-20	985.9	1.6		7.0	2.4	0.3	0.7	2.1	1.3	**15.4**	**2**
21-30	3,507.1	7.7		0.1	15.3	0.6	0.5	1.0	40.1	**65.3**	**2**
41-50	50.7									**0.0**	**0**
51-60	354.7	1.0						0.3		**1.3**	**0**
61-70	108.2									**0.0**	**0**
71-80	470.4	1.4								**1.4**	**0**
81-90	474.3	0.4								**0.4**	**0**
91-100	990.3	0.3	2.3	0.4	0.6	0.6	3.2	6.8	7.1	**21.3**	**2**
101-110	611.2									**0.0**	**0**
111-120	553.3	0.7								**0.7**	**0**
121-130	704.1	8.4		0.7						**9.1**	**1**
131-140	620.2									**0.0**	**0**
141-150	365.0	0.1						0.4	56.8	**57.3**	**16**
151-160	268.8	0.9								**0.9**	**<1**
161-170	31.6									**0.0**	**0**
191-200	14.8									**0.0**	**0**
Non-Forest	1,015.5	3.6			0.2			0.2	64.1	**68.1**	**7**
Total	**12,003.3**	**34.0**	**2.3**	**8.2**	**18.5**	**1.5**	**4.4**	**10.8**	**169.4**	**249.1**	**2.1**

Table 3.6 Summary of Disturbed and Undisturbed Area Effects (ha)

Depletion Year	Broad Study Area	Transmission 50 m ROW	Spoil Piles	Camp and Laydown	Main Access Road	Intake Access Road	Powerhouse Access Road	Earthworks	Headpond	Total Affected Area	% of Broad Study Area
Never	6,654.0	16.8	2.3	1.2	0.8	0.6	3.2	7.6	128.0	**160.5**	**2**
1980	905.3	6.5								**6.5**	**<1**
1981	321.7			0.1	11.8	0.6	0.5		22.7	**35.7**	**11**
1982	443.4								16.5	**16.5**	**4**
1983	290.9										
1984	97.6							1.0	0.2	**1.2**	**1**
1985	1,318.2	1.2			3.5				0.7	**5.4**	**<1**
1986	142.2										
1994	130.2			6.9	2.4	0.3	0.7	2.2	1.3	**13.8**	**11**
1995	463.7	1.6								**1.6**	**<1**
1996	367.8	3.3								**3.3**	**<1**
1997	14.7										
1999	164.2										
2000	130.6										
2006	558.8	4.6								**4.6**	**<1**
Total	**12,003.3**	**34.0**	**2.3**	**8.2**	**18.5**	**1.5**	**4.4**	**10.8**	**169.4**	**249.1**	**2.1**

Figure 3.3 Disturbed and Undisturbed Areas



For the 27 stands sampled, the cruise was the same for six stands, similar for eight stands and different for 13 stands. The majority of differences were related to the cruise being younger than the FRI. The FRI is outdated and ages are based on photo interpretation in the original FRI with subsequent age updates based on time in subsequent FRIs. The majority of stands have never been sampled. Many lowland black spruce stands also exhibit an all aged structure and this variability could not be captured with the limited number of cruise plots in each stand. Natural succession (e.g., near New Post Creek) and harvesting disturbances also lead to age class differences.

Table 3.7 provides a summary of forest development stage effects. A total of 9.6 ha of plantation would be affected. The majority of area affected is natural forest with approximately 68.1 ha of non-forest also affected. The proposed Project would normally require re-imbursement of renewal expenditures to the Forest Renewal Trust Fund to help avoid losses of silviculture investments and productive land. Based on an estimated plantation cost of $850/ha and the FRI plantation codes, the silviculture liability would be approximately $8,160. Figure 3.4 shows the plantation areas which are located west of the Abitibi River.

3.4 PAST, CURRENT AND FUTURE FOREST MANAGEMENT

This is Tembec Inc. traditional licensed operating area. There are no planned operations within the vicinity of the proposed Project in the current 2010-12 contingency Forest Management Plan (FMP), as well as the 2012-13 contingency FMP and the 2010-30 FMP which are currently being prepared (C. St. Amande, Tembec Inc., Forest Information Services Coordinator, February 9, 2012, pers. comm.).

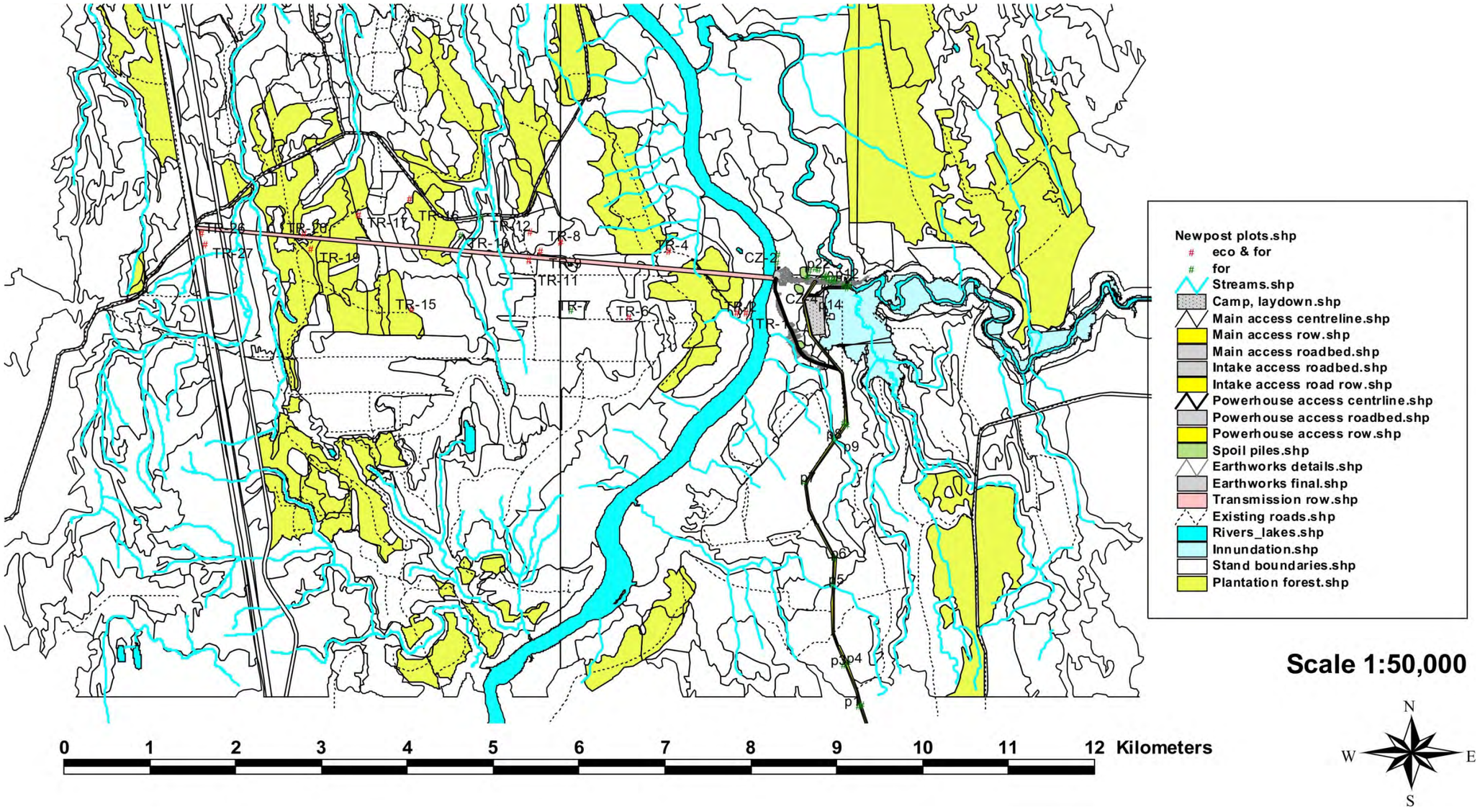
The main reason for no planned operations is that development of road access and harvesting have already occurred within the proposed development area. A small amount of renewal through planting has also occurred. Forest access roads are generally maintained as required. As a result, there has been no recent maintenance. Since harvesting is complete Tembec's activities will consist mainly of monitoring roads and water crossings and performing Free-To-Grow (FTG) assessments as required for non-FTG areas.

Table 3.7 Summary of Forest Development Stage Effects (ha)

Development Stage	Broad Study Area	Transmission 50 m ROW	Spoil Piles	Camp and Laydown	Main Access Road	Intake Access Road	Powerhouse Access Road	Earthworks	Headpond	Total Affected Area	% of Broad Study Area
Harvest Depletion	128.5										
FTG[1] Natural Forest	8,802.1	20.9	2.3	8.2	18.3	1.5	4.4	10.6	105.2	**171.4**	**2**
FTG Planted Forest	1,342.7	3.3							0.1	**3.4**	**<1**
Non-FTG Planted Forest	560.4	4.6								**4.6**	**<1**
FTG Seeded Forest	57.3										
Low Stocked Plantation	84.7	1.6								**1.6**	**2**
Low Stocked Natural Regen	12.1										
Non-Forest	1,015.5	3.6			0.2			0.2	64.1	**68.1**	**7**
Total	**12,003.3**	**34.0**	**2.3**	**8.2**	**18.5**	**1.5**	**4.4**	**10.8**	**169.4**	**249.1**	**2.1**

[1] FTG = Free To Grow.

Figure 3.4 Potentially Affected Plantations



3.5 MERCHANTABLE TIMBER EFFECTS

Table 3.8 provides an estimate of the FRI timber volumes in Net Merchantable Cubic Metres (NMm^3) based on clearing the 181 ha. An estimated 11,372 NMm^3 of merchantable timber would be affected, mainly black spruce, poplar, balsam fir and white spruce.

Table 3.8 Summary of FRI Timber Volumes (NMm^3)

Species	Broad Study Area	Transmission 50 m ROW	Spoil Piles	Camp and Laydown	Main Access Road	Intake Access Road	Powerhouse Access Road	Earthworks	Headpond	Total Volume
Pj	23,275	0	0	0	0	1	0	3	182	**186**
Sb	327,939	987	94	76	25	35	134	312	4,413	**6,076**
Sw	54,988	95	94	28	24	35	134	295	1,053	**1,758**
Bf	61,324	199	140	29	37	52	199	431	435	**1,522**
Ce	934	9	0	0	0	0	0	0	0	**9**
La	3,619	32	0	0	0	0	0	0	0	**32**
Po	190,814	222	106	48	424	46	161	347	435	**1,789**
Bw	17,459	0	0	0	0	0	0	0	0	**0**
Total	**680,351**	**1,544**	**434**	**181**	**510**	**169**	**628**	**1,388**	**6,518**	**11,372**

3.6 FOREST RESOURCES EFFECTS SUMMARY

The proposed New Post Creek Project includes a 50 m transmission ROW, work areas consisting of construction and laydown areas, the main access road to the tailrace, penstock and powerhouse, a site access road to provide access to the intake, penstock and powerhouse work area and inundation area.

The proposed Project is expected to have the following effects on forest resources:

- Forestry operations have been completed in the proposed development area. There are no proposed forestry operations in the current FMPs within the vicinity of the proposed development;

- The proposed development requires the clearing and initial development area of approximately 249 ha;

- A total of 11,372 NMm^3 of merchantable timber is estimated to be cleared. The marketable volume will be significantly less given the lack of markets for many species and products. In addition, a significant volume of very small wood from younger stands (i.e., less than 50 years old) will likely not be marketable and require chipping or crushing for disposal;

- A total of 181 ha of productive forest will be removed. The majority of this area will be lost from production with the exception of a portion of the work areas, which will be replanted with native tree species after construction;

- There will be no significant effects on forest units or ecosites. Unique forest unit and ecosite conditions (i.e., the spruce/fir climax forest) occur in the Abitibi River flood plain and sandier soils adjacent to New Post Creek. Although the proposed development will impact a small portion of this area, the majority is protected within LAPP, the Abitibi River reserve and the additional regulated lands;

- More than one-quarter (27.3%) of the proposed Project area has been disturbed due to harvesting in addition to the extensive road development; and

- A total of 9.6 ha of plantation would be affected. Normally silviculture liability charges of approximately $8,160 would be recoverable to the Forest Renewal Trust Fund for plantation loss.

3.7 RARER TREE SPECIES EFFECTS

Black spruce, white spruce, balsam fir, cedar, tamarack, poplar and paper birch are the typical boreal tree species and these were the species observed in the proposed development area. No unique or rarer tree species such as black ash, red maple, red pine, or white pine were observed as the proposed development site is well beyond their range.

3.8 EXISTING AND NEW ROAD EFFECTS

The proposed development will require the use of the Otter Rapids Road across Abitibi Canyon and north to the proposed development site. This road currently provides access to the Otter Rapids GS and is a well maintained primary access road with a crushed gravel surface.

To reach the development site there is an existing 6.1 km clay-topped operational road that extends to New Post Creek and the Abitibi River. This operational road would have to be brought up to branch road standards by widening the ROW to approximately 45 m for line of sight to accommodate two-lane travel, large floats, equipment and construction materials. Ditching, culvert replacements and re-surfacing with crushed gravel would also be required. The operational road appears to have two permanent water crossings (i.e., MNR water crossing ID#589 and ID#635) that would require permits from the MNR for culvert replacement.

The proposed transmission line will be accessed using the Fraserdale primary road to Branch Road #1 and various operational roads depending upon the transmission line section. Some maintenance on these roads may be required during construction.

3.9 GRAVEL AND FILL EFFECTS

It is expected that gravel aggregate would be required to upgrade the main access road, to construct the site access road between the powerhouse and intake, to construct parking lots at the powerhouse and intake, and for the construction footings at both locations. Gravel may also be required to improve some of the operational roads along the transmission line route to provide access during construction.

Aggregate material is in short supply in the general area. Therefore, aggregate would have to be obtained either from an existing licensed aggregate pit, or from a new gravel pit or quarry. A new aggregate or quarry pit would have to be located and it would take approximately six months to one year for MNR permit approval.

3.10 EFFECTS ON KNOWN VALUES

Table 3.9 and Figure 2.1 provide a summary of the 28 values potentially affected by the proposed development. The most significant effects would be to New Post Creek and the Abitibi River. The inundation area will also flood riparian zones. The proximity of LAPP and Pinard Moraine Conservation Reserve may require Area of Concern (AoC) prescriptions. Most other known values can be avoided and protected with modified protection zones and special conditions developed in consultation with MNR. Other effects of the proposed development involve the traversal of five small streams and one pond by the transmission line, as well as the crossings of two small tributaries to New Post Creek by the operational access road. A half dozen small culverts were observed on the existing operational access road; however, significant stream flows were not observed.

3.11 EFFECTS ON OTHER USERS

Trappers, hunters, sportfishermen, Moose Cree First Nation and the TTN also use the area for trapping, hunting and fishing. Hunters were observed during the fall field work. Canoeists also occasionally use the Abitibi River and New Post Creek.

The proposed transmission line will cross the Ontario Northland Railway (ONR) on the west side just before connection with the existing transmission line. The proposed transmission line will also cross Tembec operational roads. Proper clearance may be required to maintain lines of sight.

Table 3.9 Summary of Values Potentially Affected by the Proposed Project

Values	Location	Potential Effects and Mitigation Measures
1. Pinard Moraine Conservation Reserve (CR)	A large 18,201-ha protected area located 30 m west of the existing 115 kV transmission line and the proposed transmission line connection.	CRP/OPG proposes to use an existing timber haul road currently used by the timber industry that bisects the CR to access the interconnection of the proposed transmission line with the existing Hydro One 115 kV transmission line. An AoC prescription for use of this road will likely be required from MNR.
2. ONR	240 m east of the existing 115 kV transmission line.	Proposed transmission line crosses ONR railway; transmission line tower heights will have to accommodate the railway; approval to cross the railway will be required.
3. Trapper's Cabin	650 m south of the proposed transmission line.	No proposed Project activity near trapper's cabin AoC (i.e., within 100 m).
4,5. Pinard Creek and its Tributary (#540 and #538)	Small watercourse to be crossed at the west end of proposed transmission line.	Access to construct poles via existing operational access roads; access to the 220-m land parcel between watercourses #540 and #538 may require one crossing for construction and maintenance if spanning of both watercourses is not possible.
6,7. Unnamed Watercourses (#554 and #629)	Small streams to be crossed in the middle section of the proposed transmission line.	Access to construct poles via existing operational access roads; access to land between tributaries #554 and #629 may require the construction of a new 380 m operational road, a water crossing of one of the two tributaries, or winter construction.
8. Unnamed Pond (#6273)	Small 0.4 ha pond to be crossed at the east end of the proposed transmission line.	Access to construct poles via existing operational access roads; no water crossing required.
9. Unnamed Stream (#485)	Small stream to be crossed at the east end of the proposed transmission line.	Access to construct poles via existing operational access roads; no water crossing required.
10. Abitibi River (#2089)	150 m wide at transmission line crossing, with tailrace and powerhouse to be constructed along east shoreline.	Existing operational roads provide access to both sides of the river; a portion of New Post Creek flows will be diverted into the Abitibi River at the proposed powerhouse tailrace location; any fish habitat and water quality issues are addressed as part of the proposed Project Environmental Assessment (EA).

