Webequie Supply Road

Geology, Terrain and Soils Study Plan

Webequie First Nation

March 2021
661910

SNC·LAVALIN

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1. Introduction

The proposed Webequie Supply Road Project is a new all-season road of approximately 107 km in length from Webequie First Nation to the mineral deposit area near McFaulds Lake (also referred to as the Ring of Fire). A Location Plan for the Project is shown on **Figure 1**. The preliminary proposed corridor for the road consists of a northwest-southeast segment running 51 km from Webequie First Nation to a 56 km segment running east before terminating near McFaulds Lake. A total of 17 km of the corridor is within Webequie First Nation Reserve lands.

The goals and objectives of the Webequie Supply Road Project are as follows:

- To facilitate the movement of materials, supplies and people from the Webequie Airport to the area of existing mineral exploration activities and proposed mine developments in the McFaulds Lake area;
- To provide employment and other economic development opportunities to WFN community members and businesses that reside in or around the community's reserve and traditional territory, while preserving their language and culture; and
- To provide experience/training opportunities for youth to help encourage pursuit of additional skills through post-secondary education.

On May 3, 2018, the Ontario Minister of the Environment, Conservation and Parks (then Minister of the Environment and Climate Change) signed a voluntary agreement with Webequie First Nation to make the Webequie Supply Road Project subject to an Individual Environmental Assessment under Ontario's *Environmental Assessment Act.* The Project is also subject to meeting the requirements of the federal *Impact Assessment Act.* For the purposes of this study plan, the term "EA" is meant to include both the provincial environmental assessment and the federal impact assessment.

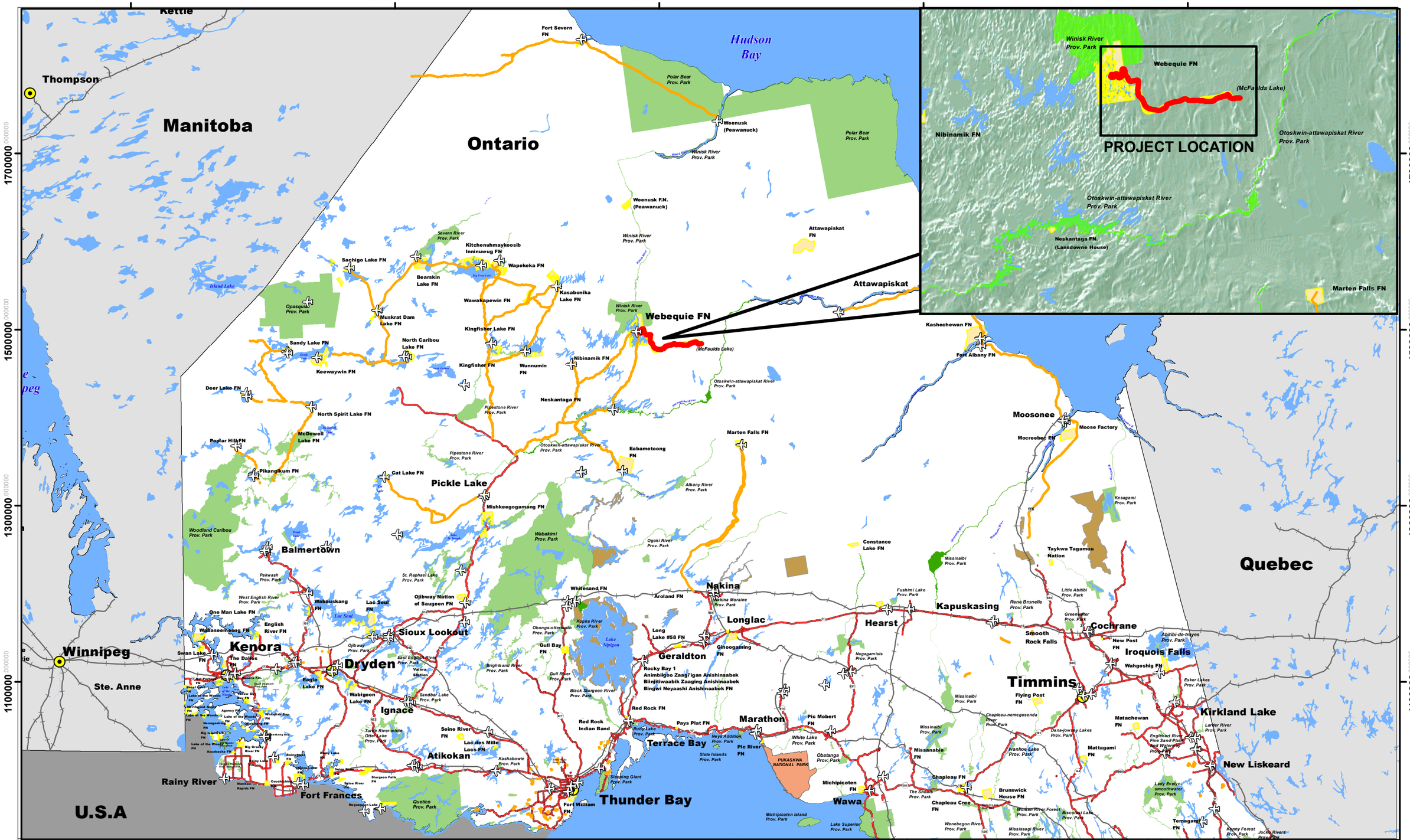
The Geology, Terrain and Soils Study Plan is being submitted to the Impact Assessment Agency of Canada (IAAC, "Agency") and the Ontario Ministry of the Environment, Conservation and Parks (MECP) requesting that a coordinated review be undertaken with the objective to provide Webequie with technical guidance in meeting the requirements of the federal Tailored Impact Statement Guidelines (TISG) and provincial Terms of Reference (ToR) for the Project, which is pending approval by Ontario. It should be noted that Ontario's review of the study plan is preliminary and secondary to any further review and decisions related to a final ToR.

1.1. Defining Spatial and Temporal Boundaries

1.1.1. Spatial Boundaries

Spatial boundaries define the geographic extent within which the potential environmental effects of the Project are considered. As such, these spatial boundaries define the study areas for the effects assessment. Spatial boundaries to be established for the EA will vary depending on the valued component and will be considered separately for each. The spatial boundaries to be used in the EA will be refined and validated through input from federal and provincial government departments and ministries, Indigenous groups, the public and other interested parties (refer to **Section 3** for approach). Input received to date from interested parties through the engagement and consultation activities during EA ToR phase for the Project has been considered in defining the preliminary spatial and temporal

boundaries for the EA identified in this document. The reader is encouraged to review the ToR (August 2020) and Record of Consultation for details on the consultation and engagement completed to date. Overall, the spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential effects of the Project; community knowledge and Indigenous Knowledge; current or traditional land and resource use by Indigenous communities; exercise of Aboriginal and Treaty rights of Indigenous peoples, including cultural and spiritual practices; and physical, ecological, technical, social, health, economic and cultural considerations.



Legend

- Optimal Geotechnical Route
- Community Preferred Route
- Airports
- City/Town
- Winter Roads
- All-Season Roads
- Rail
- First Nation Reserve
- Federal National Park
- Provincial Park
- Conservation Reserve
- Waterbody

WSR WEBEQUIE SUPPLY ROAD

0 50 100 Km

N

Canada Lambert Conformal Conic Projection

Webequie Supply Road

Project Location

Date: 2020/05/12	File Number: 649920	Sub Code: 0000
Figure Number: 1		Rev. 0

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At this stage in the EA process, the spatial boundaries for the EA will include the following three (3) study areas to capture the potential direct and indirect effects of the Project for each valued component, unless otherwise specified in a study plan:

- **Project Footprint** (PF) – is the identified areas of direct disturbance (i.e., the physical area required for Project construction and operation). The PF is defined as the 35 m right-of-way (ROW) width for the WSR and temporary or permanent areas needed to support the Project, including laydown/storage yards, construction camps, access roads and aggregate extraction sites.
- **Local Study Area** (LSA) - is identified as the area where most effects of the Project are likely to be measurable; therefore, along the PF, the LSA will be the focus of data collection to characterize existing environmental conditions. The LSA for most valued components will extend or buffer approximately 1 km from the supply road ROW boundary, and 500 metres (m) from the temporary or permanent supportive infrastructure.
- **Regional Study Area** (RSA) – encompasses the areas outside of the LSA used to measure broader-scale existing environment conditions and provide regional context for the maximum predicted geographic extent of direct and indirect effects of the Project (e.g., changes to downstream surface water quality, or changes to socio-economic conditions such as regional employment and incomes). Cumulative effects of the Project in combination with past, present, and reasonably foreseeable developments are typically assessed at this larger spatial scale. The RSA is defined as extending approximately 5 km from the LSA boundary.

Figure 2 presents the spatial boundaries for the subject valued component.

The study areas were selected to characterize existing environmental conditions and predict the direct and indirect changes from the Project on the subject valued component on a continuum of increasing spatial scales from the Project Footprint to broader, regional levels. The preliminary selection of study areas also considered the physical and biological properties of the valued component and related evaluation criteria. For the assessment it is recognized that geology, terrain and soils are important criteria of the environment for protection, with soils linked to capability to support forestry and other vegetation communities.

The baseline data collection and effects assessment relative to the spatial boundaries will focus on the set of supply road conceptual alternatives within the preliminary proposed corridor, as identified in the federal Impact Assessment Detailed Project Description (November 2019) and the provincial Environmental Assessment draft Terms of Reference (September 2019). The alternatives include the Webequie First Nation community's preferred route for the supply road (35 m right-of-way width) along the centreline of an approximately 2 km wide preliminary proposed corridor and the optimal geotechnical route within the same corridor. The route alternatives are shown in **Figure 2** with the LSA boundaries for each route alternative combined to reflect the study area for the Project. At this stage of the EA process the supportive infrastructure components have yet to be determined. It is anticipated that additional alternative routes may be developed during the EA. For example, a route that may be based on optimizing the geometric design of the community preferred route or optimal geotechnical route may be included. Where such additional alternatives are identified, the study area will be adjusted.

470000 480000 490000 500000 510000 520000 530000 540000 550000

5890000 5880000 5870000 5860000 5850000 5840000

Winisk Lake
Webequie Settlement
Eastwood Island
Webequie Airport
Bender Lake
Prime Lake
Muketei River
McFaulds Lake
Noront Exploration Camp

Legend

- Optimal Geotechnical Route
- Community Preferred Route
- Local Study Area (LSA 1km From Alternative Footprints)
- Webequie First Nation Reserve
- Waterbody
- Watercourse
- Winisk River Provincial Park

WSR WEBEQUIE SUPPLY ROAD

0 5 10 Km

N

NAD 83
UTM Zone 16N

Webequie Supply Road

Preliminary Route Alternatives and Combined Study Areas

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Figure Number: 2		Rev. 0

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1.1.2. Temporal Boundaries

The EA process was designed to evaluate the short-term and long-term changes resulting from the implementation of the Project and associated effects on the environment, including where project activities may overlap such as the restoration (e.g., revegetation) of temporary access roads that could occur during the operation.

Implementation of the Project will occur in phases (refer to Section 4.3.4 of the ToR). The potential interactions with the natural, cultural and socio-economic environments and the potential occurrence of residual impacts are anticipated to be different in each phase. In order to focus the impact assessment, the key activities can be divided into the three main phases:

- **Construction Phase**: All the activities associated with the initial development of the road and supportive infrastructure;
- **Operations Phase**: All activities associated with operation and maintenance of the road and any other permanent supportive infrastructure (e.g., operations and maintenance yard, aggregate pits) that will start after construction and continue indefinitely; and
- **Decommissioning/Abandonment/Closure Phase**: The Project will be operated for an indeterminate time period; therefore, retirement (decommissioning/abandonment/closure) is not anticipated and will not be addressed in the EA. Note that clean-up and site restoration, including the decommissioning and removal of temporary infrastructure (e.g., access roads) will be addressed in the construction phase.

Although generally based on the planned stages described above, the final selection of temporal boundaries is criteria-specific and further detail will be provided in the discipline-specific assessment sections of the EAR/IS. Temporal variation or patterns in potential effects associated with different criteria (e.g., soils and land use, surface water use, groundwater withdrawn) will also be considered. Baseline data collection for all biophysical valued components will be provided for a minimum of two years, unless specified otherwise. Temporal boundaries of soil and land use more than one year will enable accounting for annual or seasonal variations (e.g., the effects of storms on soil erosion, flooding events or early snowfalls).