Table 3.9 Summary of Values Potentially Affected by the Proposed Project (Cont'd)

Values	Location	Potential Effects and Mitigation Measures
11. LAPP	Surrounding Abitibi River and New Post Creek immediately north of proposed development.	A small southern portion of provincial park lands were replaced with Crown lands in TTN Traditional Territory to allow the proposed development to occur within the former provincial park boundary. There are no activities within the amended provincial park boundary; however, the intake, penstock and powerhouse and main access roads will be located immediately south of the provincial park boundary.
12. Unknown Raptor Nest	1,200 m north of proposed Project within LAPP along the Abitibi River.	No proposed development activity near nest AoC; beyond the 1,000 m buffer recommended by MNR during the nesting period.
13. New Post Creek (#5697)	Source of water for the proposed Project, with the proposed intake constructed in New Post Creek.	Access via a new access road. The proposed development area is limited within and adjacent to New Post Creek. Fish habitat and water quality issues have been addressed as part of the proposed Project EA.
14. Unnamed Stream (#589)	Existing operational access road to be upgraded to main access road and will require culvert replacement.	Water crossing approval will be required from MNR prior to upgrading the road.
15. Unnamed Stream (#635)	Existing operational access road to be upgraded to main access road and will require culvert replacement.	Water crossing approval will be required from MNR prior to upgrading the road.
16,17,18,19. Unnamed Stream and its Tributaries (#523, #559, #572, #525)	Lower reaches of small stream and its tributaries to be inundated	Conversion from lotic (riverine) to lentic (lacustrine) conditions.
20,21,22. Three Unnamed Streams (#554, #550, #545)	Lower reaches of small streams to be inundated.	Conversion from lotic (riverine) to lentic (lacustrine) conditions.
23. Unnamed Stream (#520)	Lower reaches of small stream to be inundated.	Conversion from lotic (riverine) to lentic (lacustrine) conditions.

Table 3.9 Summary of Values Potentially Affected by the Proposed Project (Cont'd)

Values	Location	Potential Effects and Mitigation Measures
24. Unnamed Stream (#491)	Lower reaches of small stream to be inundated.	Conversion from lotic (riverine) to lentic (lacustrine) conditions.
25. Unnamed Stream (#505)	Lower reaches of small stream to be inundated.	Conversion from lotic (riverine) to lentic (lacustrine) conditions.
26. Unnamed Stream (#489)	Lower reaches of small stream to be inundated.	Conversion from lotic (riverine) to lentic (lacustrine) conditions.
27. Unnamed Stream (#509)	Lower reaches of small stream to be inundated.	Conversion from lotic (riverine) to lentic (lacustrine) conditions.
28. Unnamed Stream (#495)	Lower reaches of small stream to be inundated.	Conversion from lotic (riverine) to lentic (lacustrine) conditions.

4.0 SUMMARY AND CONCLUSIONS

The proposed New Post Creek Project will affect approximately 249 ha of land; however, more than one-quarter (~27%) of the local study area has already been disturbed through the development of forest access roads and harvesting. Slightly less productive forest will be lost from production due to native tree plantings of non-forest and work areas after construction. A small amount of existing forest plantations will be affected. Forest operations have been completed in the area and are unlikely to occur in the near future.

Many of the known values are avoided or their effects can be mitigated with AoC prescriptions.

5.0 REFERENCES

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Jones R.K., G. Pierpoint, G.M. Wickware, J.K. Jeglum, R.W. Arnup and J.M. Bowles 1983. *Field Guide to Forest Ecosystem Classification for the Clay Belt, Site Region 3E.* Ontario Ministry of Natural Resources, Toronto, Ontario. 161 p.

McCarthy, T.G., R.W. Arnup, J. Nieppola, B.G. Merchant, K.C. Taylor and W.J. Parton 1994. *A Field Guide to Forest Ecosystems of Northeastern Ontario.* Natural Resources Canada, Canadian Forestry Service and Ontario Ministry of Natural Resources, Northeast Science & Technology, NEST Field Guide FG-001.

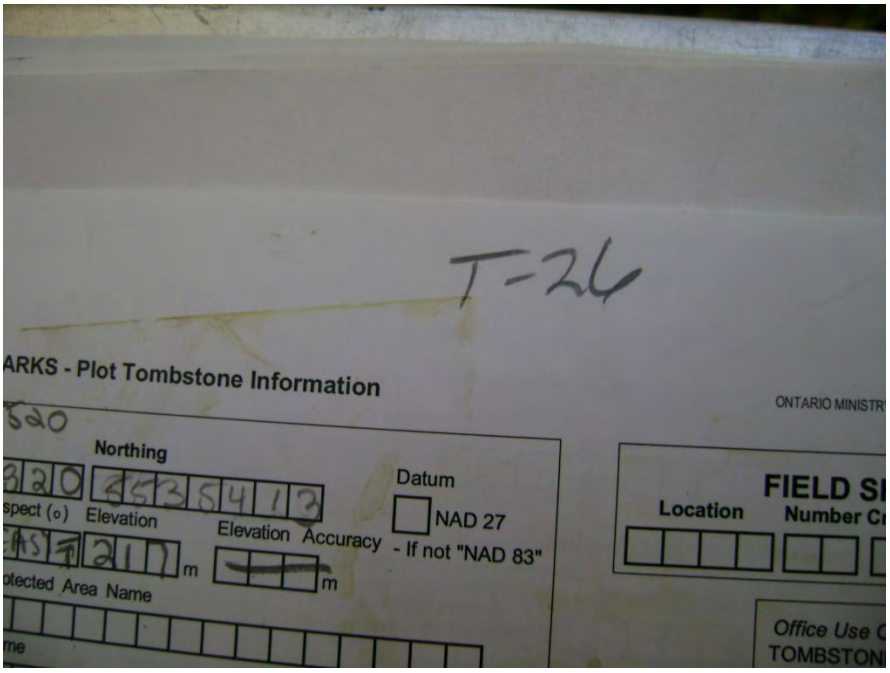
Ontario Parks 2010. *Ontario Parks Inventory and Monitoring Program (OPIAM): Guidelines and Methodologies.*

Rowe, J.S. 1972. *Forest Regions of Canada*. Canadian Forestry Service, Publication No. 1300: 172 p.

Appendix 1 – Sample Plot Photographs

Appendix 1 – Sample Plot Pictures

Plot TR-26



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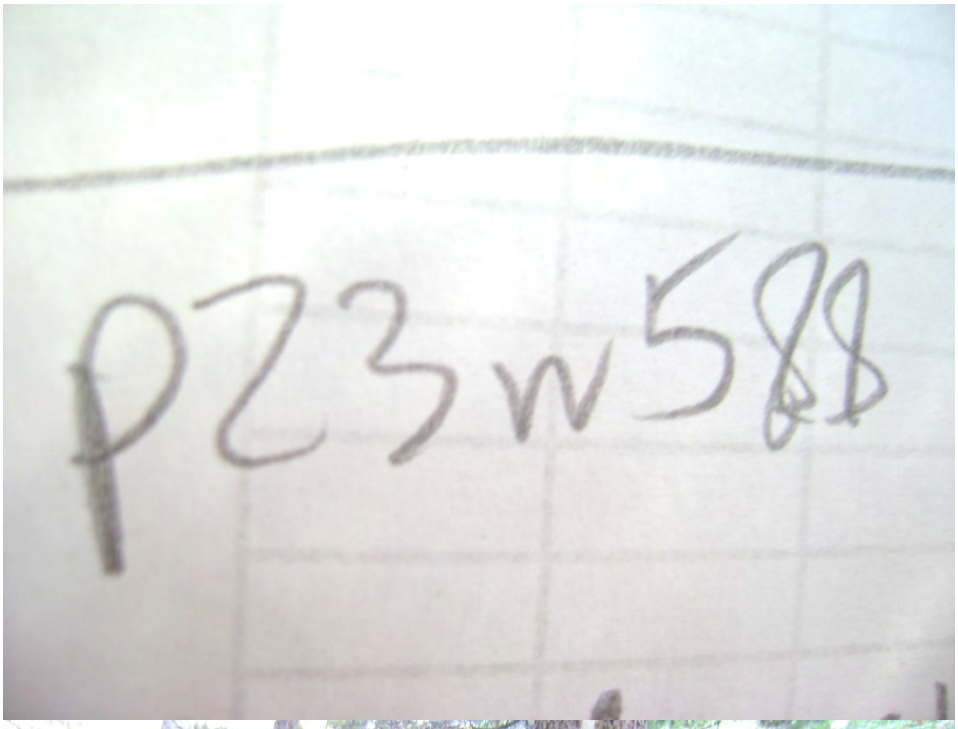

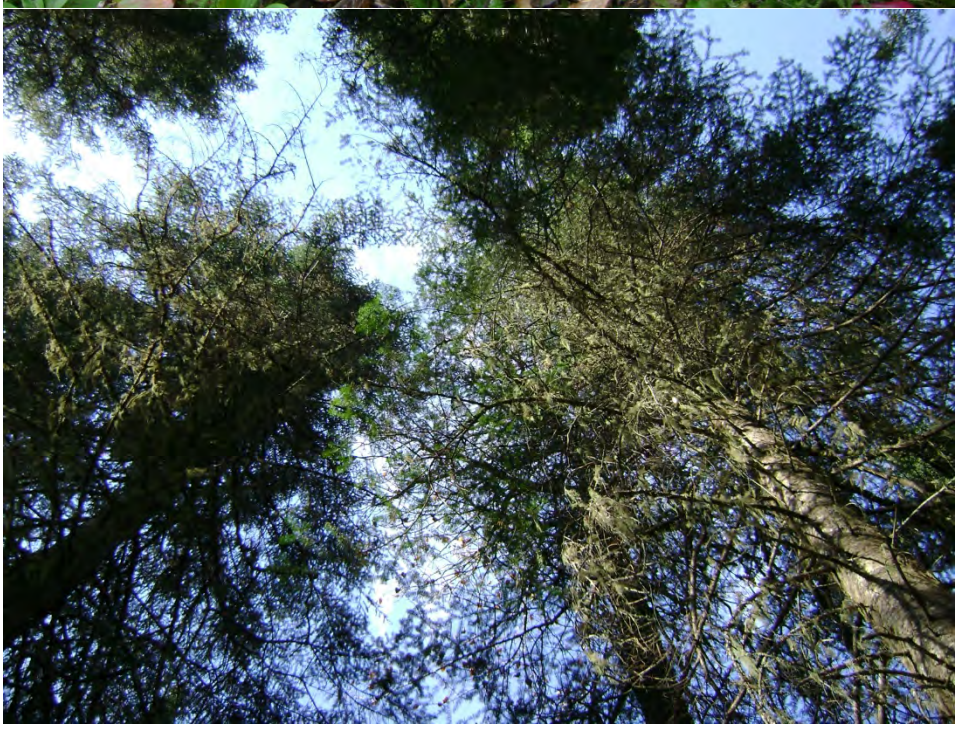

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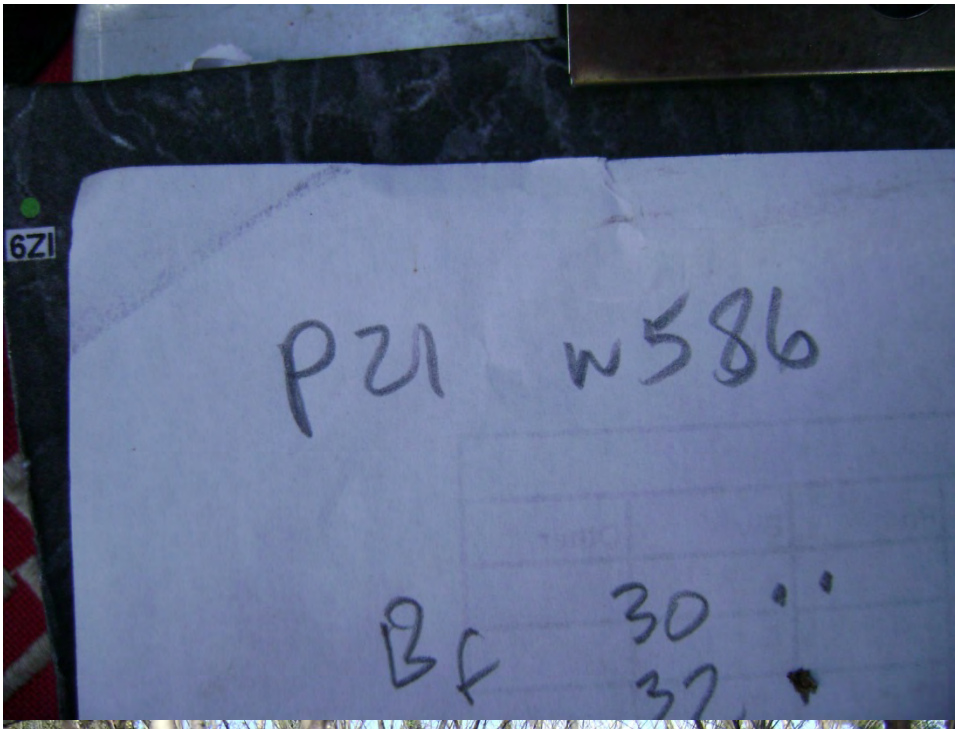

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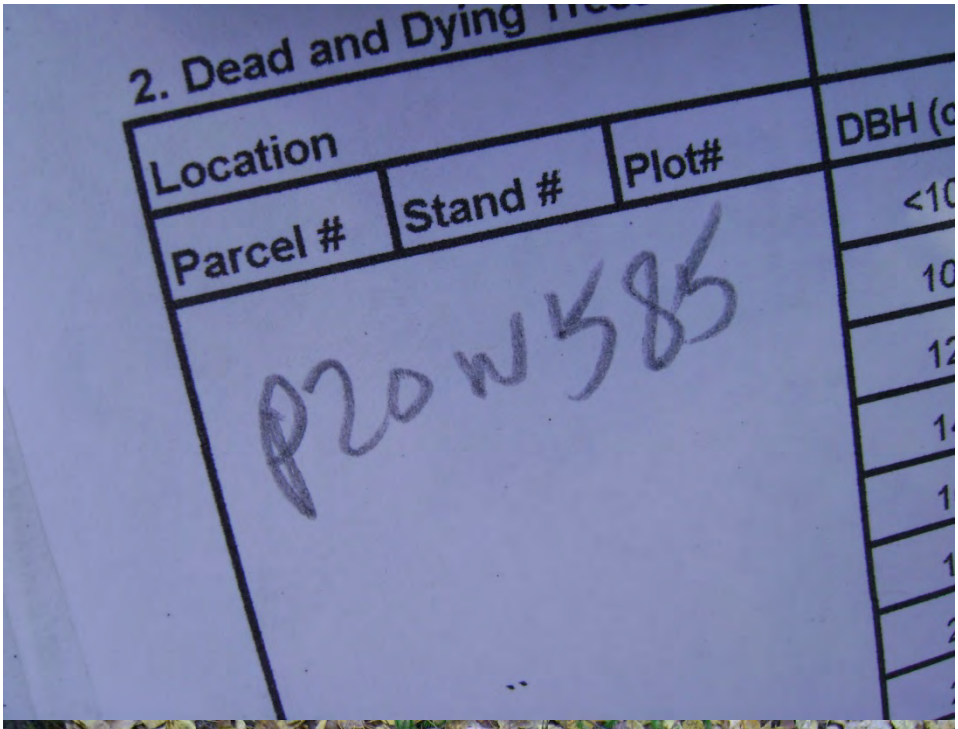
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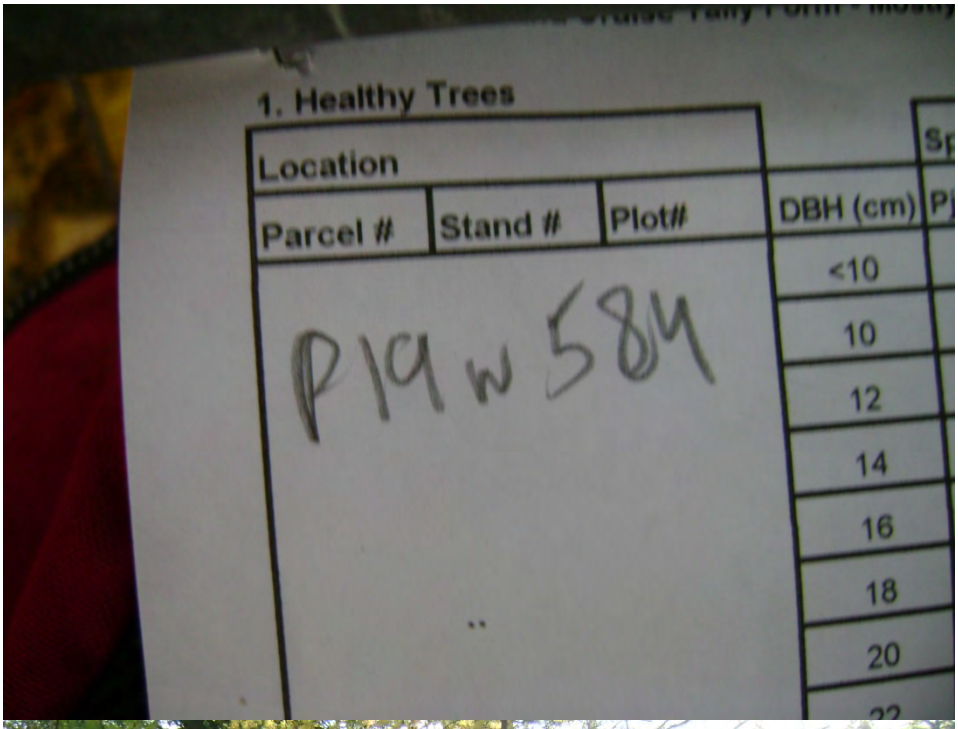
Location
Parcel #
Stand #
Plot#
P20W585
DBH
<10
10
12
14

Plot 19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Location
Parcel #
Stand #
Plot#
DBH (cm)
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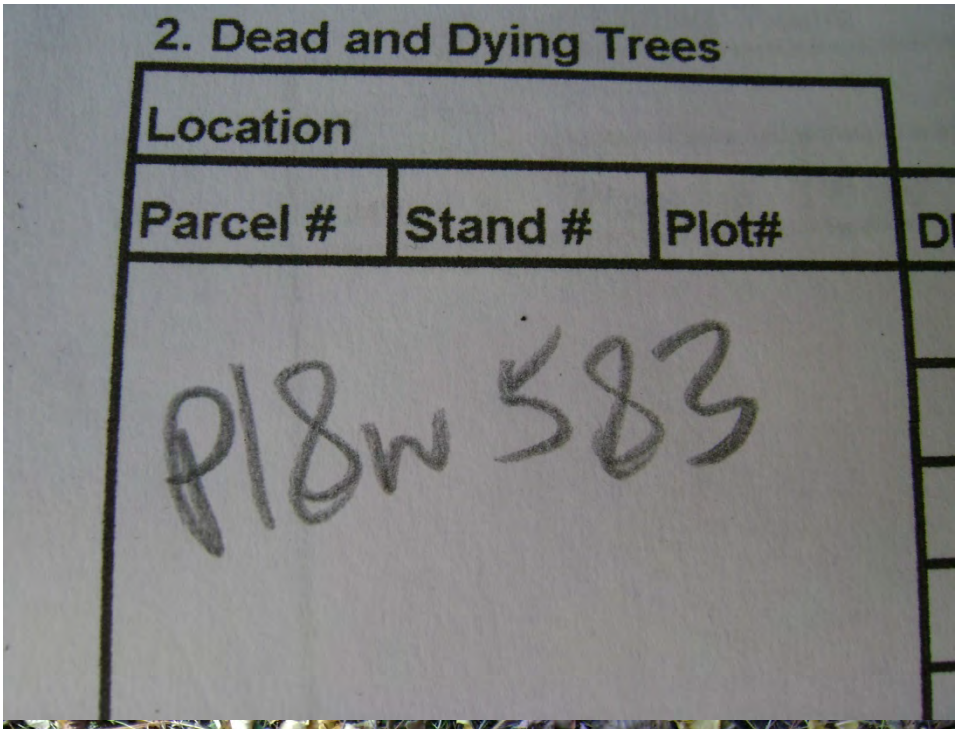
10
12
14
16
18
20
P19 w 584

Plot 18



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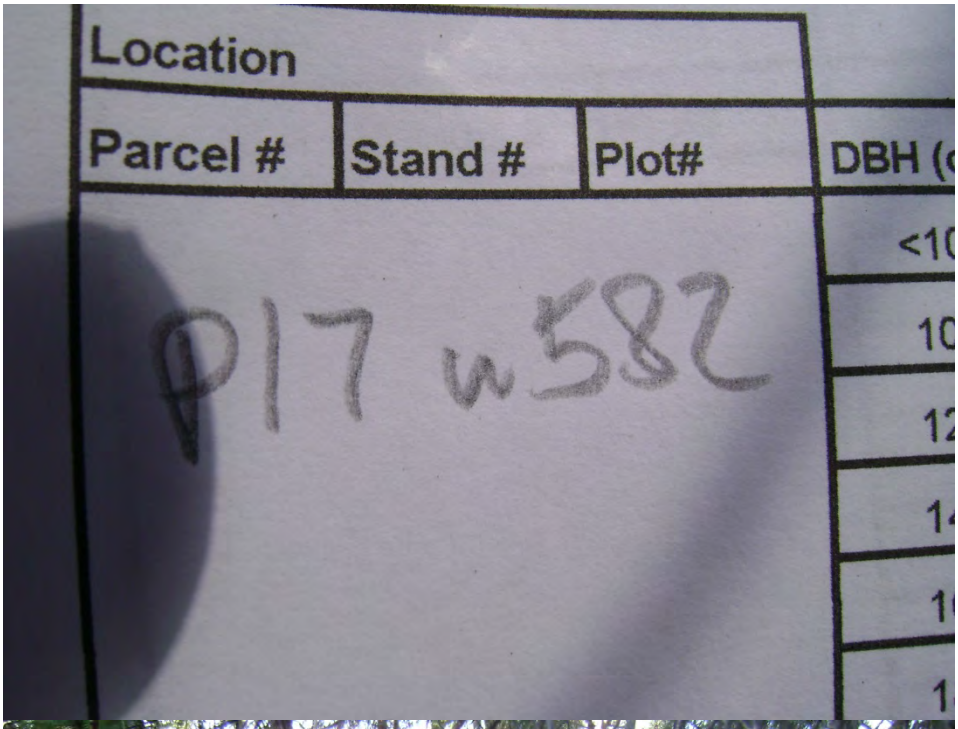

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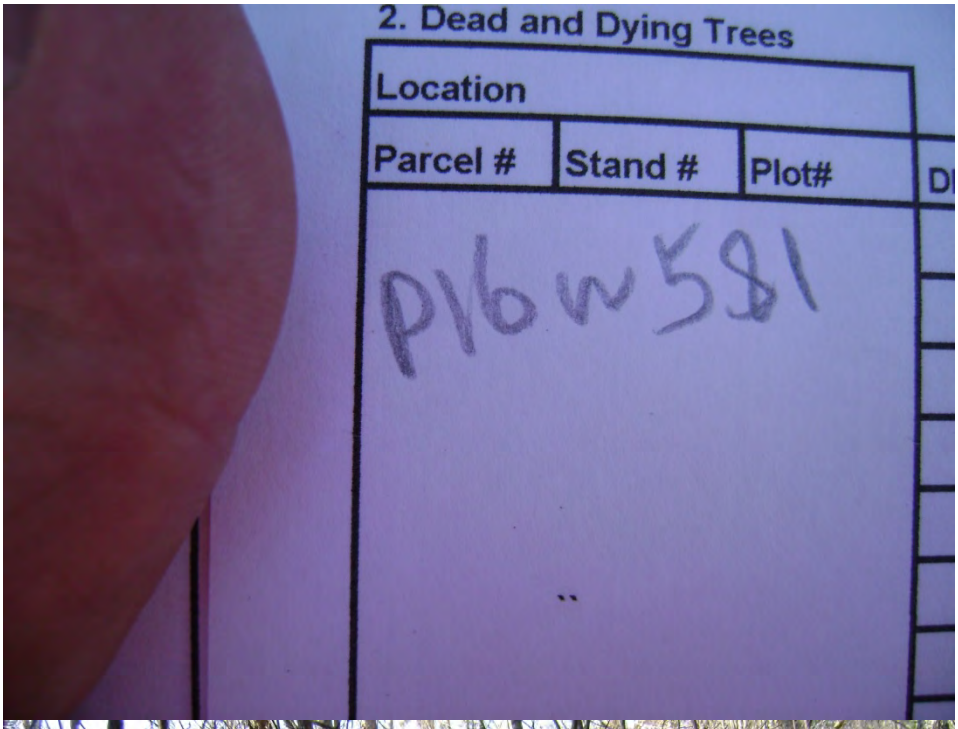

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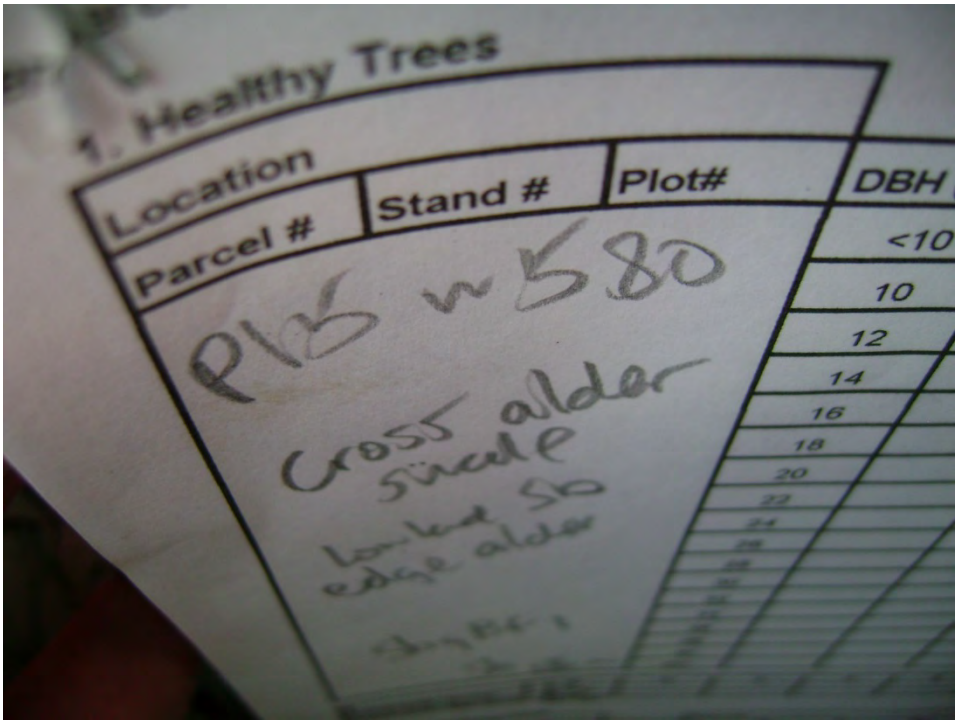
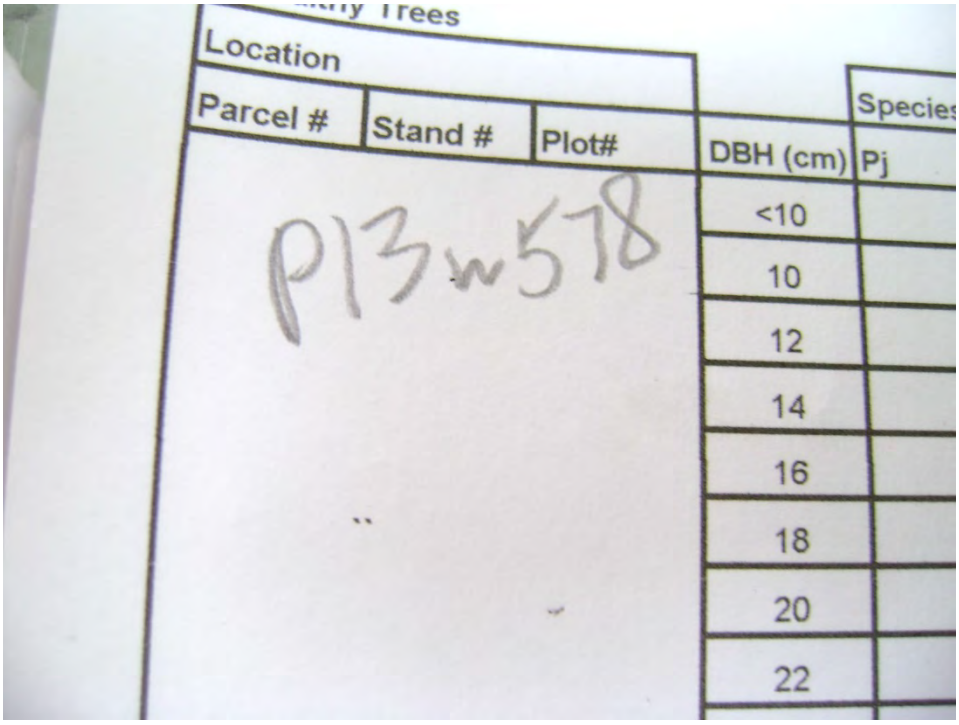
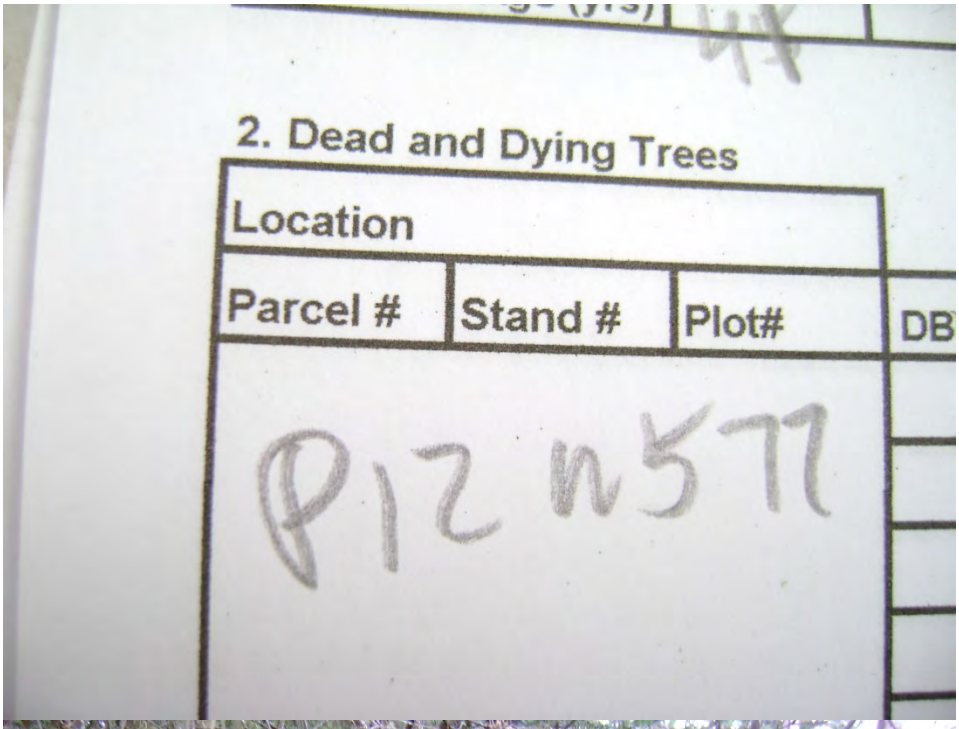