2. Study Plan

2.1. Methodology

The following sections describes the planned approach to baseline data collection related to geology, geochemistry and geological hazards; and topography, soils and sediment (collectively referred to as Geology, Terrain and Soils); and the assessment of the potential impacts to this valued component in order to address the requirements of the TISG (Sections 8.3, 8.4 and 14) and, where applicable, meet the expectations of the MECP and other provincial ministries (i.e. Ministry of Natural Resources and Forestry) as identified in the ToR.

2.1.1. Background Data Review and Field Surveys

Information to characterize existing geological, terrain and soil conditions for the Project will draw upon the following secondary sources:

- Previously conducted environmental studies, including Indigenous Knowledge information obtained through consultation with Indigenous communities, will be reviewed, and dated information will be updated as required;
- Regulatory databases;
- Aerial photography;
- Terrain and soil mapping;
- Bedrock and quaternary geology data;
- Geographic Information System (GIS) databases;
- Academic literature; and
- Information obtained from regulatory agencies and other stakeholders.

A list of secondary sources reviewed to date is provided in **Appendix A** and will be amended and documented in detail in the Environmental Assessment Report/Impact Statement (EAR/IS). In addition, data sources are described further in Section 2.1.1.1 in terrain and soils investigation.

The primary purpose of the field investigations related to geology, terrain and soils is to supplement the findings from the review of background information sources in order to provide a full and detailed characterization of existing conditions in the study area and to allow for the effects assessment. To gather the data required to support the EA, the following field surveys are proposed:

- Light Detection and Ranging (LiDAR) data collection;
- Soil and Terrain Investigations (J.D. Mollard & Associates);
- Peat Thickness and Aggregate Source Investigations (J.D. Mollard & Associates); and
- Geotechnical Investigations (SNC-Lavalin).

To supplement the above surveys riparian and wetland vegetation components will also examine landscape and/or watersheds considering topography, soil types and hydrological linkages.

The surveys related to geology, terrain and soils were conducted in 2019, with supplemental investigations performed in summer 2020 with the intent to provide 2-years of data within the preliminary proposed corridor for the WSR and supportive infrastructure areas (aggregate sources). The 2019

surveys were along the preliminary proposed corridor and focussed on collecting terrain and soils data needed to characterize existing conditions (e.g., soil and terrain, peat depths, etc.); identify and evaluate alternatives; and to support the preliminary civil and structural engineering design of the road. The focus of the proposed 2020 field surveys is to provide supplemental and complementary soil/geotechnical data for the road design, further delineate and characterize potential aggregate sources; and to collect groundwater data (refer to **Groundwater and Surface Water Study Plan**). **Figure 3** shows the location of test pits, boreholes, peat probes and groundwater monitoring wells from the 2019 field survey work and those proposed in 2020.

2.1.1.1. Terrain and Soils Investigation

On behalf of Webequie First Nation, J.D. Mollard and Associates Limited (JDMA) conducted terrain and soils investigation in 2019 within the preliminary proposed corridor (approximately 2 km wide) to facilitate the identification of potential aggregate sources, characterization of stream crossings and mapping of several route alternatives, including identification of an optimal geotechnical route based on terrain and engineering considerations.

The terrain analysis was conducted using aerial and satellite imagery and digital elevation data. The primary source of desktop information for terrain mapping was high-resolution orthoimagery (20 cm resolution) and Light Detection and Ranging (LiDAR) elevation data at 1 metre resolution. Satellite imagery available through ESRI World Imagery Basemap and Google Earth offered supplemental imagery at high-resolution. Air photo interpretation was also conducted at select locations using 1954 black & white photos at 1:60,000 scale, which when viewed stereoscopically provide 3-D perspectives to evaluate terrain and topographic conditions.

These multiple sources of imagery assisted with the terrain unit classification, particularly with resolving the wetlands and permafrost-affected terrain.

Elevation data covering the preliminary proposed corridor was provided by LiDAR and will be processed at a spatial resolution of 1 m. Using the LiDAR data, shaded-relief and slope rasters will be generated in ArcGIS to assist with the interpretation and detail description of terrain units.

Geological information will be obtained from the following published sources:

- Ontario Geological Survey, 1997. Quaternary geology, seamless coverage of the province of Ontario: Ontario Geological Survey, Data Set 14.
- Barnett, P.J. et al. 2013. Surficial Geology of the Lansdowne House Area Northeast, Northern Ontario. 1:100,000. P3697.
- Barnett, P.J. et al. 2013. Surficial Geology of the Lansdowne House Area Northwest, Northern Ontario. 1:100,000. P3696.
- Metsaranta, R.T. and Houlé, M.G. 2017. Precambrian geology of the McFaulds Lake area, “Ring of Fire” region, Ontario— central sheet; Ontario Geological Survey, Preliminary Map P .3805; Geological Survey of Canada, Open File 8201, scale 1:100 000. doi:10.4095/299711. Map P3805 on www.geologyontario.ca.
- Dyer, R.D. and Burke, H.E. 2012. Preliminary results from the McFaulds Lake (“Ring of Fire”) area lake sediment geochemistry pilot study, northern Ontario; Ontario Geological Survey, Open File Report 6269, 26p. OFR6269 on www.geologyontario.ca.
- Standard Practice for Aggregate Resource Evaluation, MTO, 2002.
- Provincial Pavement Engineering Investigation Guidelines, v.1.1, MTO, 2013.

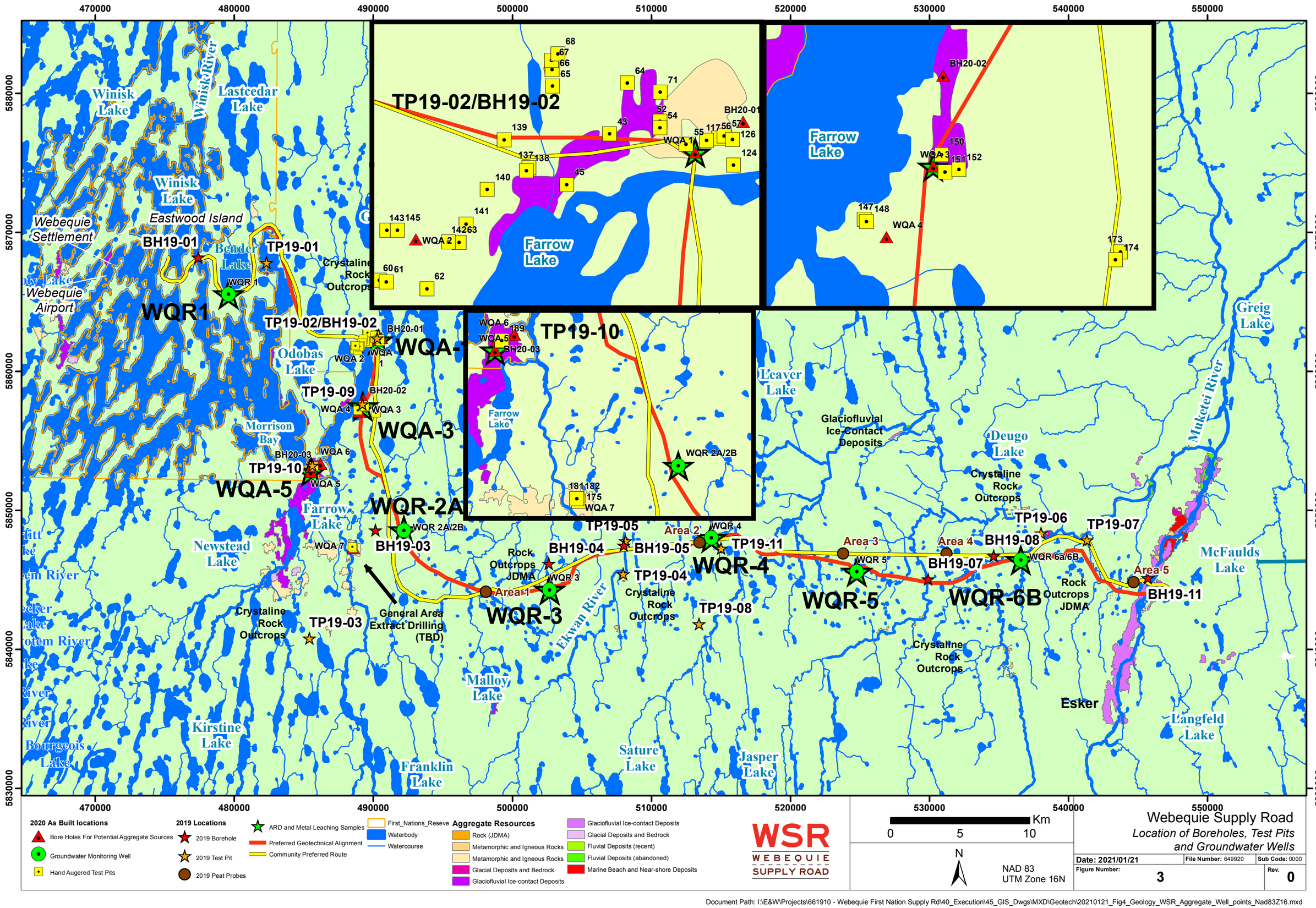
Hydrological information will be obtained from the following sources.

- Ontario Hydro Network – Waterbodies. Land Information Ontario (LIO) Warehouse.
- Ontario Wetlands: Ontario Ministry of Natural Resources.

Provincial Land Cover (2000) Database: Ontario Ministry of Natural Resources. Information from previous JDMA terrain studies in the broader project area, particularly for the terrain units, will also be obtained from the following reports:

- McFaulds Lake Project – Webequie to Esker Camp road route location: Report on mineral and organic terrain mapping in a 10 km radius around esker camp. 2010. J.D. Mollard and Associates (2010) Limited. September 23, 2010. Report No. 1675.
- McFaulds Lake Project – McFaulds Lake Peat Sampling Field Trip Report. J.D. Mollard and Associates (2010) Limited. September 17, 2010.

The above referenced JDMA sources are considered relevant surrogate data to supplement data to be collected and analysed for the WSR project. From a spatial perspective, the data from the above JDMA studies are within 50 km of the study area defined for the Project and are considered representative of the project site conditions. In general, terrain units are relatively homogenous in the area, consisting of mineral terrains (e.g., till and glacial lake clay; eskers; glaciofluvial deposits; and alluvial floodplain) and organic terrains (e.g., various bog and fen types).



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Terrain Mapping Methodology

Terrain mapping within the preliminary proposed corridor will involve the interpretation of remotely sensed imagery (air photos and satellite images) and digital elevation data, supplemented with surficial geology, hydrology, and land cover data, to characterize the landforms, surficial materials, topography, including a summary table of geologic descriptions, mineralization styles (if applicable) supported by geological maps and cross-sections at appropriate scale (normally 1:50 000). Geospatial data sources available for this study will be compiled in a Geographic Information System (GIS) and terrain units will be manually digitized over base layers of imagery (air photos and satellite) and elevation data (elevation, shaded-relief, and slope rasters).

Terrain units will be mapped and classified according to a legend developed for study area based on a compilation of previous reports and existing mapping (JDMA, 2010). In general, preliminary proposed corridor crosses extensive organic terrains of various bogs and fens along the east-west section of the corridor and glacial terrains with mineral soils on the roughly north-south section leading to the community of Webequie. Mineral terrains include till with a discontinuous lacustrine clay veneer, glaciofluvial ice-contact, esker ridges, and alluvial floodplains.

Soil and strata layer depths will be evaluated using Ground Penetrating Radar (GPR) to help characterize the depth and variability of the strata layers over bedrock or glacial sediment. A full description of the terrain units (mineral and organics), including mapping, will be presented in the Environmental Assessment Report/Impact Statement (EAR/IS) and supportive technical reports.

2.1.1.2. Soils and Strata Thickness and Aggregate Source Investigations

To further supplement and expand on the terrain analysis and investigations, JDMA collected data for peat thickness in 2019 along the road corridor and at potential aggregate source areas near and within the preliminary preferred corridor. Field work is also planned in 2020, with the specific objectives of further confirming and evaluating potential aggregate sources.

Potential aggregate sources have been identified on a preliminary basis from existing surficial geology maps (i.e., Ontario Geological Survey) and from terrain analysis using orthoimagery and LiDAR of the corridor. Among the potential aggregate sources are granular ice-contact glaciofluvial deposits and bedrock outcrops that may be blasted and crushed and will be further examined digging test pits in the granular deposits to determine the gradation of material and to visit the bedrock outcrops to determine the lithology and structure of the bedrock to assess the potential for crushing. Bedrock outcrops will be identified and mapped as potential quarry sites, will be visited in the field and the lithology and structural elements (fractures, bedding, foliation, etc.) visible at surface will be described to assess suitability for aggregate and rip-rap material production.