1. Healthy Trees
Location
Parcel #
Stand #
Plot#
DBH
<10
10
12
14
16
18
20
Plot 15 w 580
cross alder
shrub
Low-level SO
edge alder

Plot 13


Trees
Location
Parcel #
Stand #
Plot#
P13w578
DBH (cm)
Species
Pj
<10
10
12
14
16
18
20
22

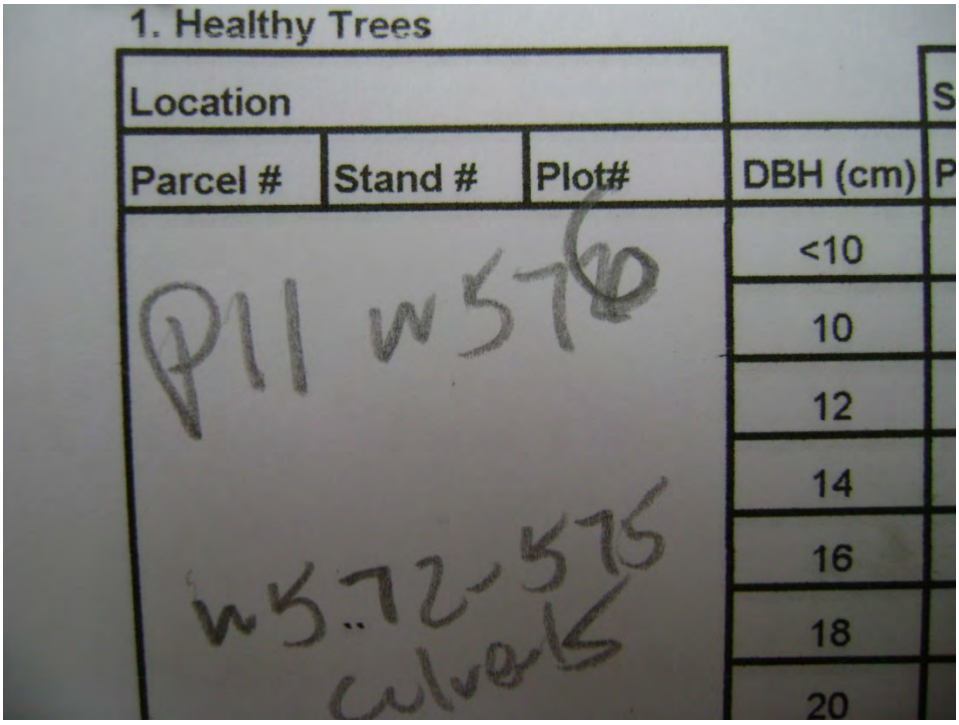
Plot 12


2. Dead and Dying Trees
Location
Parcel #
Stand #
Plot#
DB
P12 n577

Waypoint 572 - Culvert Existing Access Road

Waypoint 573 and 574 – Flooded Land along Existing Access Road

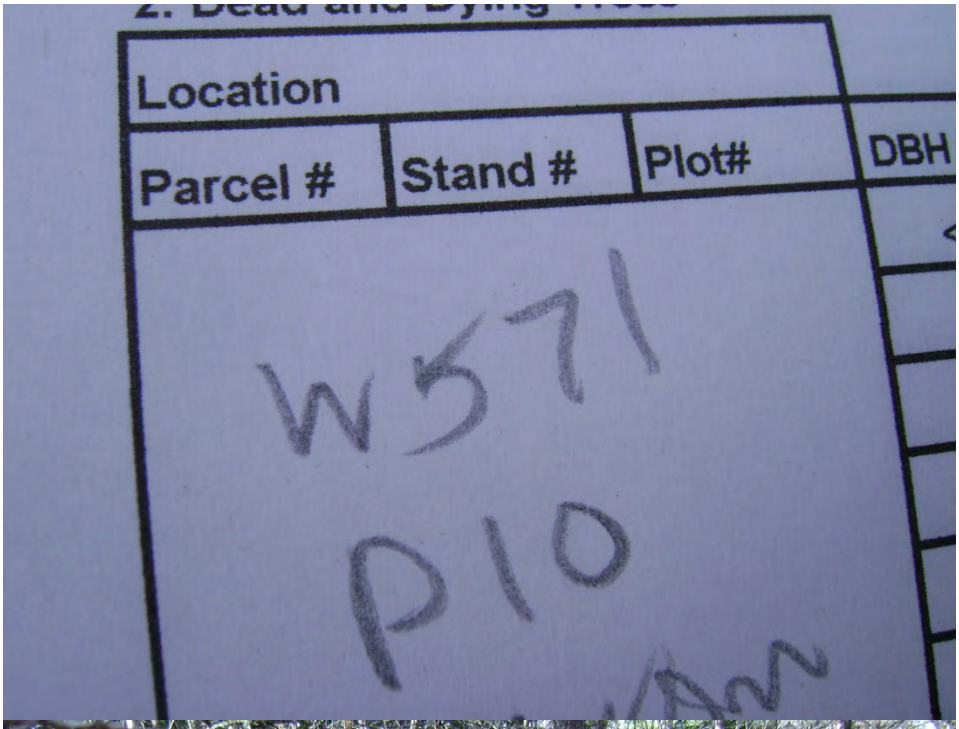
Plot 11



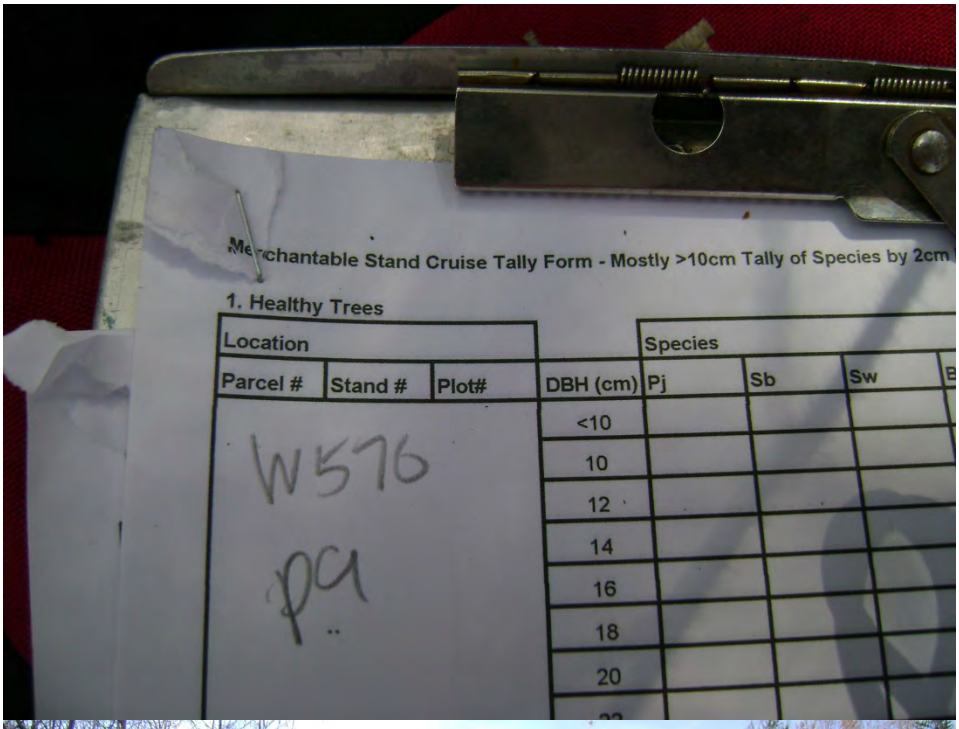
1. Healthy Trees

Location				S
Parcel #	Stand #	Plot#	DBH (cm)	P
P11 W5 76 W5 72-575 culverts			<10	
			10	
			12	
			14	
			16	
			18	
			20	

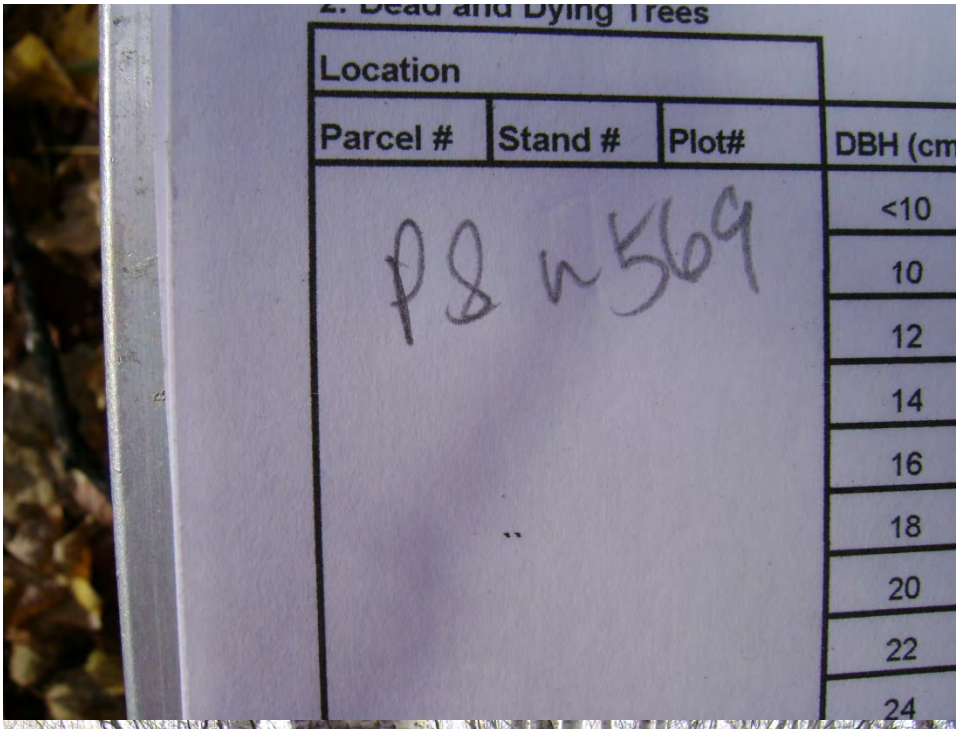
Plot 10



Plot 9


chantable Stand Cruise Tally Form - Mostly >10cm Tally of Species by 2cm
1. Healthy Trees
Location
Parcel #
Stand #
Plot#
W576
pg
Species
DBH (cm)
Pj
Sb
Sw
<10
10
12
14
16
18
20

Plot 8


2. Dead and Dying Trees
Location
Parcel #
Stand #
Plot#
DBH (cm
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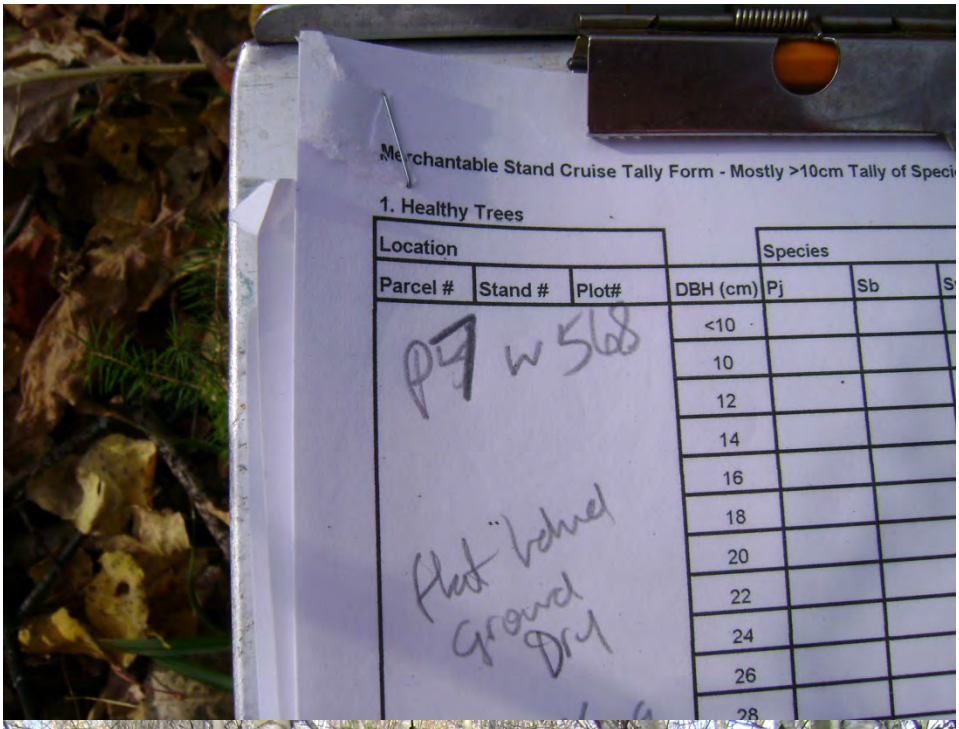
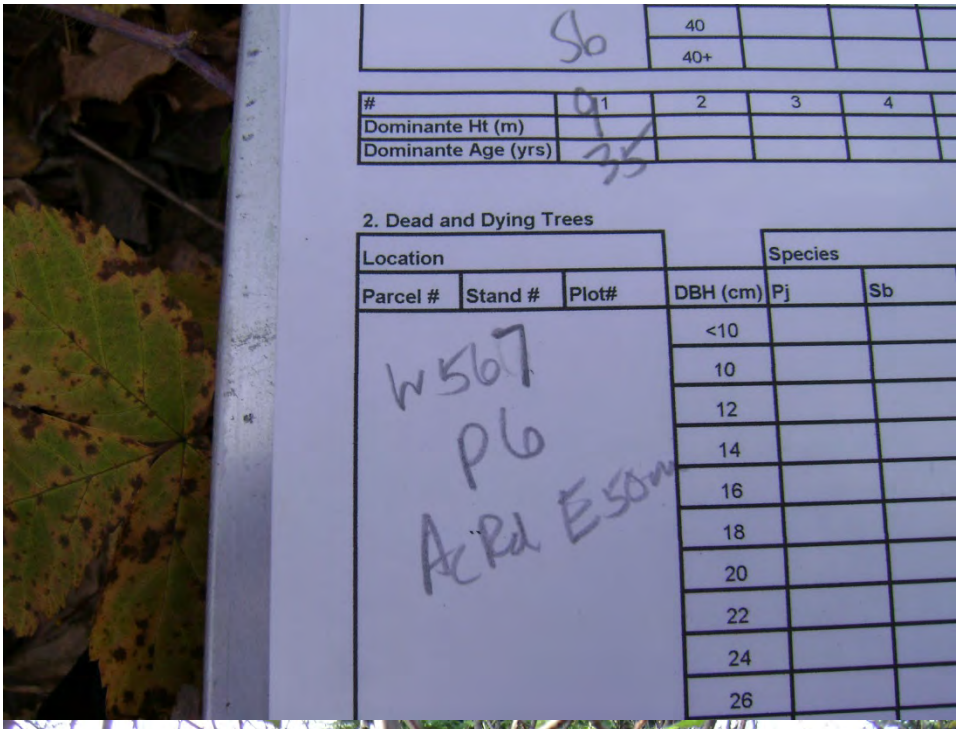
10
12
14
16
18
20
22
24

Plot 7


Merchantable Stand Cruise Tally Form - Mostly >10cm Tally of Speci
1. Healthy Trees
Location
Species
Parcel #
Stand #
Plot#
DBH (cm)
Pj
Sb
<10
10
12
14
16
18
20
22
24
26
28
P7 w568
Plot below Ground Dry

Plot 6


Sb
40
40+
#
1
2
3
4
Dominante Ht (m)
9
Dominante Age (yrs)
35
2. Dead and Dying Trees
Location
Species
Parcel #
Stand #
Plot#
DBH (cm)
Pj
Sb
W567
P6
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10
12
14
16
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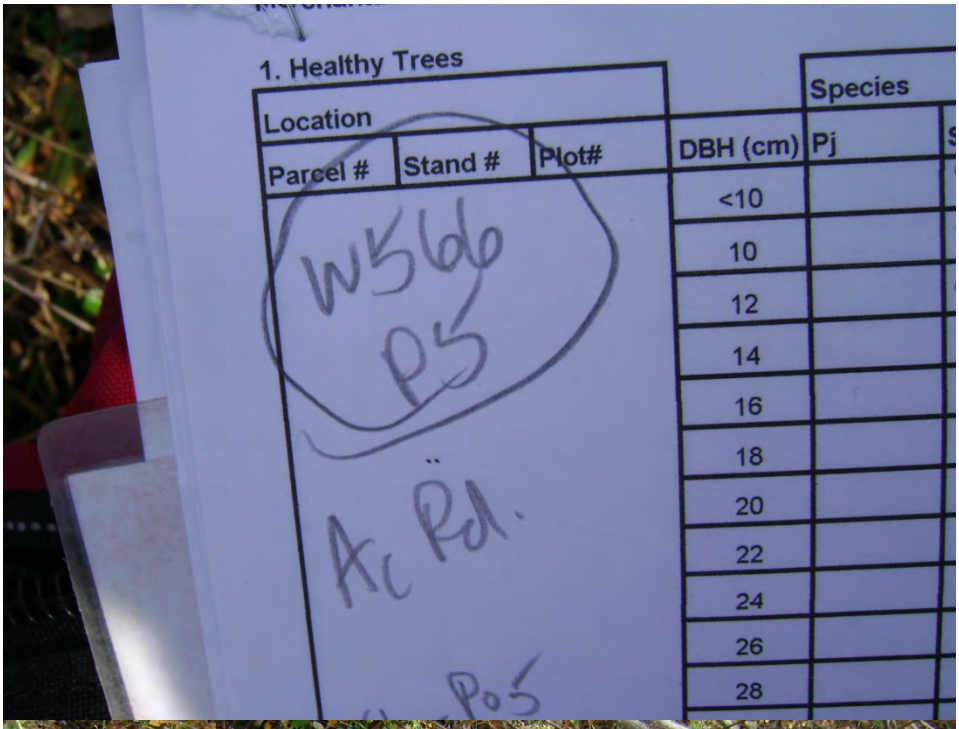
22
24
26

Plot 5


1. Healthy Trees
Location
Parcel #
Stand #
Plot#
DBH (cm)
Species
Pj
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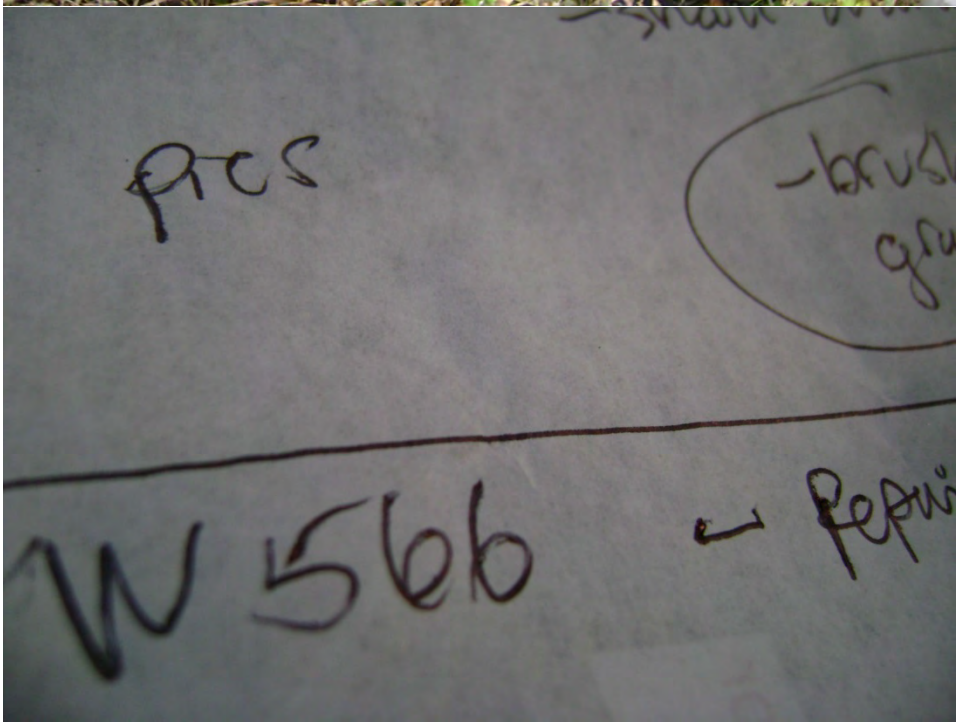
22
24
26
28
W56d
P5
Ac Pd.
P05


PCS
W566

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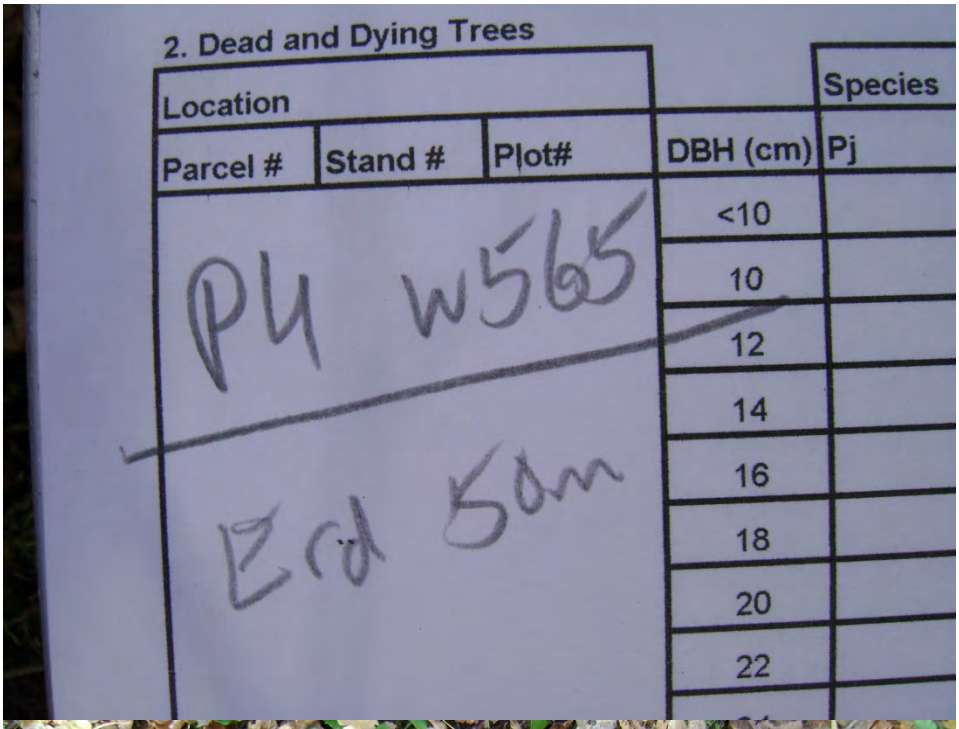
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Parcel #
Stand #
Plot#
DBH (cm)
Species
Pj
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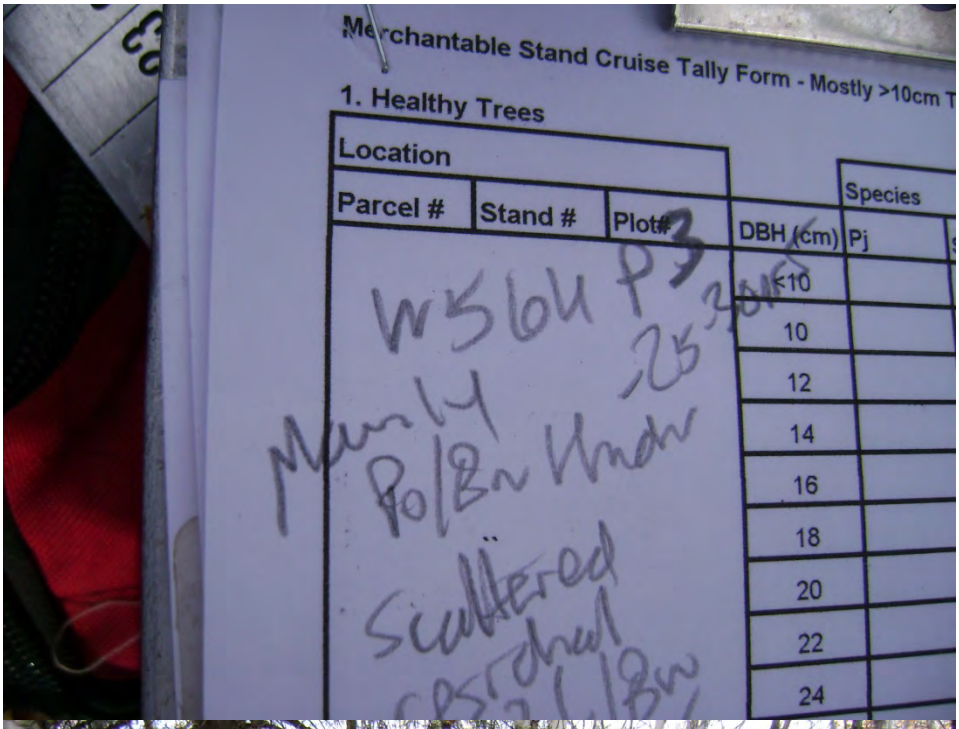
10
12
14
16
18
20
22
P4 W565
Rd 50m

Plot 3


Merchantable Stand Cruise Tally Form - Mostly >10cm T
1. Healthy Trees
Location
Parcel #
Stand #
Plot#
DBH (cm)
Species
Pj
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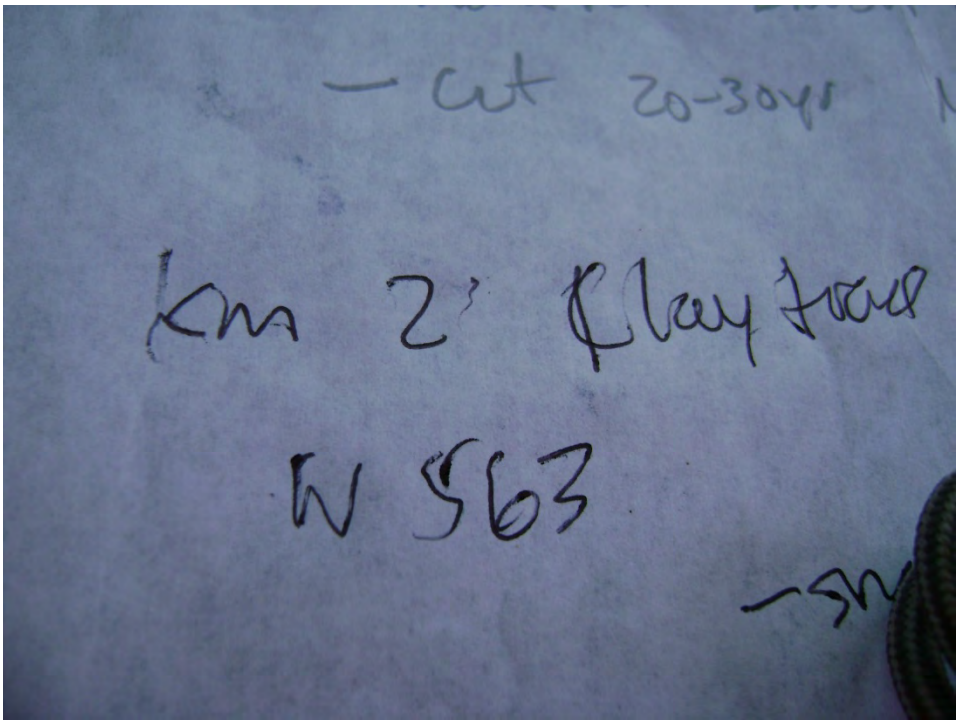
10
12
14
16
18
20
22
24
W564 P3
Mainly
Po/Bw Under
Scattered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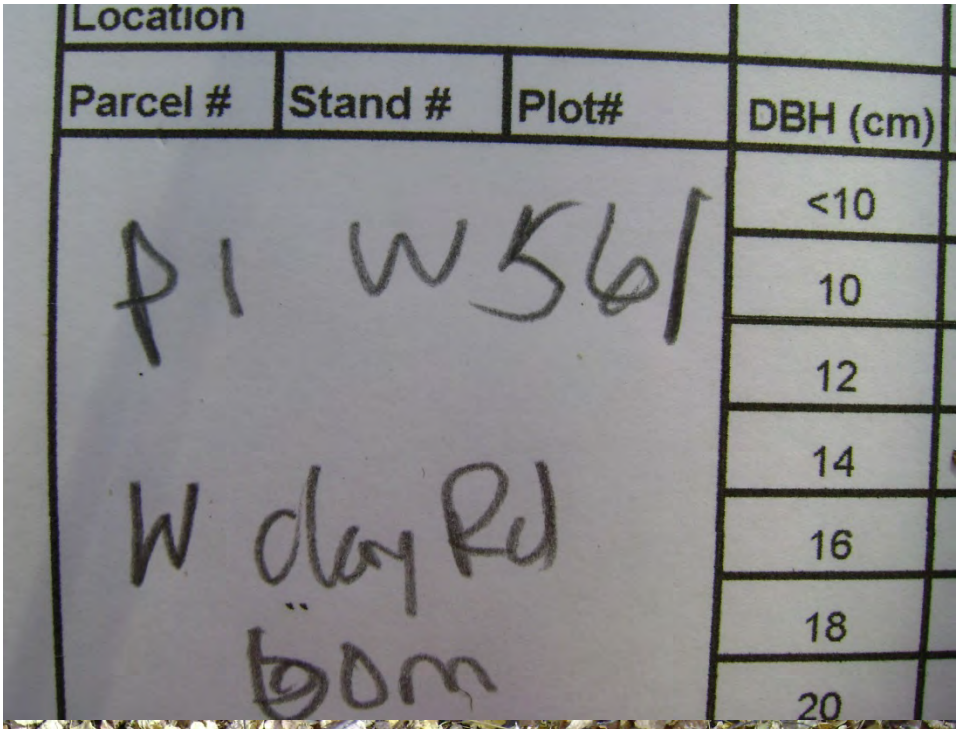
km 2
W 563

Plot 1

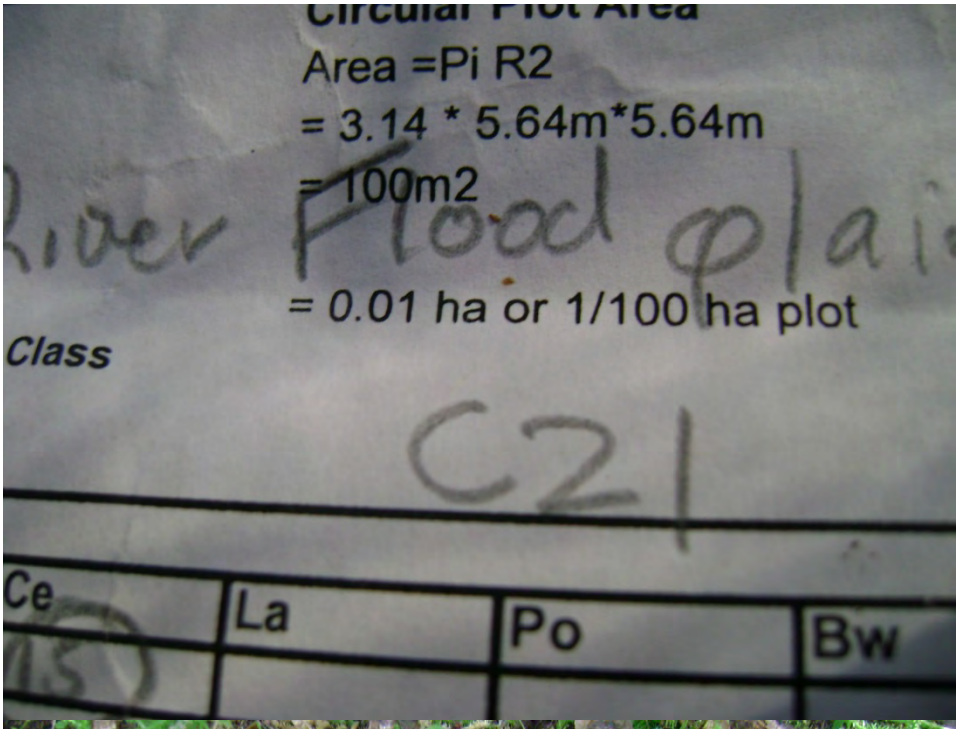

Location
Parcel #
Stand #
Plot#
DBH (cm)
<10
10
12
14
16
18
20
P1 W561
W clay Rd
bom