Potential aggregate source locations were presented in the provincial ToR and federal Detailed Project Description and these sites will be subject to alternative evaluation. Potential aggregate sources will be tested by power equipment with pits to a depth of 4.5 metres to properly delineate the deposits.

Bedrock aggregate sources will be investigated with drill holes in potential quarry sources to a depth of 15 meters. Possibilities of examining aggregate below water table will be considered.

2.1.1.3. Geotechnical Field Investigations

Geotechnical field investigations within the preliminary proposed corridor were conducted in 2019, with supplemental investigations planned in summer 2020. The primary purpose of the geotechnical program is to: assess subsurface condition along the proposed corridor and associated water body crossings; identify potential aggregate sources; and provide design and construction recommendations to the engineering team for the road, structure foundations and development of supportive infrastructure (i.e., aggregate source areas, access roads, etc.).

A total of ten (10) boreholes were advanced in 2019 using a combination of hollow stem auger and advance casing (for soils) and rock coring (for rock) methods. Standard Penetration Testing (SPT) and split spoon soil sampling carried out at regular intervals through overburden. Recovered soil samples were logged, photographed and examined on the field as per USCS (unified soil classification system). RQD (Rock Quality Designation), SCR (Solid Core Recovery) and TCR (Total Core Recovery) were recorded. Geotechnical laboratory testing was performed on selected soil and rock samples. The testing including primarily index tests for soils such as gradation and Atterberg limit tests, UCS and point load tests for rock core samples and abrasion and soundness test for potential aggregate samples. Field observations were made during drilling and upon completion of borings with respect to groundwater conditions. Borehole logs with soil/rock stratification will be prepared.

The following studies and investigations comprise the current geotechnical database for this project:

- J.D. Mollard and Associates (2019)a: The terrain analysis, potential aggregate sources & identification of route alternatives.
- J.D. Mollard and Associates (2019)b: The field investigation of peat thickness and potential aggregate sources.
- SNC-Lavalin (2019). The geotechnical investigation factual report.
- McFaulds Lake Projects (Ring of Fire, Noront, or Cliffs Chromite): Relevant available documentation.

A brief overview summary of these studies and investigation is presented in the Geotechnical Engineering Report, SNC-Lavalin, September 2020.

The Geotechnical Investigations proposed for year 2020 and the type of work to be performed is described in the Work Permit Letter, June 12, 2020 included in **Appendix B**. Drilling to confirm non-intrusive testing has been added to the 2020 geotechnical work. A summary of boreholes proposed along the proposed Road Alignment and the potential aggregate and Rock extraction Areas is presented in the **Tables 1 and 2** below and **Figure 3**.

Table 1 – Proposed Groundwater Monitoring Wells – along the Proposed Road Alignment

Well ID	Depth (m bgs)	Screen (m bgs)	Strata	Location	Geotechnical Investigation (m bgs)	Water Level (m bgs)	Notes
Along Road Alignment							
WQR-1	6.5	3.5 to 6.5	Bedrock	Near BH19-01	BH19-01: Silt and sand till to 2.1 m Granite 2.1 to 4.9 m, slightly weathered	0.3	Overburden is too shallow to install a well. The well needs to be completed installed and sealed in bedrock.
WQR-2A	4.5	1.5 to 4.5	Overburden	NE of BH19-03, north of the alignment	Organic to 0.6 m Silt and sand till 0.6 to 2.6 m Sandy silt till 2.6 to 8.1 m	1.67	Well cluster (within 2 m) to test vertical hydraulic gradient.
WQR-2B	7.5	4.5 to 7.5	Overburden				
WQR-3	6.0	3.0 to 6.0	Bedrock	Near BH19-04	BH19-04: Organic to 0.5 m Sand and gravel till 0.5 to 1.4 m Granite 1.4 to 5.8 m, good quality	0.3	Slightly fractured
WQR-4	4.5	1.5 to 4.5	Overburden	Near TP19-06	BH19-06: Organic to 0.6 m Sandy silt to silty sand till 0.6 to 15.3 m	0.46	
WQR-5	4.5	1.5 to 4.5	Overburden	Between BH19-06 and BH19-07	Organic to 0.6 m Sandy silt and clay till 0.6 to 4.1 m Sand and gravel till 4.1 to 5.5 m	1.22	
WQR-6A	4.5	1.5 to 4.5	Overburden	Near BH19-08, south of the alignment	Organic to 0.5 m Silty Sand 0.5 to 3.0 m Silt and Sand till 3.0 to 9.1 m Clayey sandy silt 9.1 to 15.2 m	1.5	Well cluster (within 2 m) to test vertical hydraulic gradient.
WQR-6B	7.5	4.5 to 5.5	Overburden				

Table 2 – Proposed Groundwater monitoring Wells – around the Potential Aggregate and Rock Extraction Areas

Well ID	Depth (m bgs)	Screen (m bgs)	Strata	Location	Previous Geotechnical Investigation (m bgs)	Proposed BH/TP Locations	Coordinates
Aggregate and Quarry Sites							
WQA-1	6.5	3.5 to 6.5	Bedrock	Near TP19-02 and BH19-02	Same as BH19-02	TP19-02-i	490209E, 5862262N
WQA-2	6.5	3.5 to 6.5	Bedrock			TP19-02-iv	490625E, 5862495N
WQA-3	4.5	1.5 to 4.5	Overburden	Near TP19-09	Assumed to be same as BH19-03	TP19-09-ii	489266E, 5857979N
WQA-4	4.5	1.5 to 4.5	Overburden			TP19-09-iii	489242E, 5857550N
WQA-5	4.5	1.5 to 4.5	Overburden	Near TP19-10	Assumed to be same as BH19-03	TP19-10-iii	485662E, 5852574N
WQA-6	4.5	1.5 to 4.5	Overburden			TP19-10-iv	485998E, 5853335N
WQA-7	4.5	1.5 to 4.5	Bedrock	Between TP19-03 and BH19-03		TP19-03-i	488480E, 5847270N
WQA-8	4.5	1.5 to 4.5	Bedrock			TP19-03-ii	488954E, 5847125N

2.1.1.4. Geochemical Investigation

Further Geochemical field work undertaken in 2020 included soil and rock sampling and testing to provide an indication of the potential for metal leaching (ML) and acid rock drainage (ARD) at quarries, rock cuts and talus sites as well as locations where materials are generated and stockpiled (refer to **Figure 3**).

A total of 10 representative samples (6 soil and 4 bedrock samples) were subject to acid-base accounting (ABA) [paste pH, total sulphur, sulphide sulphur, HCl leachable sulphate, carbonate leach sulphate, modified Sobek Neutralisation-Potential (NP), total carbon and inorganic carbon] and Synthetic Precipitation Leaching Procedure (SPLP) with an extraction fluid at pH 4.2 [with ICP-MS analysis for major cations (Ca, Mg, K, Na) and 28 metals and metalloids]. These tests were performed by ALS

laboratories based in North Vancouver, BC and Thunder Bay, Ontario. Refer to Appendix Z for a copy of the laboratory reports.

The purpose of each test:

- ABA – to provide an indication of the acid-base accounting characteristics of the soil and bedrock materials and associated insights on potential generation of net-acidity; and
- SPLP – to provide a preliminary indication of leachable loadings upon contact with moderately acidic water (i.e. pH 4.2).

Both sampling and geochemical test work methods were informed by industry best practice in relation to the assessment of [1]ARD-ML generally and specifically for [2]road works projects.

Table 3 – Sites for Geochemical sampling 2020

Sample	Type
WQA-1 (FROM 14’ 2"-15’)	Rock
WQR-6B (FROM 28’-28’,9")	Rock
WQR-4 (FROM 20’ 7"-21’-6")	Rock
WQR-3 (FROM 10’ - 18’ 9")	Rock
WQA-3 (FROM 10’-12’)	Soil
WQR-2A (FROM 5’-7’)	Soil
WQA-5 (FROM 15’-16’ 6")	Soil
WQR-5 (FROM 7’ 6"-9’ 6")	Soil
WQR-3 (FROM 7’ 6"-9’ 6")	Soil
WQR1 (FROM 15’-17’)	Soil

Review of ABA results infers the following:

- Bedrock materials:
  - Relatively low total sulphur content and associated maximum acid-potential (MPA) [the greatest of which was sample WQR-3 (FROM 10’ - 18’ 9") with an MPA of 5 tonne $CaCO_3$ per 1000 tonnes].
  - Very low modified Sobek-NP, all of which is likely to be provided by silicate minerals (as suggested by an absence of carbonate carbon).
  - NPR ratios ranging from 1.4 [sample WQR-3 (FROM 10’ - 18’ 9")] up to 64. Overall potential generation of net-acidity appears low for these materials, however there maybe low amounts of net-acidity from some materials as even though the MPA value for sample WQR-3 (FROM 10’ - 18’ 9") is low, its modified Sobek-NP value of 7 $CaCO_3$ per 1000 tonnes is also low (and its effective neutralisation potential is likely to be lower as it would be provided by silicate minerals rather than net-neutralising Ca/Mg carbonate minerals). Greater certainty around

[1] Prediction Manual Drainage Chemistry from Sulphidic Geologic Materials, MEND Report 1.20.1, Natural Resources Canada, December 2009.
[2] The ARD geochemical testing is also consistent with the ABA testing recommendations by the British Columbia Ministry of Transportation and Infrastructure (MOTI), Technical Circular T-04/13, September 15, 2013.

potential acid generation could be provided via a single NAG-test[3] that measures pH upon oxidation of the sulphide content of the sample.

- Soil materials:
  - Relatively low total sulphur content and associated maximum acid-potential (MPA) [the greatest of which were samples WQA-5 (FROM 15'-16' 6") and WQR1 (FROM 15'-17') that both had an MPA of 0.6 tonne CaCO3 per 1000 tonnes].
  - Significant modified Sobek-NP ranging from 214 to 440 CaCO3 per 1000 tonnes, primarily as a result of carbonate mineral content. Although the extent to which the carbonate mineral content is net-neutralising Ca/Mg carbonate minerals is not known (i.e. calcite or dolomite as compared to iron/manganese containing carbonates) the associated effective neutralisation capacity is well in excess of the greatest MPA values.
  - NPR ratios ranging from 572 to 1293 as a result of the significant modified Sobek-NP values and in light of significant carbonate mineral content, the soils represented by these samples have a very low probability of ARD.

Review of SPLP results infers the following:

- Bedrock materials:
  - Contact between bedrock materials and a moderately acidic contact water source (circa pH 4.2) may generate a leachate with slightly elevated concentrations of aluminium and iron, however most metals and metalloids are likely to be at relatively low concentration (many below the reportable limit.
- Soil materials:
  - Contact between soil materials and a moderately acidic contact water source (circa pH 4.2) may generate a leachate with elevated concentrations of aluminium and iron and slightly elevated arsenic, chromium, copper, lead, manganese and nickel [suggested primarily by samples WQR-2A (FROM 5'-7'); WQR-5 (FROM 7' 6"-9' 6"); and WQR1 (FROM 15'-17')]. Although an SPLP at pH 4.2 does not represent anything other than exposure to moderately acidic water (i.e. not representative of any probable field conditions) it does suggest the leachability of the soil materials warrants further investigation. This could be achieved via leachate test that is more representative of contact with rainwater flow (e.g. shake flask extraction test[1]).

Overall, the current sampling and geochemical test work suggests both the bedrock and soils represent a relatively low potential of ARD-ML. However, the following aspects should be addressed over the course of construction and development of borrow / quarried materials (i.e. incorporated into the associated geochemical test work program/s):

- Confirmation that the relatively low total sulphur content in the bedrock does not represent a significant ARD issue. As previously suggested, this could be addressed by incorporating the single NAG-test into the associated geochemical test work program. Additionally, if the material appears to be ARD, a NAG leach test for sulphate and metals and metalloids would provide a 'worst case' indication of the probable drainage water quality.

[3] AMIRA International (2002). ARD Test Handbook. Project P387A Prediction & Kinetic Control of Acid Mine Drainage. Prepared by Ian Wark Research Institute & Environmental Geochemistry International Pty Ltd, May 2002.

› Confirmation of the leachability of materials via geochemical tests that are more representative of field conditions (e.g. use of a shake flask extraction test).

2.1.1.5. Characterization of Existing Baseline Conditions

Based on the review of background information sources and field surveys described in the preceding sections, the EAR/IS will identify, characterize and/or describe the following for geology, terrain and soils.