Main Access Road Junction of Otter Rapids Primary Road

Otter Rapids Primary Road


KGS
GROUP
204-896-1209

Plot CZ1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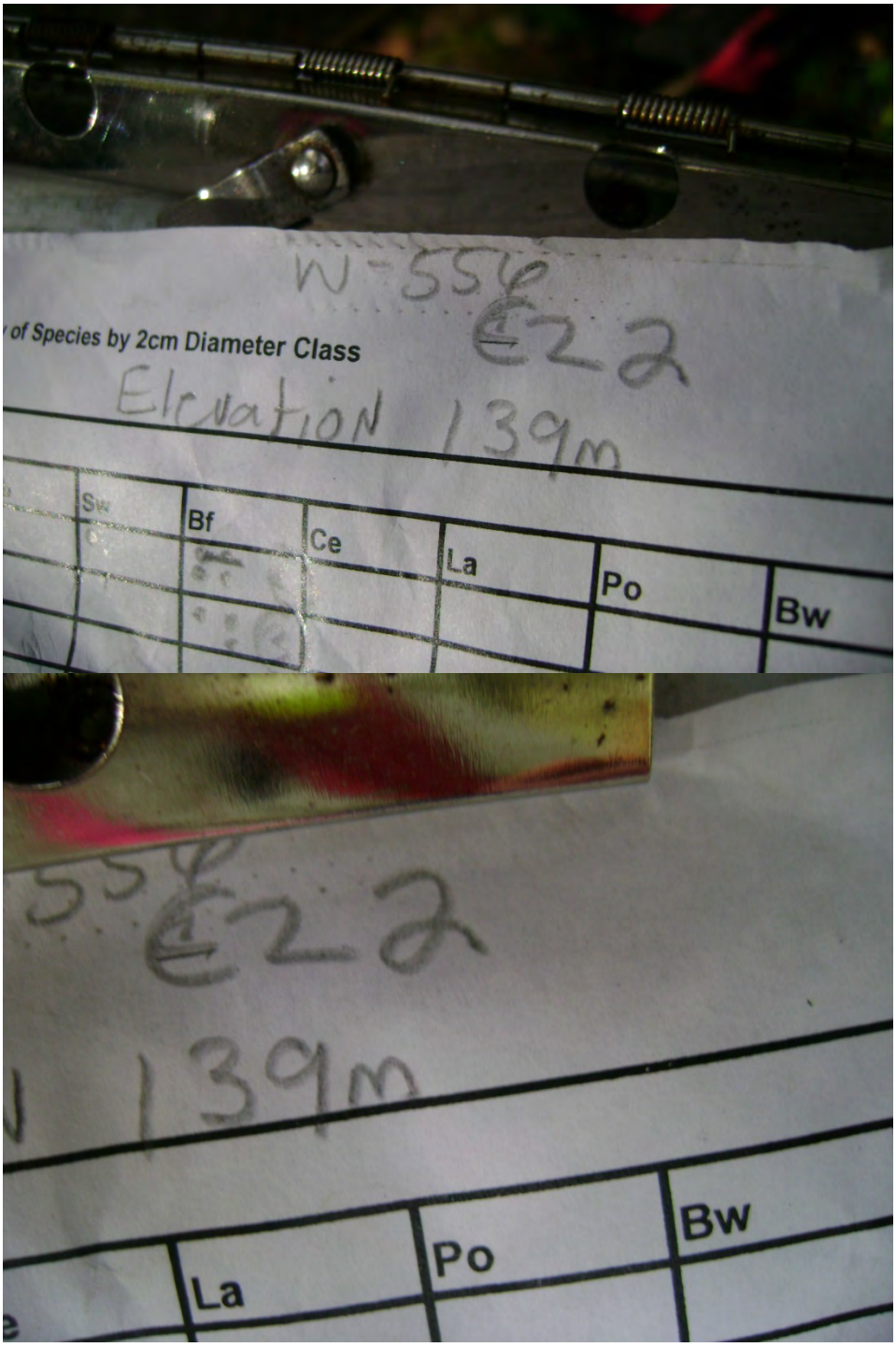
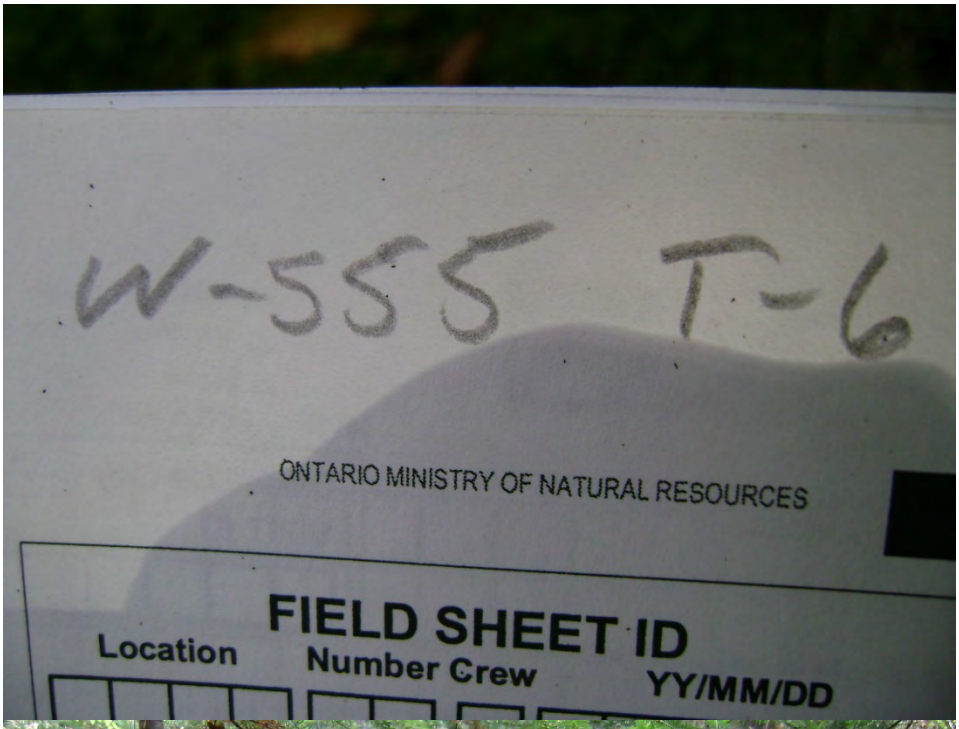
= 3.14 * 5.64m*5.64m
= 100m2
= 0.01 ha or 1/100 ha plot
Class
CZ1
Ce
La
Po
Bw

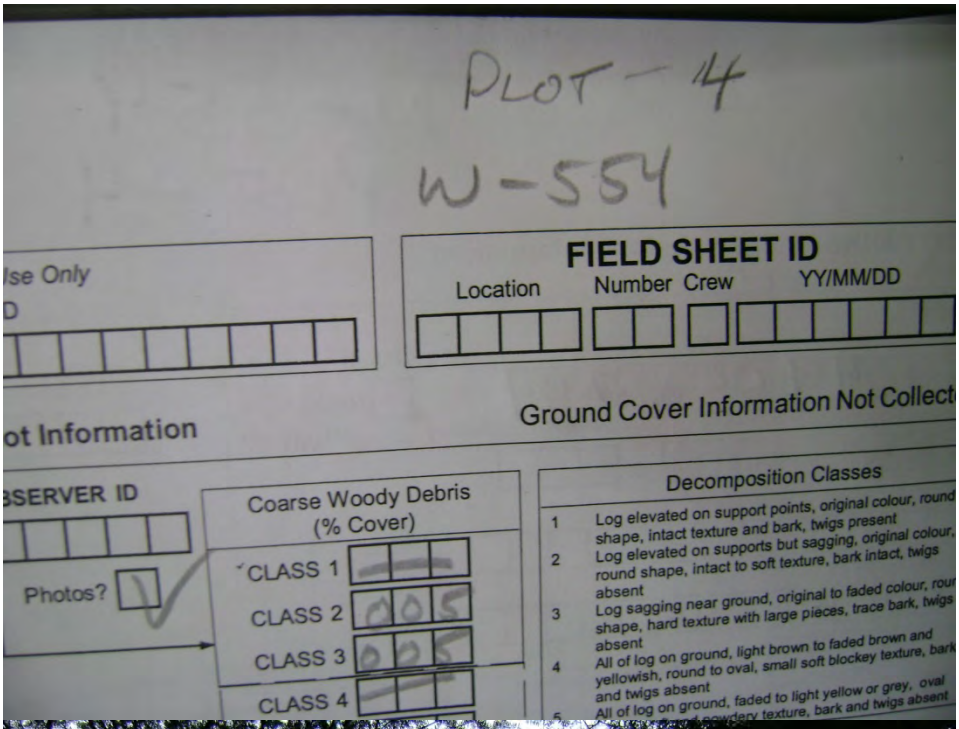
Plot CZ-2


W-556
E22
of Species by 2cm Diameter Class
Elevation 139m
Sw
Bf
Ce
La
Po
Bw
556
E22
139m
La
Po
Bw

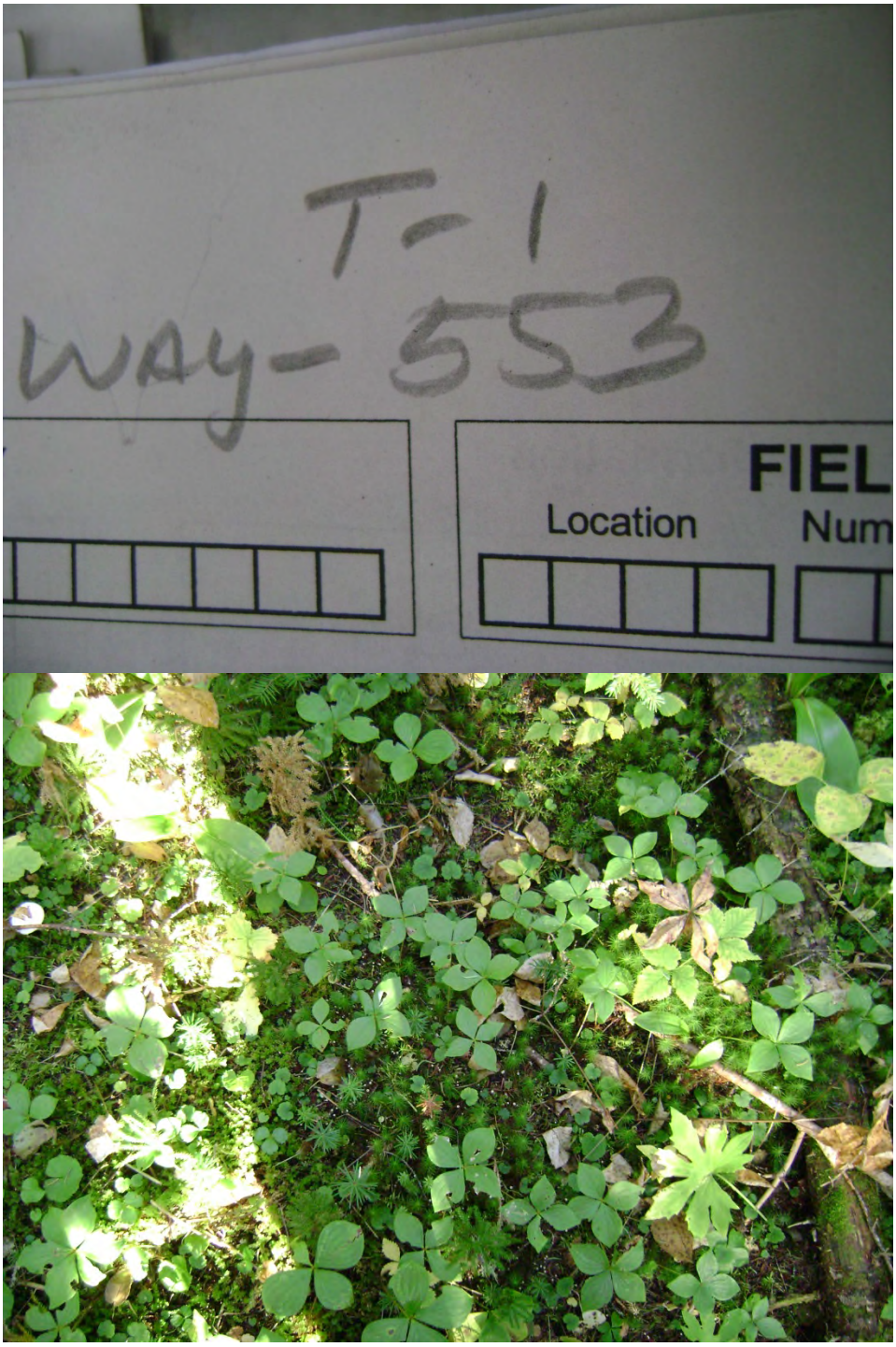
Plot TR-6


W-555 T-6
ONTARIO MINISTRY OF NATURAL RESOURCES
FIELD SHEET ID
Location
Number Crew
YY/MM/DD

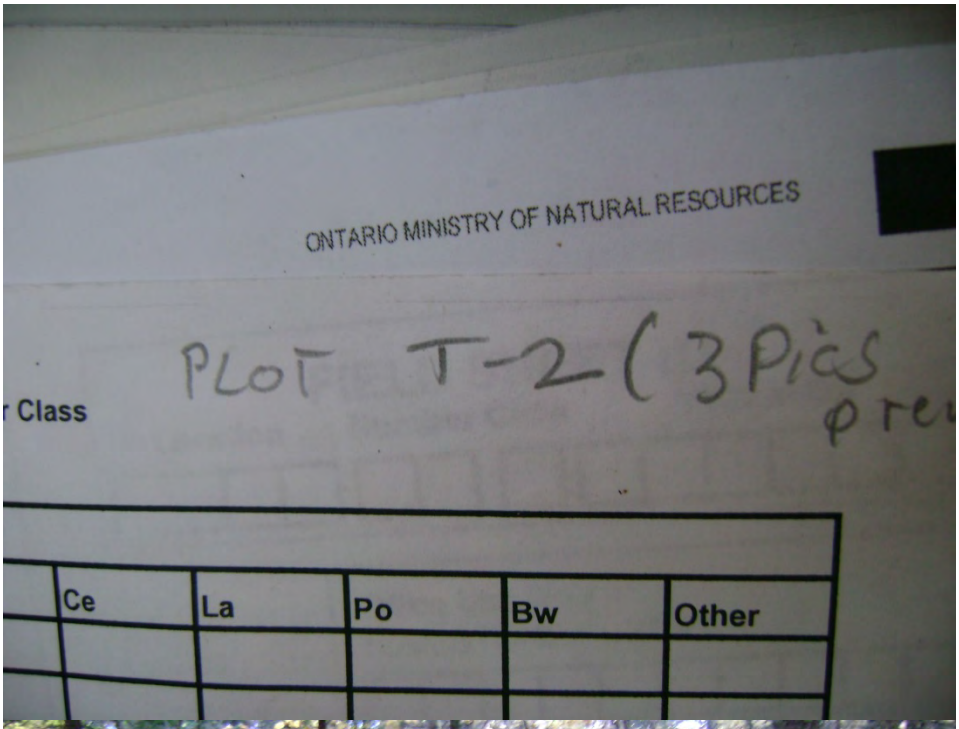
Plot TR-4


PLOT - 14
W-554
FIELD SHEET ID
Location
Number
Crew
YY/MM/DD
Ground Cover Information Not Collect
Coarse Woody Debris
(% Cover)
CLASS 1
CLASS 2
CLASS 3
CLASS 4
Photos?
Decomposition Classes
1 Log elevated on support points, original colour, round shape, intact texture and bark, twigs present
2 Log elevated on supports but sagging, original colour, round shape, intact to soft texture, bark intact, twigs absent
3 Log sagging near ground, original to faded colour, rou shape, hard texture with large pieces, trace bark, twigs absent
4 All of log on ground, light brown to faded brown and yellowish, round to oval, small soft blockey texture, bark and twigs absent
All of log on ground, faded to light yellow or grey, oval