Geology, Geochemistry and Geological Hazards

› Describe bedrock geology (regional and local geology) and lithological units, including a summary table of geologic descriptions, mineralization and terrain units that will be supported by geological maps and cross-sections at appropriate scale.
› Identify any geological hazards that exist in the areas planned for the Project and supportive infrastructure (PF, LSA and RSA), including:
  - seismic activity in the area, including earthquakes, and secondary effects such as the risk of landslides;
  - evidence of active faults;
  - recorded landslides, slope erosion and potential for ground and rock instability/landslides; and
› Provide characterization of the geochemical composition of all expected construction and rehabilitation/restoration materials disturbed, such as aggregate and rock sources at quarries and pits, overburden, etc.), in order to predict metal leaching and acid rock drainage. This will include a table with an inferred risk rating (i.e., low, medium, high) for acid rock drainage and metal leaching potential based on the desk-top review and laboratory analytical analysis of bedrock geology and mineralization.
› Describe and show location of aggregate quarries and potential aggregates (refer to Figure 3).

At this stage of the Project, it should be noted that geochemical investigations and groundwater hydrogeological studies are ongoing.

Geochemical Sampling Methodology

› The samples for Geochemical tests will be selected according to the following methodology proposed by Prediction Manual Drainage Chemistry from Sulphidic Geologic Materials, MEND Report 1.20.1, Natural Resources Canada, December 2009:
› Prior of starting construction, samples will be collected at regular intervals across the width and depth of all geologic materials within the proposed excavations, quarries, aggregate materials and other areas of disturbance.
› Type of samples: Will include materials with significantly different physical (e.g. highly fractured), mineralogical (e.g. mineral alteration), geochemical, weathering (e.g. oxidized) and leaching (e.g. supergene enrichment) properties. Note will be made to readily observable aspects regarding the nature of sulphides and neutralising minerals present and aspects that may control their distribution (e.g. quartz and carbonate veining, etc). Composite samples will not be collected.
› Size of samples: The samples will be collected at regular intervals. A sampling unit will be split into separate samples when it contains different geologic units or material with different physical, mineralogical, geochemical, weathering and leaching properties. Drill logs records will be consulted prior to sampling to identify the materials that need to be sampled separately.
› Excavations will be sampled including: residual blasted material, backfill, final walls, and notable talus, fractures and residual rock.

The sampling dimensions and sampling frequency and locations will depend on the prediction objectives, construction practices, geochemical variability, the required accuracy, and the potential contribution of the sampled material to the drainage chemistry.

Geochemical Test Work

- Static ABA test work for a similar suite as was undertaken for this report upon all samples [e.g. paste pH, total sulphur, sulphide sulphur, HCl leachable sulphate, carbonate leach sulphate, modified Sobek Neutralisation-Potential (NP), total carbon and inorganic carbon].
- Single NAG pH samples with Uncertain ARD classification and or the highest total sulphur content.
- 4-acid digest and ICPMS for a wide range of metals and metalloids upon all samples to identify elements that maybe subject to significant enrichment.
- Static leachate tests (e.g. shake flask extraction upon selected samples with note to all materials that suggest significant elemental enrichment and soil materials and a NAG leach test for sulphate and metals and metalloids for any apparent PAG / uncertain bedrock samples).
- Mineralogical test work (e.g. XRD) to determine the nature of sulphides and neutralisation minerals present (select samples where required).

Evaluation of results

Overall, we are looking to identify materials that may generate ARD/ML and to that extent although we will use NPR as a risk indicator of ARD (as described below) we will also use the fore mentioned leachate test work data (e.g. shake flask extraction and NAG leach) to provide an indication of the risk of generating adverse water quality. The aspect of 'risk' be further qualified via the expected range of field conditions that the materials will be subject to as a result of handling and final emplacement and will also consider the receiving environment (e.g. screen the leachate results against relevant ecologically based water quality guidelines, accounting for mixing effects between point source and reception).

Neutralization potential ratio (NPR) as a key indicator to assess the potential risk of ARD/ML generation is shown in Table 4.

Table 4 – Risk of ARD/ML generation

NPR Value	Risk of ARD/ML generation
NPR> 2:	Low risk
1< NPR< 2	level of uncertainty
NPR <1	High risk

- NPR> 2: indicates the sample has either low concentration of acidic sulphides material and/or high concentration of neutralization material, therefore it has a low potential to produce ARD.
- 1< NPR< 2: indicates a level of uncertainty to produce ARD. The sample may have a similar level of acidic sulphides material and concentration of neutralization material and the NPR has an uncertain value. In this case the QP may consider other methods of evaluation to lessen the uncertainty in the evaluation.
- NPR <1: indicates the sample has either high concentration of acidic sulphides material and/or low concentration of neutralization material therefore it has a high potential to produce ARD and is unsuitable for MOTI purposes. An NPR value < 1 strongly suggests that the rock should not be further disturbed or exposed.

For all the cases the QP will consider the site-specific factors and the final use of the material.

Mitigation Measures for ARD/ML

If the project chooses to use materials or sites that are identified as having uncertain potential for ML/ARD, mitigative measures, sensitive receptor identification, and/or baseline concentration studies will be addressed in the project detail design plans. Amongst other things, this may include infrastructure to divert or lower the water table, sub-drains, and/or ongoing monitoring of surface and groundwater.

Topography, Soil and Sediment

- Describe the geomorphology, topography and geotechnical characteristics in project area, including the presence and distribution of eskers and permafrost;
- Identify any areas of ground instability;
- Describe and depict soil depth by horizon and soil order (borehole logs, maps, etc.) within the project site area to support salvage and site restoration, and to assess potential for soil erosion;
- Describe the suitability of topsoil and overburden for use for the Supply Road and restoration of disturbed areas;
- Describe the potential for contamination of soils and sediments and identify any known or suspected soil contamination with the project study area;
- Description and map ecozones, ecoregions, and ecodistricts as per Ontario's Ecological Landscape Classification;
- Describe and map location of eskers and other post-glacial deposits;
- Describe permafrost conditions including distribution of frozen and unfrozen ground; and
- Describe thaw settlement and terrain instability associated with ground thawing in permafrost areas.

The Geotechnical Engineering Report, SNC-Lavalin, September 2020 and future Natural Environment Existing Conditions Report will describe escribes the following characteristics of permafrost, Geohazards and Thaw Consolidation and Settlement present in the project area.

Permafrost

The project area is situated within a band of sporadic permafrost that is part of the Discontinuous Permafrost Zone of Canada's permafrost region (National Atlas of Canada, 5th Edition (1995): Canada Permafrost). In the sporadic permafrost band where the project area is located, permafrost occurs in islands (10 to 50 % of the land area is underlain by permafrost); permafrost varies in thickness (estimated at a few metres in the project area); the active layer (the surface layer of soil or rock above the permafrost) may not extend down to the permafrost; and ground ice content in the upper 10-20 m of the ground is categorized as Low (less than 10%). In addition, the thickness of the permafrost may be influenced by soil and rock type, snow cover and proximity to waterbodies.

Geohazards

No landslide hazards were identified, nor were sinkholes or major geological depressions or geological anomalies observed. In general, the site is in discontinuous permafrost regions, thaw weakening may be concern if ice rich soils were present under the road alignment. Ad freeze forces on piles or buried foundation surfaces through the frost penetration depths will be considered for the design.

Thaw Consolidation and Settlement

During the next phase of the Project, if frozen ground is encountered below the active frost depth, thaw consolidation tests shall be considered on ice rich soils. Thaw consolidation tests have two components: the thaw test; and then the usual consolidation test and the tests are done in a conventional consolidation cell. A frozen soil sample is placed in a consolidation cell and is allowed to thaw under nominal or expected in situ stress, and then the conventional consolidation test is continued. This allows measuring the thaw strain during thaw testing and then the usual consolidation parameters during the consolidation process. The undrained shear strength at the end of consolidation shall also be measured. Dense/hard till and bedrock have no challenges with thaw consolidation. Overburden thickness is generally small; therefore, thaw strain may not be significant or a major design challenge. More details are presented in the Geotechnical Design Report with civil and structural engineering recommendations, SNC-Lavalin, September 2020.

2.2. Criteria and Indicators

Criteria are components of the environment that are considered to have economic, social, biological, conservation, aesthetic or cultural value (Beanlands and Duinker, 1983). The assessment will focus on valued components, and applicable specific criteria, that have physical, biological, social, economic or health importance to the public, Indigenous groups, federal and provincial authorities and interested parties, and have the potential for change as a result of the Project. Valued components have been identified in the federal TISG and are, in part, based on what Indigenous communities and groups, the public and stakeholders identify as valuable to them in the EA process to date. The list of valued components identified to date include the following:

- **Geology, Terrain and Soils** (subject of this study plan);
- Surface Water;
- Groundwater;
- Air Quality;
- Climate Change;
- Noise;
- Vegetation and Wetlands;
- Fish and Fish Habitat;
- Wildlife, including migratory birds;
- Archaeological Resources;
- Built Heritage and Cultural Heritage Resources;
- Socio-economic Environment;
- Aboriginal Land and Resource Use;
- Visual/Aesthetic Environment;
- Human Health; and
- Aboriginal and Treaty Rights and Interests.

The list of valued components will be informed, validated and finalized through the engagement and consultation process, including those to whom these concerns are important and the reasons why, such as environmental, cultural, spiritual, historical, health, social, economic and their relation to the exercise of Aboriginal and Treaty rights.

The list of identified valued components and associated criteria will be validated and finalized by the Project Team through a variety of means and consideration of factors that include, but are not limited to the following:

- Engagement with Indigenous communities and groups and the extent to which the valued component is linked to the interests or exercise of Aboriginal and Treaty rights of Indigenous peoples;
- Stakeholder engagement, including discussions with interest holders, and government authorities;
- Presence, abundance and distribution within, or relevance to, the area associated with the Project;
- Extent to which the effects (real or perceived) of the Project and related activities have the potential to interact with the valued component;
- Uniqueness or rarity in the study area;
- Likelihood of an indirect effect on an associated criterion (i.e., a link exists between the affected criterion and another criterion, such as water quality from soil erosion);
- Ecological, social and economic value to Indigenous communities, municipalities, stakeholders, government authorities, and the public; and
- Traditional, cultural and heritage importance to Indigenous peoples.

Terrain and soils influence local and regional biodiversity and contribute to the abundance and distribution of vegetation and wildlife on the landscape and also support forestry and rights of Indigenous peoples such as the quantity and quality of resources available for harvesting (e.g. medicinal plants). Terrain and soils as elements of the physical environment are considered a valued component because, if changed by Project activities, they could affect terrestrial and aquatic systems and functions due to their interrelationship or interfere with current use of land and resources by Indigenous peoples. The following criteria have been identified for terrain and soils:

Terrain and soils: Terrain, or topographical relief, is the elevation, slope, and orientation of the land surface. Soil is a mixture of minerals and organic matter that is a medium for plant growth, water storage, and habitat for organisms. Soils are typically heterogeneous across the landscape and are therefore referred to in the plural.

Feedback through engagement and consultation with Indigenous communities, stakeholders, and regulators will be obtained during the EA process to finalize the criteria, including further supportive rationale for their selection.

In order to evaluate the effects of the WSR and alternatives, the criteria for terrain and soils will have one or more indicators that will identify how the potential environmental effects will be measured. In general, indicators represent attributes that can be used to characterize changes to criteria as a result of the Project that may demonstrate a physical, biological or socio-economic effect. As indicators represent an expression of change this may be characterized quantitatively or qualitatively to compare predicted environmental effects to existing baseline conditions. The proposed preliminary indicators for terrain and soils include the following:

Terrain distribution: is the amount or abundance and spatial configuration (distribution) of terrain units in the landscape. This will be measured qualitatively as a change in overall representation (abundance and distribution) of the terrain unit in the study areas (PF, LSA and RSA), and will be analyzed through

mapping. Data on terrain (including surficial geology, topography, hazardous slopes, geological features – eskers) will be collected from existing published literature, mapping and from the results of field surveys, where applicable, and incorporated into a GIS platform for evaluation.

Soil quality: refers to the physical, chemical, and biological characteristics of soil. This will be measured qualitatively in terms of changes to soil quality in the study areas. Soil quality is defined qualitatively by determining its potential for compaction, erosion, admixing as well as chemical influences from Project activities such as accidental spills of hazardous materials. As mentioned previously, ARD-ML risk will consider identification of the expected range of field conditions that the materials will be subject to as a result of handling and final emplacement. Potential impact to the receiving environment will be qualified via both NPR values and results static leachate tests (e.g. Shake Extraction Flask or NAG leach test extraction) screened against relevant ecologically based water quality guidelines (also accounting for mixing effects between point source and reception).

Soil distribution: refers to the amount or abundance and spatial configuration of soil. This will be measured qualitatively as a change in overall abundance and distribution of soil in the study areas and will be analyzed through examination of mapping. Soil distribution data will be collected from existing published literature, mapping and from the results of field surveys, where applicable, and incorporated into a GIS platform for evaluation.

The EAR/IS will further describe the criteria and indicators, including details of how each indicator will be measured, along with data sources and rationale for selection. This will be presented in tabular format and will build on the preliminary criteria and indicators included in Appendix B to the ToR.

2.3. Effects Assessment Approach

The approach for the assessment has been developed to satisfy regulatory requirements under the *Environmental Assessment Act* and is based on the MECP *Code of Practice: Preparing and Reviewing Terms of Reference for Environmental Assessments in Ontario* (MOECC 2014), and the Terms of Reference for the Project that is currently pending approval from the MECP. The approach for the assessment has also been developed to meet the requirements of the federal TISG and specifically Section 13 – Effects Assessment. The approach has also taken into consideration the Ministry of Natural Resources and Forestry (MNRF) Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects (MNRF, 2003).

2.3.1. Consideration and Evaluation of Alternatives

The EA process requires that two types of project alternatives be considered: “alternatives to” the Undertaking (i.e., functionally different ways of addressing an identified problem or opportunity to arrive at the preferred planning solution) and “alternative methods” of carrying out the Undertaking (options for implementing the preferred planning solution). The consideration and evaluation of alternatives to the Undertaking were documented in the federal Impact Assessment Detailed Project Description (November 2019) and the provincial Environmental Assessment draft Terms of Reference (September 2019) and concluded that developing a new all-season road between Webequie and the McFaulds Lake area is the preferred alternative. This analysis and conclusion are not proposed be re-examined as part of the EA process but will be documented in the EAR/IS. Therefore, in keeping with the focussed approach the preferred planning alternative (developing a new all-season road) has been carried forward to the initial consideration of alternative methods of carrying out the Undertaking.

The consideration of alternatives methods will focus on the supply road conceptual alternatives within the proposed preliminary corridor, as identified in the Detailed Project Description (November 2019) and the draft Terms of Reference (September 2019). These alternatives include the Webequie First Nation community's preferred route for the supply road along the centreline of an approximately 2 km wide preliminary preferred corridor and the optimal geotechnical route within the same corridor (Refer to Figure 2). In addition, the following alternative methods related to supportive infrastructure and the preferred supply route will be examined.

- Alternative sites for temporary and/or permanent aggregate extraction pits and production facilities needed for construction and operation of the road, including access roads to these sites;
- Alternative sites for supportive infrastructure (i.e., temporary laydown and storage areas, construction camps, including access roads to these areas);
- Watercourse crossing structure types (i.e., culverts, bridges), span length, lifecycle, and construction staging methods at waterbody crossings; and
- Road attributes, including roadbed foundation; horizontal alignment, vertical alignment (elevation/profile), and adjustments to the cross-section and right-of-way (ROW) width of the corridor.

The assessment of alternatives will include environmental, socio-economic, cultural and technical factors using criteria and indicators for the comparative analysis. This will also include specific consideration of community based Indigenous land and resource uses (e.g., fishing, hunting) and cultural (e.g., built; sacred or spiritual sites) criteria of value to Indigenous communities within the broader factors. As noted previously the criteria and indicators will be developed in detail as part of the EA through input from the engagement and consultation activities with Indigenous communities, the public and stakeholders. Both a quantitative and/or qualitative assessment of alternatives for each criterion will be conducted to allow for a comparison of the advantages and disadvantages and selection of a preliminary recommended route for the WSR and the sites/access routes for supportive infrastructure.

2.3.2. Assessment of Net Effects

A step-wise process will be used to assess the environmental effects of the Project in a systematic and transparent manner once the relevant project elements and activities and their interactions, assessment boundaries, and relevant environmental criteria and indicators are identified and finalized through the engagement and consultation process. The net effects assessment method will include the following primary steps:

- Identification of potential environmental effects;
- Identification of technically and economically feasible impact management measures;
- Prediction of net effects following implementation of impact management measures; and
- Evaluation of the predicted net effects (i.e., describe and determine the magnitude, duration, extent, frequency, and significance of the predicted net effects).

2.3.2.1. Identification of Potential Environmental Effects

The net effects assessment will consider the potential interactions between the project components and activities and the criteria within the identified spatial boundaries and phases of the Project (i.e., construction and operation). Potential effects of the Project on valued components (VC) will be determined by comparing baseline conditions to those expected to result from the construction and operation and maintenance of the Project. Potential effects will be described for each assessment

criterion, including an indication of whether they are expected to be direct (i.e., as a result of a project component or activity affecting a valued component), or indirect (i.e., as a result of a change to one VC affecting another VC). Relevant project works and activities will be analysed individually to determine if there is a plausible pathway for an effect on VCs.

The assessment of potential effects to geology, terrain and soils will include the characterization of baseline conditions in the project study area using both publicly available information on a regional scale and data obtained in the field or via desktop review on a local scale or site-specific basis. As potential effects from the development of the supply road and supportive infrastructure could affect geology, terrain and soils within the PF, LSA and RSA, we will also assess specific potential effects that could have lingering detrimental effects to in the study areas such as soil compaction, soil loss or changes to rates of erosion or sedimentation, physical alteration of waterbodies or channel morphology and spills.

Effects to geology, terrain and soils as a result of the Project will consider the specific items contained in Sections 8.3, 8.4, 15 of the TISG, as well as the interaction and interconnectedness with other select valued components of value to Indigenous peoples and others.

2.3.2.2. Identification of Impact Management Measures

Once potential effects are identified, technically and economically feasible impact management measures (or “mitigation measures”) to avoid and minimize potential adverse effects will be identified for each phase of the Project. Design considerations and impact management measures for soil and terrain will be identified to offset or eliminate potential adverse effects (e.g., erosion and sediment controls, restoration of disturbed areas) and will be described in the EAR/IS. Refinements to these measures may also be made in the future detail design phase of the Project. Impact management measures will be developed for the Project based on:

- Knowledge and experience of the Project Team with linear infrastructure developments;
- Industry best management practices and applicable agency requirements and guidance; and
- Measures identified by Indigenous communities, the public and stakeholders through feedback received as part of the engagement and consultation program.

It is understood that impact management measures are not always fully effective, therefore, WFN will identify a compliance monitoring and effects monitoring program as part of the EA for implementation during the project phases (refer to Section 2.3.2.6).

2.3.2.3. Prediction of Net Effects

A net effect, or the alternative term residual effect, is considered an environmental (biophysical), social, economic or health effect from the Project and its related activities that is predicted to remain after the implementation of impact management measures. A potential effect is considered to occur where anticipated future conditions resulting from the Project differ from the conditions otherwise expected from natural change without the Project. In some situations, the recommended impact management measures will eliminate a potential adverse effect, while in other situations impact management measures may reduce, but not eliminate the effect. Impact management measures may also enhance positive effects. A potential effect that will be eliminated, or considered unlikely after impact management measures, will be identified as not resulting in a net effect (i.e., no net effect) and will not be considered further in the net effects assessment. An effect that may remain after the application of impact management measures will be identified as a net effect and will be further considered in the effects assessment. Positive effects will also be considered further in the effects assessment, including means of enhancing benefits of the

Project. Neutral changes will not be carried forward for the characterization of net effects, but where identified will be characterized in terms of the confidence in the predictions and the likelihood of the effect.

2.3.2.4. Characterizing the Net Effects

The characterization of net effects will provide the foundation for determining the significance of incremental and cumulative effects from the Project for each assessment criterion. The objective of the method is to identify and predict net adverse and positive effects that have sufficient magnitude, duration, and geographic extent to cause fundamental changes to the self-sustainability or ecological function of a valued component, and therefore, result in significant combined effects.

Using terrain and soils as an example, the magnitude of the potential effect will be qualitatively assessed by inferring the anticipated changes relative to baseline conditions using the identified preliminary criteria and indicators related to terrain distribution, soil quality and soil distribution. In general, the magnitude is the intensity of the effect or a measure of the degree of change from existing conditions and will be defined by each discipline assessment. If a significant effect is identified, the contribution of the Project to the combined effect will be described. The assessment of significance of the net effects of the Project on geology, terrain and soils and other valued components will be informed by the interaction between significance factors (as defined below), in addition to those concerns raised by Indigenous groups, interested agencies, and individuals during the consultation and engagement for the EA. Therefore, predicted net effects, where identified, will be described in terms of the following significance factors (MNRF, 2003), with integration of the assessment methodology identified in the federal TISG, as required.

- **Direction** – The direction of change in effect relative to the current value, state or condition, described in terms of Positive, Neutral, or Negative.
- **Magnitude** - The measure of the degree of change from existing (baseline) conditions predicted to occur in the criterion.
- **Geographic Extent** - The spatial extent of which an effect is expected to occur/can be detected and described in terms of the PF, LSA and RSA.
- **Severity** - The level of damage to the valued component from the effect that can reasonably be expected; typically measured as the degree of destruction or degradation within the spatial area of the PF, LSA and RSA. Severity would be characterized as: Extreme; Serious, Moderate or Slight.
- **Duration/Reversibility** - Duration is the period of time over which the effect will be present between the start and end of an activity or stressor, plus the time required for the effect to be reversed. Duration and reversibility are functions of the length of time a valued component is exposed to activities. Reversibility is an indicator of the degree to which potential effects can be reversed and the valued component restored at a future predicted time. For effects that are permanent, the effect is deemed to be irreversible. Duration/Reversibility would be characterized for each adverse effect as: Short-Term (0- 5 years), Medium-Term (6-20 years), Long-Term (21 to 100 years) or Permanent (>100 years).
- **Frequency** – Is the rate of occurrence of an effect over the duration of the Project, including any seasonal or annual considerations. Frequency would be characterized as: Infrequent; Frequent or Continuous.
- **Probability or Likelihood of Occurrence** – Is a measure of the probability or likelihood an activity will result in an environmental effect. Probability or likelihood of occurrence would be characterized as: Unlikely, Possible; Probable and Certain.

The definitions and description of the above factors will be described in detail in the EAR/IS. An effort will be made to express expected changes quantitatively / numerically. For example, the magnitude (intensity) of the effect may be expressed in absolute (changes to available or distribution of terrain units – hectares) or percentage values above (or below) baseline conditions or a guideline value (e.g. soil quality). Additionally, the definition of effect levels may vary from one valued component or criterion to another, recognizing that the units and range of measurement are distinct for each. Lastly, effects may impact communities, Indigenous groups and stakeholders in different ways, including through a gender-based lens (refer to **Section 2.3.3**) and they may respond differently to them. Therefore, determining and characterizing effects will be based largely on the level of concern expressed through engagement with the Indigenous groups and community members.

2.3.2.5. Assessment of Significance

MNRF's Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects (MNRF 2003) require the assessment of significance of environmental effects and provides guidance for assessing the significance of potential environmental effects under individual criteria, for a project as a whole, and for alternatives.

In addition to the Class EA guidance, the determination of significance of net effects and cumulative effects from the Project and other previous, existing, and reasonably foreseeable developments will generally follow the guidelines and principles of the *Draft Technical Guidance Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act* (CEA Agency, 2017) and the *Operational Policy Statement: Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act*, 2012 (CEA Agency, 2015).

In general, the assessment of significance of net effects will be applied to each valued component for which net effects are predicted, and net adverse effects or positive effects will be classified as significant or not significant (i.e., binary response). Additional details on the application of biophysical, cultural, socio-economic and health criteria and definitions that would describe "significant" and "not significant" will be provided in the EAR/IS.

2.3.2.6. Identification of a Monitoring Framework

Webequie First Nation will develop a monitoring framework during the EA process for each project phase (construction and operation and maintenance). The two primary types of monitoring to be developed will include:

- Compliance monitoring; and
- Effects monitoring.

The compliance monitoring will assess and evaluate whether the Project has been constructed, implemented and/or operated in accordance with commitments made during the EA process, and any conditions of the federal IA and provincial EA approvals and other approvals required to implement the Project.

The effects monitoring will be designed to verify the prediction of the effects assessment, and to verity the effectiveness of the impact management measures. This would include construction and operational monitoring that would identify actual effects, assess the effectiveness of the measures to minimize or

eliminate adverse effects, and evaluate the need for any additional action to ensure that environmental commitments and obligations are fulfilled and mitigation measures are effective.

2.3.3. Gender Based Analysis Plus (GBA+)

Information and data collected will be disaggregated by diverse subgroups (women, youth, elders, etc.), as part of applying a Gender Based Analysis Plus (GBA+) lens. For terrain and soils, the baseline information will focus on land and resource use activities that interconnected to terrain and soils and will be obtained through such methods as socio-economic and health surveys, key informant interviews with community members who fish (gender, youth, elders), desktop research and Indigenous Knowledge where provided. This will include qualitative and quantitative data that help to characterize and describe the importance of plants and wildlife distribution relative to soils and terrain of cultural significance to Indigenous communities through a GBA+ lens, including where feasible the data disaggregated by sex, age, and other identity factors. Through Survey Monkey the data will be filtered and disaggregated based on the demographic questions answered (i.e., gender, age, Indigenous community membership, etc.).