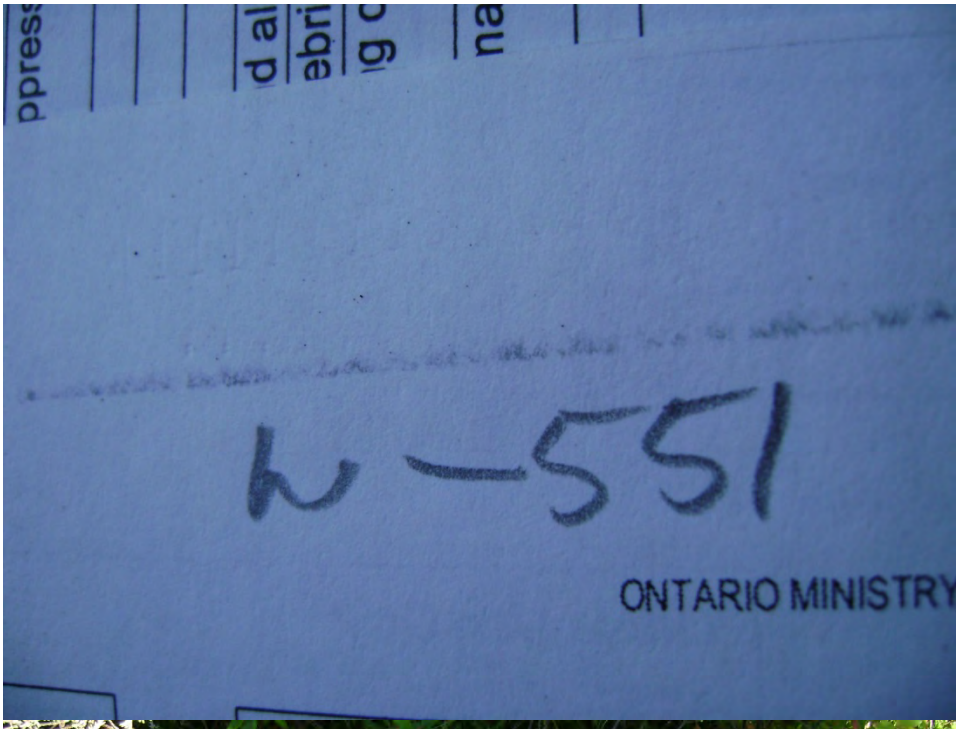
Plot TR-1



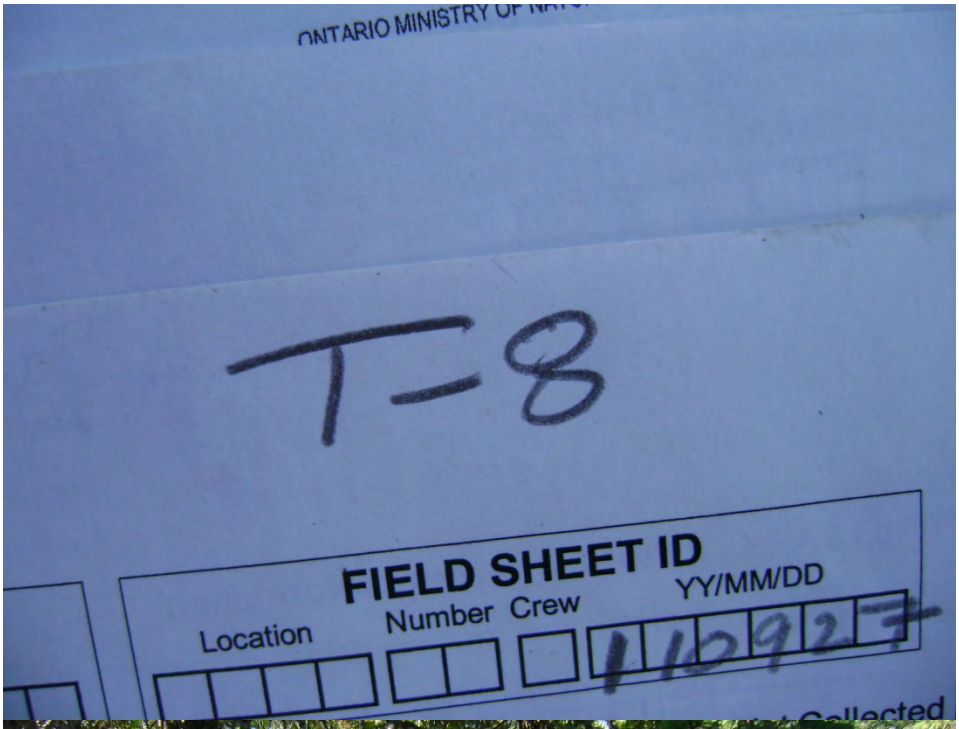
Plot TR-2


ONTARIO MINISTRY OF NATURAL RESOURCES
PLOT T-2 (3 Pics
Class
Ce
La
Po
Bw
Other

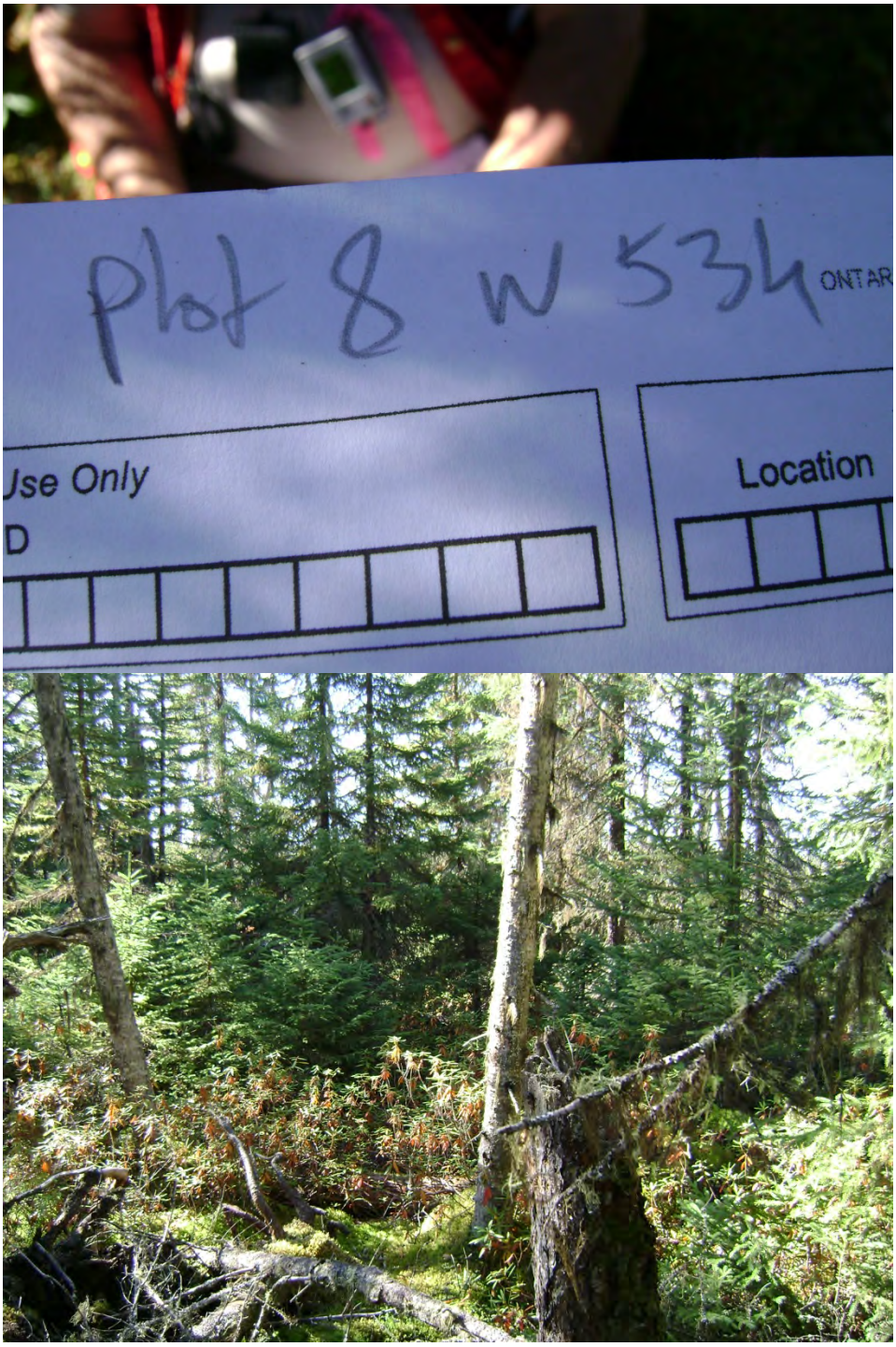
Plot TR-11



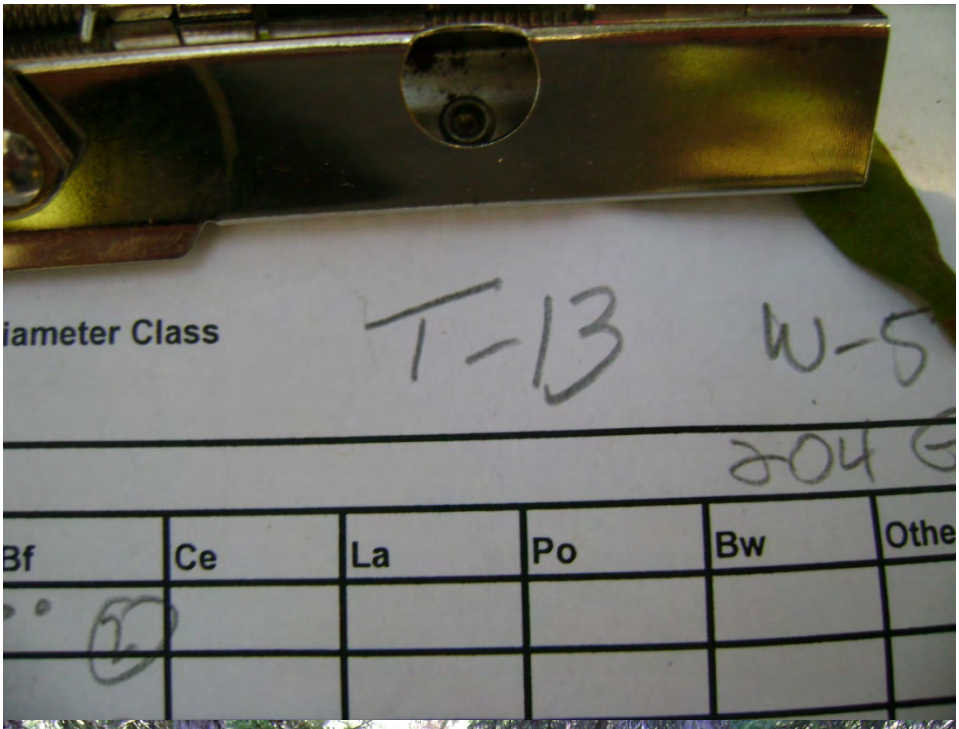
Plot TR8


ONTARIO MINISTRY OF
T-8
FIELD SHEET ID
Location
Number
Crew
YY/MM/DD

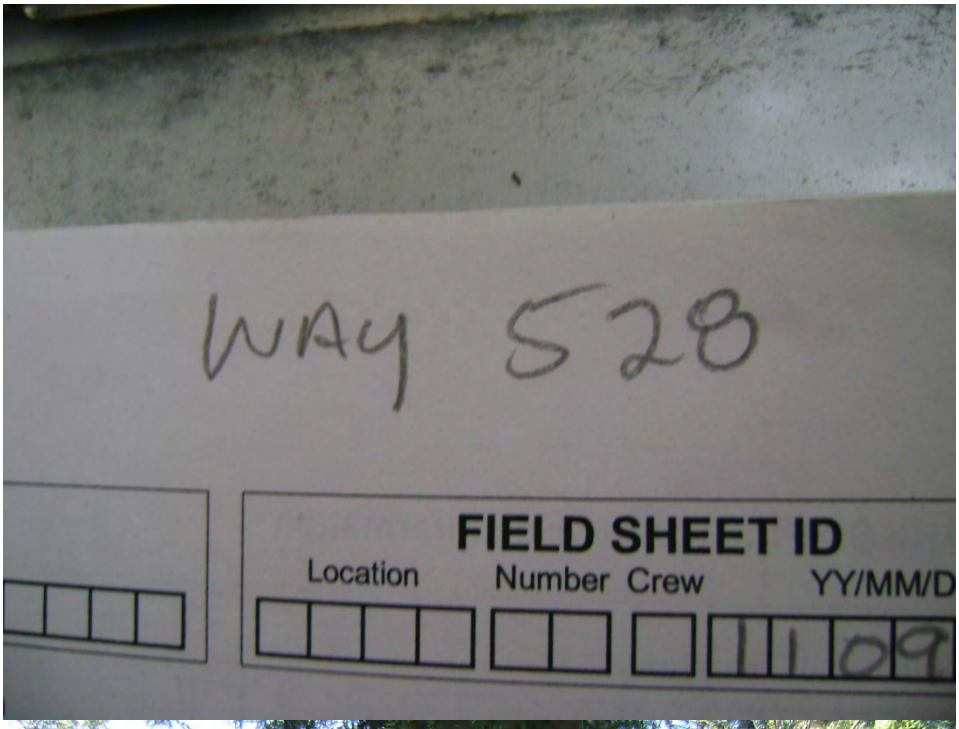
Plot 8

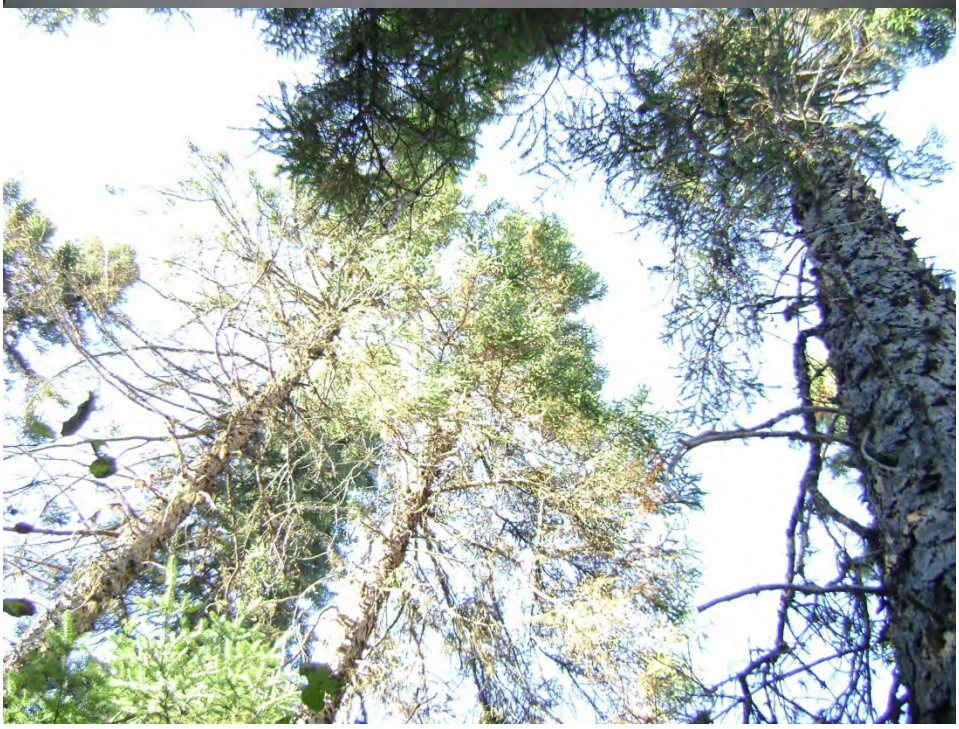


Plot TR-13

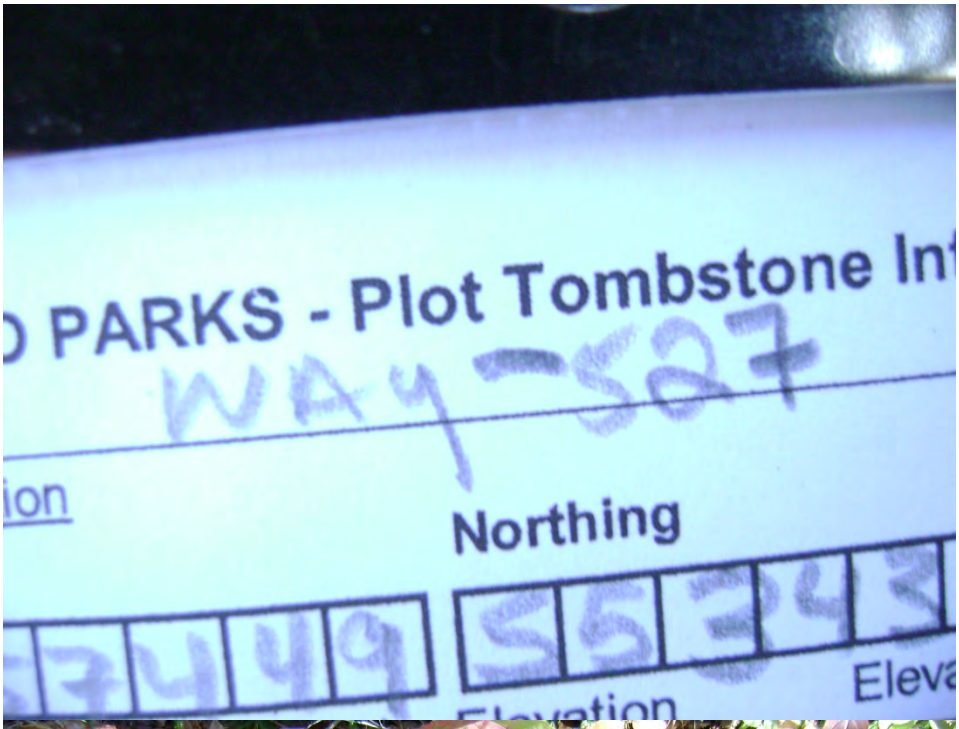


Plot TR-17

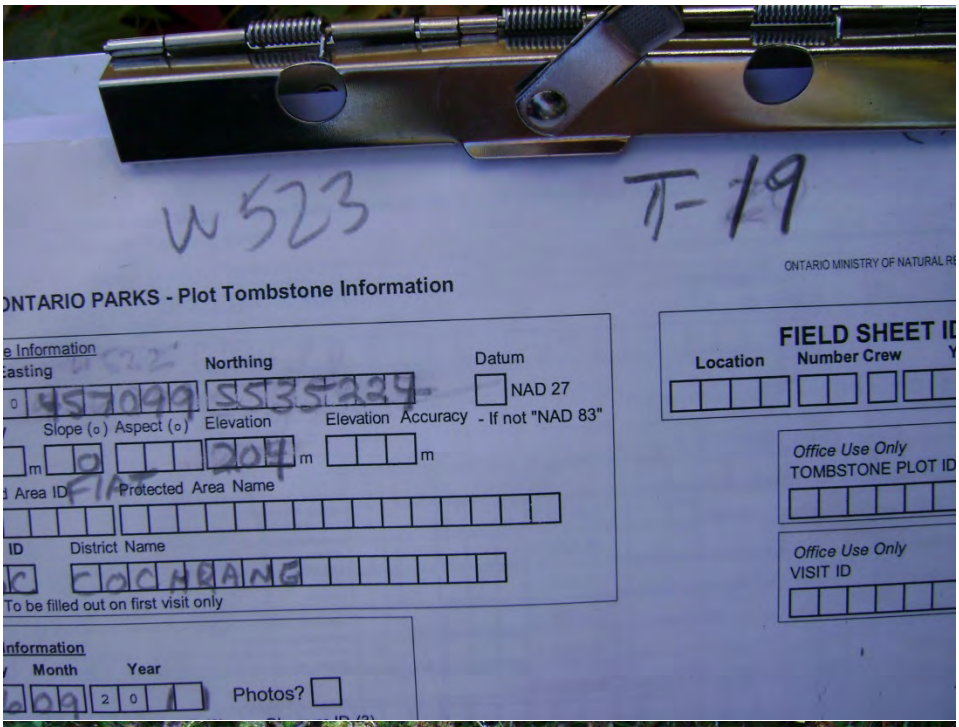


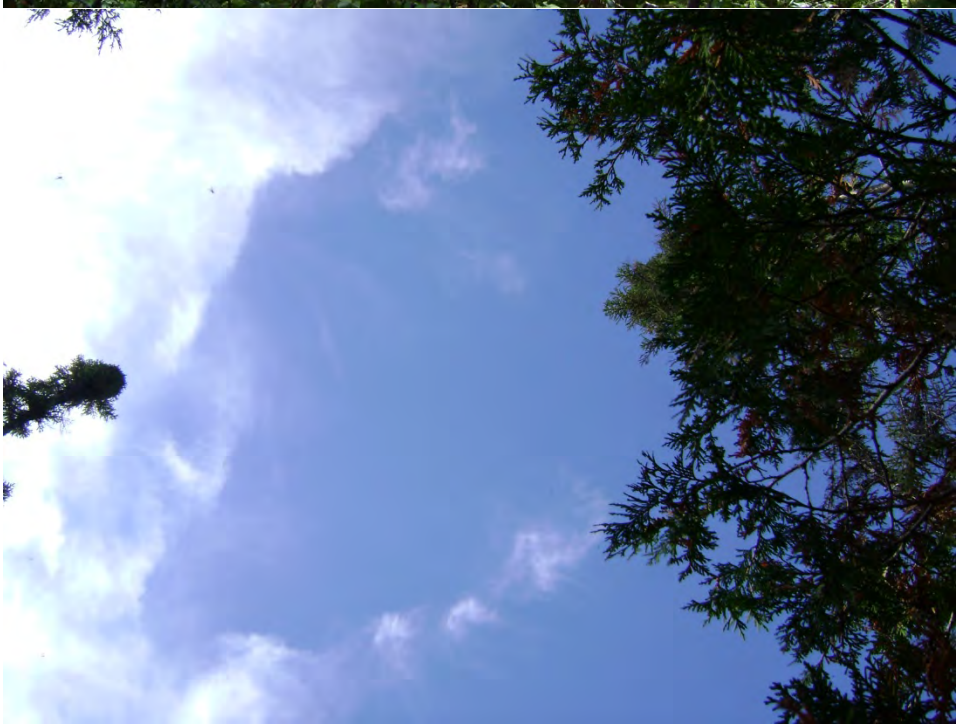


Plot TR-15

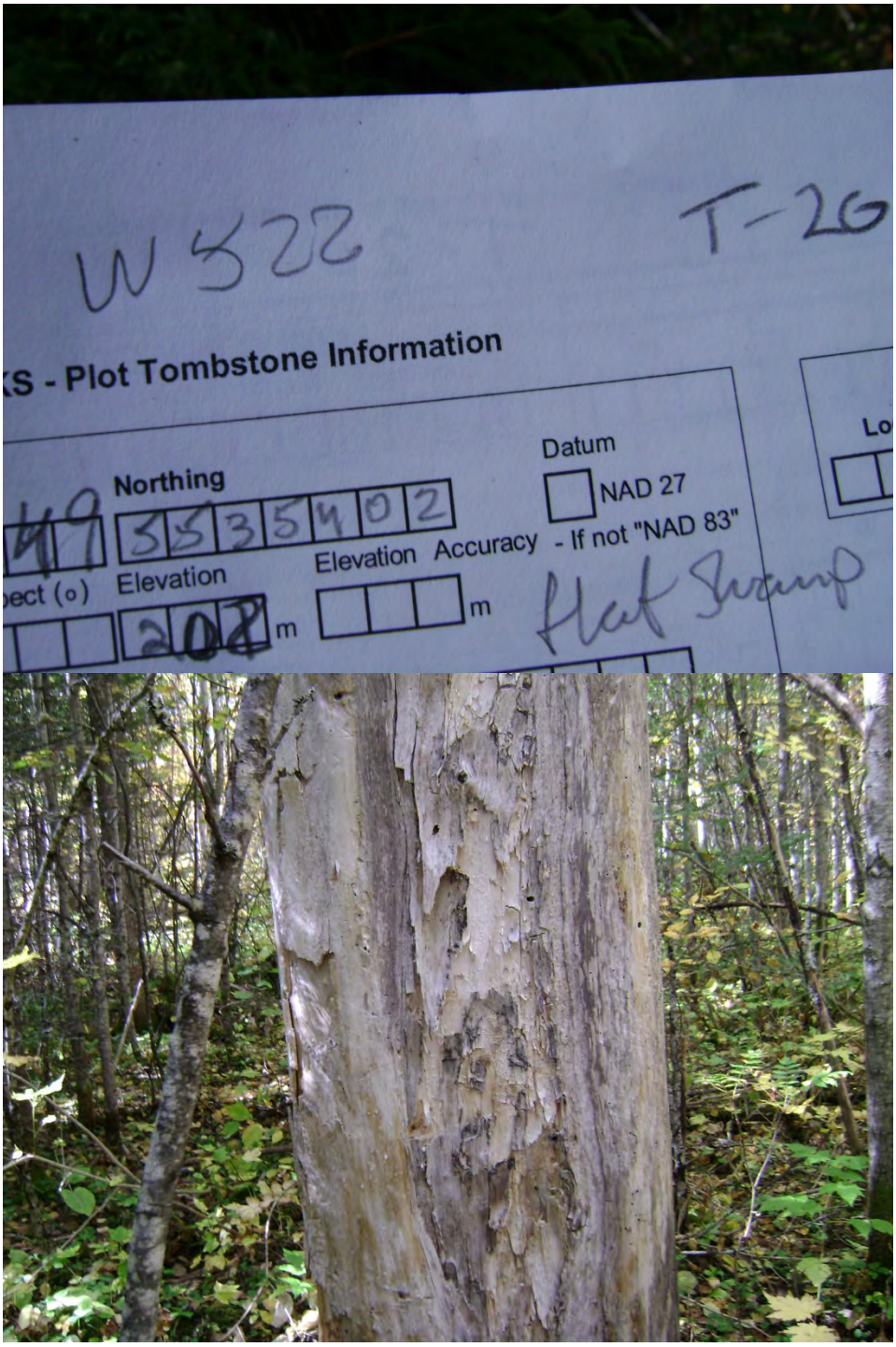


Plot TR19

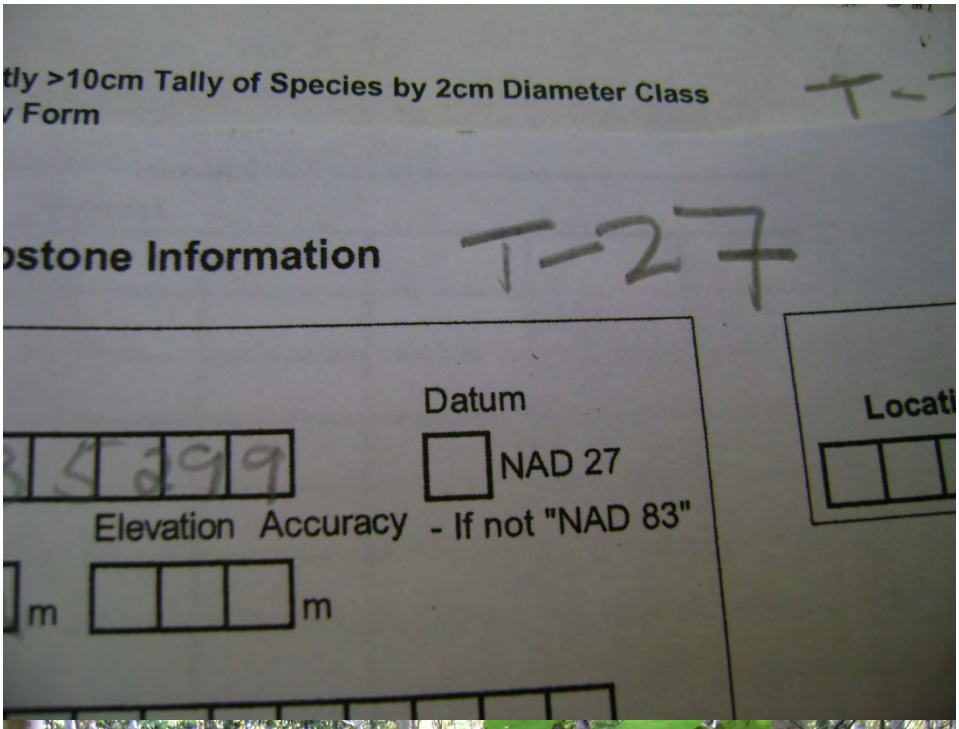

W523
T-19
ONTARIO PARKS - Plot Tombstone Information
Northing
Datum
NAD 27
- If not "NAD 83"
Slope (o) Aspect (o) Elevation
Elevation Accuracy
Protected Area Name
District Name
To be filled out on first visit only
FIELD SHEET ID
Location
Number Crew
Office Use Only
TOMBSTONE PLOT ID
Office Use Only
VISIT ID
Month
Year
Photos?



Plot TR-20


W 522
T-26
S - Plot Tombstone Information
Northing
3535402
Datum
NAD 27
- If not "NAD 83"
Elevation
Elevation Accuracy
m
m
flat Swamp

Plot TR-27


tly >10cm Tally of Species by 2cm Diameter Class
Form
ostone Information
T-27
Datum
NAD 27
Elevation Accuracy - If not "NAD 83"
m
m

APPENDIX 2 – 1994 NEFEC DESCRIPTION

Appendix 2 - 1994 NEFEC Description

The McCarthy *et al.* (1994) Northeastern Ontario Forest Ecosystem Classification (NEFEC) uses a framework of 22 site types, 26 vegetation types and 23 soil types to classify forest ecosystems. Site types are classified based on the occurrence and abundance of plant species, and on the distribution of soil and site features.

Table A2.1 provides a summary of the 22 different site types used, whereas Table A2.2 provides a summary of the 26 different vegetation types used. The a, b, or c after the ecosite refers to a gradient of increasing soil textures.

Table A2.1 NEFEC Ecosite Types

Ecosite Type	Description
NE1	Very Shallow Soil
NE2a	Jack Pine - Coarse Soil
NE2b	Jack Pine - Very Coarse Soil
NE3a	Mixedwood - Medium Soil
NE3b	Mixedwood - Coarse Soil