The Project Team will work with the Indigenous communities to identify the appropriate participants for each of the subgroups that are willing to contribute to the baseline data collection through surveys and key informant interviews. The Project Team will tailor how they engage with these groups based on community protocols (i.e., it is expected that elders would prefer in-person dialogue and will require a community translator vs. youth who would participate in online survey).

3. Consideration of Input from the Public and Indigenous Peoples

3.1. Public Participation

EA study participants as identified in the Agency *Public Participation Plan* dated February 24, 2020 for the WSR Project will be engaged and consulted. The Public Participation Plan was developed by the Agency to set out proposed opportunities for participation during the impact assessment process for Agency-led activities. The proponent, or its subject matter experts, may participate in activities as requested by the Agency.

The ToR provides a plan for engaging and consulting government ministries and agencies, the public and stakeholders based on EA study milestones similar to those for Indigenous communities.

All identified affected and/or interested stakeholders and members of the public will be notified at the EA study milestones. The public and stakeholders will have the opportunity to attend two (2) open house sessions that will be held in the City of Thunder Bay, focussing on:

1. Project and EA process overview; baseline data collection; spatial and temporal boundaries for assessment; criteria and indicators; and identification and preliminary evaluation of alternatives; and
2. Presentation of the selected preferred alternatives/the Project, including potential effects, mitigation, net effects and their significance and follow-up monitoring.

The open houses will include display materials and handouts containing information on the Project, the EA study process, known existing environmental conditions, the results of studies that have been conducted to date; the development and evaluation of alternatives, including the rationale for use of criteria and indicators; the project schedule; and the results of the consultation program. The Webequie Project Team will be available to receive and respond to questions and have an open dialogue regarding the EA process. Written comments may be prepared and left at the open house venue or sent to the Project Team within a specified period following the event.

The public and stakeholders will be notified regarding the commencement of the EA and submission of the Draft and Final EAR/IS. The EAR/IS will be available for review on the Project Website, and at municipal offices or nearby public libraries in:

- City of Thunder Bay
- Municipality of Greenstone
- Township of Pickle Lake
- City of Timmins
- Municipality of Sioux Lookout

In summary, the methods and activities for engagement and consultation with the public will include:

- Notification letters;
- Public notices and newspaper advertising at key EA milestones – Notice of Commencement; Notice of Open Houses; Notices for Draft and Final EAR/IS;
- Open houses;
- Communication materials for use at meetings such as slide decks, project fact sheets, handouts, etc.;
- Project Website; and
- Opportunities to review and provide comments on the Draft and Final EAR/IS.

All comments received from the public engagement and consultation activities will be tracked (i.e., Record of Consultation) and considered by the Project Team with the objective that the public be provided meaningful opportunities to participate, including in meaningful discussions in the EA process.

3.2. Indigenous Engagement and Consultation

3.2.1. Communities to be Included in the Assessment

The assessment of geology, terrain and soils component will include the 22 identified Indigenous communities that are to be consulted as part of the EA process, as shown in **Table 5** below. These communities have been identified by the MECP and Agency as communities whose established or asserted Aboriginal and/or Treaty rights may be adversely affected by the Project and/or may have interests in the project. Communities marked with an asterisk are those whose Aboriginal and Treaty rights may be affected by the Project.

The table also includes those communities that have been identified by Webequie First Nation based on Elders' guiding principles and Webequie's Three-Tier approach to Indigenous consultation and engagement. WFN identified communities and assessed them based on the following criteria:

- Geographically closer to the project area than others;
- Known to have traditionally used some of the potentially affected lands in the past, or currently;
- Downstream of the Project and may experience impacts as a result of effects to waterways;
- Considered to have closer familial/clan connections to the members of WFN; and/or
- Have been involved in all-season road planning in the Region, either directly with the WFN, or in consideration of all-season road planning that the WFN has been involved with in recent years.

Based on these factors, the communities identified by WFN will be offered the deepest or intensive consultation/engagement.

Table 5: Indigenous Communities to be Consulted

Indigenous Community	Identified by WFN	Identified by MECP	Identified by IAAC
Webequie First Nation	✓	✓ *	✓ *
Aroland First Nation		✓ *	✓ *
Attawapiskat First Nation	✓	✓ *	✓ *
Constance Lake First Nation		✓ *	✓
Eabametoong First Nation	✓	✓	✓ *
Fort Albany First Nation		✓ *	✓ *
Ginoogaming First Nation		✓	✓
Kasabonika First Nation	✓	✓ *	✓ *
Kaschechewan First Nation		✓ *	
Kitchenuhmaykoosib Inninuwug		✓ *	✓
Kingfisher Lake First Nation		✓ *	
Long Lake #58 First Nation		✓	✓
Marten Falls First Nation	✓	✓ *	✓ *
Mishkeegogamang First Nation		✓	
Neskantaga First Nation	✓	✓ *	✓ *
Nibinamik First Nation	✓	✓ *	✓ *
North Caribou Lake First Nation		✓	
Wapekeka First Nation		✓ *	
Wawakapewin First Nation		✓ *	
Weenusk (Peawanuck) First Nation	✓	✓ *	✓ *
Wunnumin Lake First Nation		✓ *	
Metis Nation of Ontario – Region 2		✓	

3.2.2. Approach and Methods

The Project Team will consult and engage with Indigenous communities throughout the assessment process. It is the Project Team's objective that the EA capture Indigenous Knowledge and any issues, concerns or other information being provided by Indigenous communities accurately and appropriately. As such, Indigenous communities will have the opportunity to provide input and feedback during the following steps of the EA and more specifically the assessment of terrain and soils as outlined in this study plan:

- Provide input to defining areas such as areas with known soil quality issues (e.g., contamination from a spill) or soil or terrain types where plants are harvested or spatial boundaries of the VC for the purposes of the baseline data collection and effects assessment;
- Provide input on the criteria and indicators for terrain and soils;
- Provide input on methods and types of baseline data and information to be collected, including opportunity to provide Indigenous Knowledge;
- Validate how baseline information is captured and used in the EA;
- Provide input on the effects assessment methodology, including alternatives;
- Discuss potential effects based on predicted changes to terrain (e.g., slopes, topography, drainage patterns), soil quality (chemicals from accidental spills) and soil distribution (e.g., soil erosion potential and ability to support plants); and,

- Provide input to identify mitigation measures and any follow-up monitoring programs during the construction and/or operation phases of the Project, including predicted overall net effects and significance, including those that may interfere with the exercise of rights of Indigenous peoples.

A variety of activities and materials will be used to provide information and receive input from Indigenous communities during the EA process. These are outlined and detailed in the provincial ToR which includes the mechanisms, activities and events that are planned for various stages throughout the EA process and will be used at milestone points to ensure optimal engagement with Indigenous communities. In summary this includes the following:

- Notification letters sent by registered mail to all of the identified Indigenous communities and groups (i.e., Tribal Councils inform them at key milestone (e.g., Commencement of provincial EA; Submission Draft EAR/IS and Submission of Final EAR/IS;
- Community visits throughout for those communities identified by IACC and MECP whose established or asserted Aboriginal and/or Treaty rights may be adversely affected by the Project;
- Meetings (2) with off-reserve community members of the 22 Indigenous communities to be consulted as part of the EA;
- Information meetings with Métis Nation of Ontario;
- Engagement with Tribal Councils and Nishnawbe Aski Nation, with meetings held upon request;
- Communication materials for use at meetings such as slide decks, project fact sheets, handouts, etc., including where requested translation to native language;
- Audio and visual products for those Indigenous communities that have the capability, community meetings and presentations will be live-streamed through local community media to allow for a wider audience to participate in the meetings;
- Use of surveys (e.g., “Survey Monkey”) or focused community-based meetings to obtain information (e.g., socio-economic, human health, etc.) and identify concerns from Indigenous people;
- Project Website (www.supplyroad.ca) for the public to review project related information and documents, including informative video tutorials (e.g. EA studies); and
- Project Newsletter letters.

Engagement with Indigenous groups has been undertaken as part of the ToR phase and included components of the study plan (e.g., baseline studies for valued components, spatial and temporal boundaries, criteria and indicators, EA alternatives, etc.) and will continue as part of the planned EA engagement activities for the Project.

All outreach efforts and consultation activities will be recorded as part of the Record of Consultation to allow for validation by the Agency and the MECP. The EAR/IS will describe how input from Indigenous communities and public was incorporated into the geology, terrain and soils assessment and other valued components.

3.2.3. Indigenous Knowledge

Through engagement activities, the Project Team will also collect Indigenous Knowledge relevant to the WSR study area and specific valued components, where available, from the 16 Indigenous communities identified by Ontario and the 10 Indigenous communities identified by the Agency. Indigenous Knowledge will assist in describing existing conditions (e.g. characterizing the study area, natural environment conditions, social and economic conditions, cultural characteristics, community characteristics, past and

current land uses and other values of importance. Indigenous Knowledge will be used to assist in developing mitigation measures, monitoring commitments and accommodation measures, where necessary. The Project Team will document efforts to obtain Indigenous Knowledge. It is recognized that each community may have its own protocols and procedures to be followed in transferring Indigenous Knowledge to outside parties such as WFN and the Project Team. The Project Team will ensure that related protocols are respected and will work with each community to understand how the information will be transferred, securely stored, and applied. Additionally, the Project Team will ensure that the Indigenous Knowledge provided will be protected and kept confidential. The Project Team will seek guidance from the community as to how the information will be used and published.

As Indigenous Knowledge is holistic it can provide insights related to interrelationships between the natural, social, cultural, and economic environments, community health and will being, Indigenous governance and resource use. Therefore, Indigenous Knowledge, where provided, will be included in all of aspects of the technical assessments of potential impacts of the Project on Indigenous peoples, or, given is holistic nature, may be presented in one section of the EAR/IS. It will also be considered in technical sections or chapters of the documents (e.g., baseline data on soils and terrain will include information gathered through collection of Indigenous Knowledge). It is recognized that it is important to capture the context in which Indigenous groups provide their Indigenous Knowledge and to convey it in a culturally appropriate manner. Indigenous Knowledge will only be will be incorporated in the EAR/IS where written consent has been granted.

3.2.4. Aboriginal and Treaty Rights

The Webequie Project Team will be engaging with Indigenous communities regarding potential impacts of the Project on the exercise of rights, and where possible, the project's interference with the exercise of rights. Potential effects to be considered will include both adverse and positive effects on the current use of land and resources for traditional purposes, physical and cultural heritage, and environmental, health, social and economic conditions of Indigenous peoples impacted by the Project. For example, this will include such effects as reductions in the quantity and quality of resources available for harvesting (e.g., species of cultural importance, including traditional and medicinal plants; or interference with the current and future availability and quality of country foods (traditional foods). Webequie First Nation and the Project Team will discuss with Indigenous communities their views on how best to reflect and capture impacts on the exercise of rights in the EAR/IS. Should impacts on the exercise of Aboriginal and Treaty rights be identified, Webequie First Nation and the Project Team will work with Indigenous communities to determine appropriate mitigation measures to reduce or eliminate such impacts. Where no mitigation measures are proposed or mitigation is not possible, the Project Team will identify the adverse impacts or interference to the exercise of Aboriginal and Treaty rights and this will be described (e.g., level of severity) and documented in the EAR/IS. Webequie First Nation and the Project Team will advise Ontario and the Government of Canada on concerns Indigenous communities may have in relation to their exercise of Aboriginal and Treaty rights and whether their concerns cannot be addressed or mitigated by the Project Team.

4. Contribution to Sustainability

4.1. Overarching Approach

As recognized in the Agency's current guides to considering how a project will contribute to sustainability, it is not until baseline information has been collected and the potential effects of the Project are assessed that a full understanding or determination of the project's contribution(s) can be achieved/made. However, information and data requirements for sustainability have been considered from the outset of the WSR Project for planning purposes. In the absence of the potential effects assessment, this section outlines the general approach to determining sustainability contributions for this valued component.

The approach is based on the goal of providing a broad or holistic description of the project's potential positive and negative effects, including the interactions among those effects and the long-term consequences of the effects. In the context of the IAA requirements, sustainability means "the ability to protect the environment, contribute to the social and economic well-being of the people of Canada and preserve their health in a manner that benefits present and future generations", with the aim of "protecting the components of the environment and the health, social and economic conditions that are within the legislative authority of Parliament from adverse effects caused by a designated project", recognizing that the Minister's or the Governor in Council's public interest determination must include sustainability as one of five factors to be considered in rendering a final decision.

The approach also considers the level of effort required to assess a project's contribution to sustainability to be scalable, depending on the phase of the process and the context of the project, and can/will be adjusted/scoped as the impact assessment proceeds. For example, effects on future generations requires temporal scoping (i.e., consideration of next generation to "seventh generation"), based on expectations as to how many generations it will take for effects to become fully apparent, including return to VC baseline conditions; resilience of the VC; and whether a VC is expected to recover from effects.

As part of the public participation and Indigenous peoples engagement programs described in Section 3.2.2, the Project Team has (and will continue to) facilitate early identification of values and issues to better inform the assessment of the project's contribution to sustainability; and identify VCs that should be carried forward into that assessment, scoping related criteria and indicators to reflect the project context. As part of sustainability considerations, this information has also been used (with regard to which VCs are considered most important to Webequie First Nation) to identify alternative means of carrying out the Project and select alternatives to be carried forward for an assessment of sustainability contributions. Ultimately, with the appropriate input from the engagement and consultation program, the sustainability assessment will culminate with the development of commitments to ensuring the sustainability of Indigenous livelihood, traditional use, culture and well-being.

In identifying and scoping key VCs for sustainability contributions, the Project Team will consider VCs that:

- could experience long-term effects, including how those effects could change over time, and how they could affect future generations;
- may interact with other VCs;

- may interact with potential effects of the designated project; and/or
- may interact with project activities.

4.2. Assessment of Contribution to Sustainability

During preparation of the Impact Statement, the four (4) Sustainability Principles identified in the Agency's guides and the TISG will be applied as follows:

Principle 1 - Consider the interconnectedness and interdependence of human-ecological systems

A systems approach will be used to determine/express VC interconnectedness. The degree of interconnectedness within systems and/or subsystems may vary greatly (may be characterized as very intricate and tight/direct, or quite loose and indirect). The focus will be on those aspects that are most important to communities, the social-ecological system and to the context of a project. All interactions, pathways and connections among effects to the environment, and to health, economic and social conditions will be described, as will how these interactions may change over time. The Project Team will ensure that the description of systems and the direct and indirect relationships are guided by input from Indigenous Knowledge. It is expected that a graphic with simple pictorial images will be developed to visually represent the connections between human and ecological systems to facilitate comprehension and encourage input/feedback.

Principle 2 - Consider the well-being of present and future generations

The long-term effects on the well-being of present and future generations will be assessed. To conduct an analysis on future generations, the Project Team will first determine the potential long-term effects on well-being. This will entail consideration of the elements of environmental, health, social and economic well-being, across a spectrum of VCs, that communities identified as being valuable to them. In the context of subject VC (aquatic environment), well-being could include community cohesion, protection of the environment, culture, stress, or livelihoods. Available Comprehensive Community Plans (CCP) will be consulted to determine whether sustainability is a CCP central theme. How the environmental, health, social and economic effects on well-being could change over time will also be assessed, as information permits. Although effects on future generations could include effects beyond the lifecycle of a project, this is not expected to be major consideration for the WSR Project, as no expected decommissioning or abandonment timeframe has been identified. With respect to temporal scoping, there is still a need to determine what the "future generation" is (i.e., how far into the future the project effects will be considered). Predicted potential effects on future generations will be assessed based on the supporting data or uncertainty; any uncertainty will be documented.

Principle 3 - Maximize overall positive benefits and minimize adverse effects of the designated project

The Impact Statement will include a consideration of ways to maximize the positive benefits of the Project and consider mitigation measures that are technically and economically feasible and would mitigate any adverse effects of the Project. Sustainability considerations will include: whether additional mitigation measures are required; have additional benefits been identified and, if so, how can they be maximized; does the direction of the impact (i.e., positive or negative) shift between different groups and sub-populations; are there particular strengths or vulnerabilities in the potentially affected communities that

may influence impacts; do the impacts cause regional inequities; and do the near term benefits come at the expense of disadvantages for future generations.

Principle 4 - Apply the precautionary principle and consider uncertainty and risk of irreversible harm

The precautionary principle states that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation". All uncertainties and assumptions underpinning an analysis will be described. A precautionary approach will be applied in cases where there is risk of irreversible harm (irreversible harm refers to project-related effects from which a VC is not expected to recover; reversibility is influenced by the resilience of the VC). Taking such a conservative approach may include setting out worst-case scenarios for decision-makers to consider, particularly when there is uncertainty about the significance or irreversibility of potential effects. As appropriate, the precautionary approach may be extended to commitments regarding the project's design (to prevent adverse effects, prevent pollution, deal with unplanned events) and the development of monitoring and follow-up programs to verify effects predictions, or gauge the effectiveness of mitigation measures. Uncertainty may be characterized quantitatively (e.g., description of confidence levels of modelled predictions) or qualitatively (e.g., through descriptors such as "high", "medium", and "low"). Qualitative descriptions of uncertainty will explain how the level of uncertainty was determined, identify sources of uncertainty and data gaps, and describe where and how professional judgment was used.

5. Closure

Prepared by:

<Original signed by>

Adriana Lafleur, M.Sc., P.Geo.
Senior Project Manager
Environment & Geoscience
Engineering, Design and Project Management

Prepared by:

<Original signed by>

Craig Wallace, BES
Manager, Environmental Assessment and Permitting
Environment & Geoscience
Engineering, Design and Project Management

Reviewed by:

<Original signed by>

Hafeez Baba, Ph.D., P.Eng.
Engineering Manager
Mine Environment
Mining & Metallurgy

6. References

J.D. Mollard and Associates (2010) Limited, March 2019. Webequie Supply Road Terrain Mapping, Potential Aggregate Sources & Identification of Route Alternatives.

J.D. Mollard and Associates (2010) Limited, November 2019. Webequie Supply Road: Field Investigation of Peat Thickness and Potential Aggregate Sources, Draft Report.

SNC-Lavalin, May 2020. Webequie Supply Road: Draft Geotechnical Engineering Report.

APPENDIX A

List Background Information Sources

LIST OF BACKGROUND INFORMATION SOURCES

Geological Survey of Canada physiographic regions map (Bostock, 2014);

Bedrock and Quaternary Geology data, Ontario Geological Survey (2000, 2011);

Geology of the Canadian Shield in Ontario: An Update, J.A. Percival and R.M. Easton, Ontario Geological Survey, 2007;

Tectonic Styles in Canada: The Lithoprobe Perspective, Percival, J.A., Cook, F.A. and Clowes, R.M., Geological Association of Canada Special Paper, 2012;

Digital Northern Ontario Engineering Geology Terrain Study (NOEGTS 2005);

Eagles Nest Project – A Federal/Provincial Environmental Impact Statement/Environmental Assessment Report, Noront Resources Ltd., Knight Piesold Consulting, December 2013;

Surficial geology, bedrock geology, topographic mapping, and available existing geological and hydrogeological reports (Ontario Geological Survey 2011, MNRF 2016);

The Kapuskasing Uplift: a geological and geophysical synthesis, J.A. Percival and G.F. West, Canadian Journal of Earth Sciences, 1994;

The Canadian System of Soil Classification (SCWG 1998);

The Ecosystems of Ontario, Part 1, Ecozones and Ecoregions, William J. Crins et al. Ministry of Natural Resources, 2009;

Precambrian geology of the Hudson Bay and James Bay lowlands region interpreted from aeromagnetic data - east sheet, G.M. Scott, Ontario Geological Survey, 2008.

Ring of Fire Baseline Environmental Monitoring Program: Preliminary Report, Ministry of Environment, Conservation, and Parks, 2019.

Permafrost, The National Atlas of Canada, 5th Edition, Department of Energy, Mines and Resources Canada, 1995.

Ontario Geological Survey, 1997. Quaternary geology, seamless coverage of the province of Ontario: Ontario Geological Survey, Data Set 14.

Barnett, P.J. et al., 2013. Surficial Geology of the Lansdowne House Area Northeast, Northern Ontario. 1:100,000. P3697.

Barnett, P.J. et al., 2013. Surficial Geology of the Lansdowne House Area Northwest, Northern Ontario. 1:100,000. P3696.

Ontario Hydro Network – Waterbodies. Land Information Ontario (LIO) Warehouse.

Ontario Wetlands: Ontario Ministry of Natural Resources.

Provincial Land Cover (2000) Database: Ontario Ministry of Natural Resources.

McFaulds Lake Project – Webequie to Esker Camp road route location: Report on mineral and organic terrain mapping in a 10 km radius around esker camp. 2010. J.D. Mollard and Associates (2010) Limited. September 23, 2010. Report No. 1675.

McFaulds Lake Project – McFaulds Lake Peat Sampling Field Trip Report. J.D. Mollard and Associates (2010) Limited. September 17, 2010.

APPENDIX B

Geotechnical Investigations Work Permits

SNC·LAVALIN

SNC-Lavalin Inc.
Environment & Geoscience
195 The West Mall
Toronto, Ontario, Canada M9C 5K1
416-252-5311

June 12, 2020

Geraldton Field Office
Ministry of Natural Resources and Forestry
208 Beamish Ave W, PO Box 640
Geraldton, ON
P0T 1M0

ATTENTION: Dave Barker, District Resources Management Supervisor

REFERENCE: **MNRF Work Permit Application for Drilling and Monitoring Well Installation in Support of the Webequie First Nation Supply Road**

Dear Mr. Barker,

This letter is provided in support of the Ministry of Natural Resources and Forestry Application for Work Permit Part 1 and Application to Do Work on Shorelands Part 3 (**Appendix A**). A borehole drilling and monitoring well installation field program is proposed to take place from approximately July 2nd – 29th, 2020 along the proposed 107km long all-season supply road which runs southeast from Webequie First Nation to the proposed Ring of Fire mining exploration and development area near McFauld's Lake (**Appendix B - Figure 1**). The field program includes:

- Borehole Drilling: The drilling program will include 16 boreholes to install monitoring wells with depths ranging from 4.5 m to 7.5 m and five (5) boreholes with a maximum depth up to 4.5 m (**Appendix B**). The holes will be drilled using the same drill rig (Simco 2400 SK-1 – **Appendix C**) used during the winter program supplied and operated by TBT drilling contractor. The rig and associated equipment will be moved from one location to another location using a Bell 407 Helicopter.

As noted, a small drill rig (Simco 2400 SK-1) for boreholes will be moved from one location to another location using a Bell 407 Helicopter. A similar program was conducted in the winter and fall of 2019 and Work Permit applications were submitted to the MNRF Nipigon District Office. For both these programs, a Work Permit was not deemed required and the attached Letter of Authority was received from Chris Magee at the MNRF Nipigon District (February 2019) and Patti Westerman (September, 2019) (**Appendix D**).

The drilling program will consist of 5 people (TBT Engineering, SNC-Lavalin, J.D. Mollard and Associates, possible a Webequie community member). It will involve the following activities:

- Approximately 16 boreholes will be drilled to install monitoring wells with depths ranging from 4.5 m to 7.5 m and five (5) boreholes with a maximum depth up to 4.5m depending on the subsurface material;

- Drilling equipment will include; Simco 2400 SK-1 Multi-purpose shallow depth drill rig, chainsaws, bucksaws, water pumps, winch
- The drill rig and all equipment will be lifted to each drill location by helicopter and placed on the 8' x 8' steel platform or rubber mat.
- A laydown area approximately 15m in radius will be required at each drill location for the helicopter landing site, drill equipment and other equipment necessary to complete the task;
- Water will be pumped from a nearby stream or lake to facilitate the drilling and for cooling the drill (approximately 400L of water is required for each 3m depth of borehole for an estimate total maximum 20,000L per day). The estimate of 20,000L per day is a maximum estimated volume and would be taken from 4-5 different unnamed watercourses/lakes/ponds over the course of one day as they move from site to site. In some cases, there will be no water pumped as the water in the holding tank will be utilized;
- Crews will be transported by helicopter from Pickle Lake to a borehole location each day;
- No work will be taking place on shorelands. All work will be conducted well away from the banks of any watercourse or lake/pond; and
- Clearing of trees and shrubs is not expected to be required to conduct the work.

The coordinates for anticipated borehole/monitoring well locations are given below. Additional details about the proposed groundwater monitoring wells along the proposed road alignment and around the potential aggregate and rock extraction areas are included in Tables 1 and 2 of **Appendix E**.