NE4	Jack Pine-Black Spruce- Coarse Soil
NE5a	Black Spruce - Fine Soil
NE5b	Black Spruce - Medium Soil
NE6a	Mixedwood - Fine Soil
NE6b	Conifer Mixedwood - Medium Soil
NE6c	Hardwood Mixedwood - Coarse Soil
NE7a	Hardwood - Fine Soil
NE7b	Hardwood - Medium Soil
NE8	Black Spruce - Feathermoss - Sphagnum
NE9	Conifer - Moist Soil
NE10	Hardwood - Moist Soil
NE11	Black Spruce - Labrador Tea
NE12	Black Spruce - Speckled Alder
NE13	Conifer - Speckled Alder
NE14	Black Spruce - Leatherleaf
NE15	Tolerant Hardwood Mixedwood
NE16	Sugar Maple -Yellow Birch

Table A2.2 NEFEC Ecosite Types

Vegetation Type	Description
V1	Sugar Maple
V2	Yellow Birch Mixedwood
V3	Red Maple Mkixedwood
V4	White Pine Mixedwood
V5	Red Pine Mixedwood
V6	Black Spruce - Speckled Alder - Feathermoss
V7	White Spruce - Balsam Fir - White Cedar - Mountain Maple
V8	Trembling Aspen - Black Spruce
V9	Trembling Aspen - Balsam Fir - Mountain Maple
V10	Balsam Poplar - Trembling Aspen - Speckled Alder
V11	Trembling Aspen - Mountain Maple - Beaked Hazel
V12	Trembling Aspen Mixedwood
V13	Trembling Aspen - Black Spruce - Blueberry
V14	White Spruce - White Birch - Feathermoss
V15	Jack Pine - Blueberry - Feathermoss
V16	Jack Pine - Black Spruce - Feathermoss
V17	Jack Pine - Black Spruce - Labrador Tea
V18	Black Spruce - Jack Pine - Feathernoss
V19	Black Spruce - Larch - Speckled Alder
V20	White Cedar - Black Spruce
V21	Black Spruce - Speckled Alder - Sphagnum - Stair-step Moss
V22	Black Spruce - Feathermoss
V23	Black Spruce - Feathermoss - Sphagnum
V24	Black Spruce - Speckled Alder - Sphagnum - Schreiber's Moss
V25	Black Spruce - Labrador Tea - Sphagnum
V26	Black Spruce - Leatherleaf - Sphagnum

FRI data were based on NEFEC ecosites only as vegetation type information was not available. Cruise data were collected both NEFEC ecosite and vegetation type information. As indicated in Table 1.3, plot TR1 had a cruise ecoiste of NE6 representing a mixedwood on fine, medium, or coarse soil. The cruise ecosite was 9r with a vegetation type of V16 representing conifer on moist rich site with jack pine, black spruce and feathermoss vegetation. An r, p, f, or m after the cruise ecosite depicts rich, poor, fine, or moist soil.