BH/MW ID	Coordinates (UTM WGS84 ZONE 16 NORTH)		Depth (m)	Rock coring
	Easting (m)	Nothing (m)		
WQR-1	477310	5867980	6.5	Yes
WQR-2A	490125	5848701	4.5	No
WQR-2B	490125	5848701	7.5	No
WQR-3	502582	5845745	6	Yes
WQR-4	537682	5848037	4.5	No
WQR-5	529620	5845132	4.5	No
WQR-6A	536549	5846366	4.5	No
WQR-6B	536549	5846366	7.7	No
WQA-1	490209	5862262	6.5	Yes
WQA-2	490625	5862495	4.5	Yes
WQA-3	489266	5857979	4.5	No
WQA-4	489242	5857550	4.5	No
WQA-5	485662	5852574	4.5	No
WQA-6	485998	5853335	4.5	No
WQA-7	488480	5847270	4.5	Yes

BH/MW ID	Coordinates (UTM WGS84 ZONE 16 NORTH)		Depth (m)	Rock coring
	Easting (m)	Nothing (m)		
WQA-8	488954	5847125	4.5	Yes
BH-TP19-2-2	490097	5862398	4.5	No
BH-TP19-2-3	490446	5862326	4.5	No
BH-TP19-9-1	489350	5858117	4.5	No
BH-TP19-10-1	485640	5853170	4.5	No
BH-TP19-10-2	485583	5852934	4.5	No

If you require any additional information please do not hesitate to contact the undersigned at 416-252-5311 x 56276 or craig.wallace@snclavalin.com.

Yours truly,

<Original signed by>

Craig Wallace, BES
Manager, Environmental Assessment and Permitting

Environment & Geoscience
Engineering, Design and Project Management

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Appendix A

Application for a Work Permit Part 1

Application to Do Work on Shorelands Part 3

Ontario

Ministry of Natural Resources and Forestry

Application for Work Permit Part 1

1. Applicant Information

Applicant (e. g., landowner, licencee, permittee, etc.) (Cannot be a subcontractor)

Last Name	First Name	Middle Initial
Fox	Michael	

Business Telephone Number	ext.	Residence Telephone Number
807 472-6147		

Mailing Address

Unit Number	Street Number	Street Name	PO Box
			268

City/Town	Province	Postal Code
Webequie First Nation	Ontario	P0T 3A0

2. Site Contractor or Person in Charge

Last Name	First Name	Middle Initial
Brooks	Angela	

Business Telephone Number	ext.	Residence Telephone Number	Radio Contact Available
416 252-5311	56258		☐ Yes ☑ No

Mailing Address

Unit Number	Street Number	Street Name	PO Box
	195	The West Mall	

City/Town	Province	Postal Code
Toronto	Ontario	M9C 5K1

3. Type of Work Proposed

Indicate and complete the appropriate additional part(s)

☐ Building Construction ☑ Work on Shorelands ☐ Work within a Waterbody ☐ Roads or Trails or Water Crossing

4. Location of Work Permit Area

Township, Municipality, Basemap No. or Lot and Concession, Location, Subdivision or Mining Claim or U.T.M. No.

Webequie First Nation and easterly for 107 km to the Ring of Fire mining area

Other (i.e. Waterbody) describe

Camp Location	Number or Workers on Site
No camps	10

5. Private Land

Private Lands of - Applicant

☐ Yes ☑ No ☐ Other (specify) _____

6. Effective Dates (s)

Start Date (yyyy/mm/dd)	Finish Date (yyyy/mm/dd)
2020/07/02	2020/07/29

7. Equipment Information

Equipment to be used (specify)

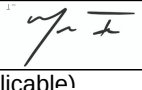
Helicopter, drill rig (see specs attached), chainsaws, bucksaws

8. Signature

Personal Information on this form is collected under the authority of Section 13 of the *Public Lands Act*, R.S.O. 1990 and Ontario Regulation 453/96 as amended and Ontario Regulation 975 as amended, and the information will be used for the purposes of the Act and Regulations. Questions about this information should be directed to the local MNRF office. MNRF office addresses and phone numbers are listed on the reverse of this form.

I/We hereby agree to rely solely upon the terms and conditions of the written work permit issued pursuant to this application. Any changes, amendments to the written work permit must be approved in writing by MNRF.

I certify the information given in this application is true.

Signature of Applicant	Position	Date (yyyy/mm/dd)
	Webequie First Nation Project Facilitator	2020/06/11
Signature of Contractor (if applicable) <Original signed by>	Position	Date (yyyy/mm/dd)
	Senior Ecologist	2020/06/11
Date Application Received in Office (yyyy/mm/dd)		

Note: The issuance of this permit does not relieve the applicant from the responsibility of acquiring any other agency, board, government, or other approvals as may be required.

If an applicant requires a copy of this application, the applicant should retain copy prior to submitting.

  Disponible en français Print Form Clear Form

A list of MNRF offices with addresses and telephone numbers.

Northwest Region

Regional Office	Address	Telephone Number
Northwest Regional Office – Thunder Bay	435 S. James St, Suite 221, P7E 6S8	807 475-1261
Atikokan	108 Saturn Avenue, P0T 1C0	807 597-6971
Dryden	479 Government Road (Hwy.17), Box 730, P8N 2Z4	807 223-3341
Fort Frances	922 Scott Street, P9A 1J4	807 274-5337
Geraldton	208 Beamish Avenue Box 640, P0T 1M0	807 854-1030
Ignace	Box 448, P0T 1T0	807 934-2233
Kenora	808 Robertson Street, Box 5080, P9N 3X9	807 468-2501
Nipigon	5 Wadsworth, Box 970, P0T 2J0	807 887-5000
Red Lake	227 Howey Street Box 5003, P0V 2M0	807 727-2253
Sioux Lookout	49 Prince Street, Box 309, P8T 1A6	807 737-1140
Thunder Bay	435 S. James St, Suite B001, P7E 6S8	807 475-1471

Northeast Region

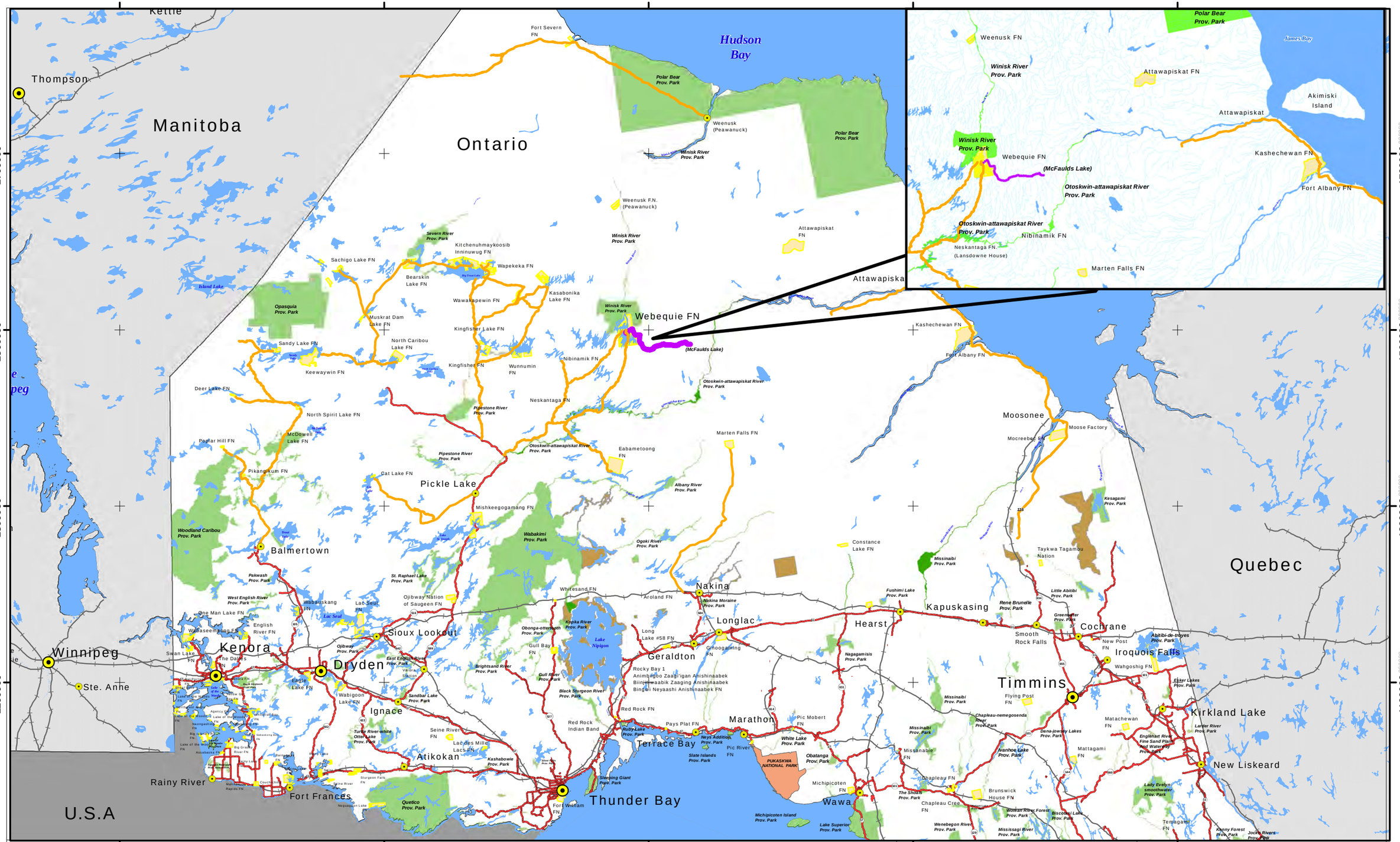
Regional Office	Address	Telephone Number
Northeast Regional Office – South Porcupine	Ontario Government Complex Hwy 101, Postal Bag 3020, PON 1HO	05-235-1157
Blind River	62 Queen Avenue, P0R 1B0	705 356-2234
Chapleau	190 Cherry Street, P0M 1K0	705 864-1710
Cochrane	Cochrane District 2-4 Hwy. 11 South, PO Box 730, P0L 1C0	705 272-4365
Hearst	613 Front Street, Box 670, P0L 1N0	705-362-4346
Kapuskasing	Hwy 11 W., Box 2, P5N 2X8	705 335-6191
Kirkland Lake	Box 910, 10 Government Rd., P2N 3K4	705 568-3222
Manitouwadge	Box 309, P0T 2C0	807 826-3225
Moosonee	Revillion Road, Box 190, P0L 1Y0	705 336-2987
North Bay	3301 Trout Lake Road, P1A 4L7	705 475-5550
Sault Ste. Marie	64 Church Street, P6A 3H3	705 949-1231
Sudbury	3767 Hwy. 69 South, Suite 5, P3G 1E7	705 564-7823
Timmins	Ontario Government Complex, Hwy 101 East, Postal Bag 3090 South Porcupine, P0N 1H0	705 235-1300
Wawa	48 Mission Road, Box 1160, P0S 1K0	705 856-2396

Southern Region

Regional Office	Address	Telephone Number
Southern Regional Office – Peterborough	300 Water Street, 4th Floor, South Tower, K9J 3C7	705-755-2001
Aurora, Greater Toronto Area (GTA)	50 Bloomington Road, L4G 0L8	905 713-7400
Aylmer	615 John Street North, N5H 2S8	519 773-9241
Bancroft	106 Monck Street Box 500, K0L 1C0	613 332-3940
Bracebridge	1350 High Falls Road, P1L 1W9	705 645-8747
Guelph	1 Stone Road West, N1G 4Y2	519 826-4955
Kemptville	10 Campus Road, Postal Bag 2002, Concession Road, K0G 1J0	613 258-8204
Kingston	Ontario Government Building, Beachgrove Complex 51 Heakes Lane, K7M 9B1	613 531-5700
Midhurst (Huronia)	2284 Nursery Road, L0L 1X0	705 725-7500
Minden	Hwy. 35 By-pass, Box 820, K0M 2K0	705 286-1521
Niagara	Box 5000, 4890 Victoria Avenue North, L0R 2E0	905 562-4147
Owen Sound	1450 7th Ave. East, N4K 2Z1	519 376-3860
Parry Sound	7 Bay Street, P2A 1S4	705 746-4201
Pembroke	31 Riverside Drive, K8A 8R6	613 732-3661
Peterborough	300 Water Street, 1st Floor South Tower, K9J 3C7	705 755-2001

Appendix B

Figures 1 to 7



Document Path: I:\E&W\Projects\661910 - Webequie First Nation Supply Rd\40_Execution\45_GIS_Dwgs\MXD\ProjectDescription\20190704_661910_WebequieFN_ProjectLocation_Fig4.1.mxd

An overview map showing the location of prospects to be tested is shown in Figure 3. Proposed borehole locations within each of the prospect areas listed above are shown in Figures 4 to 7.

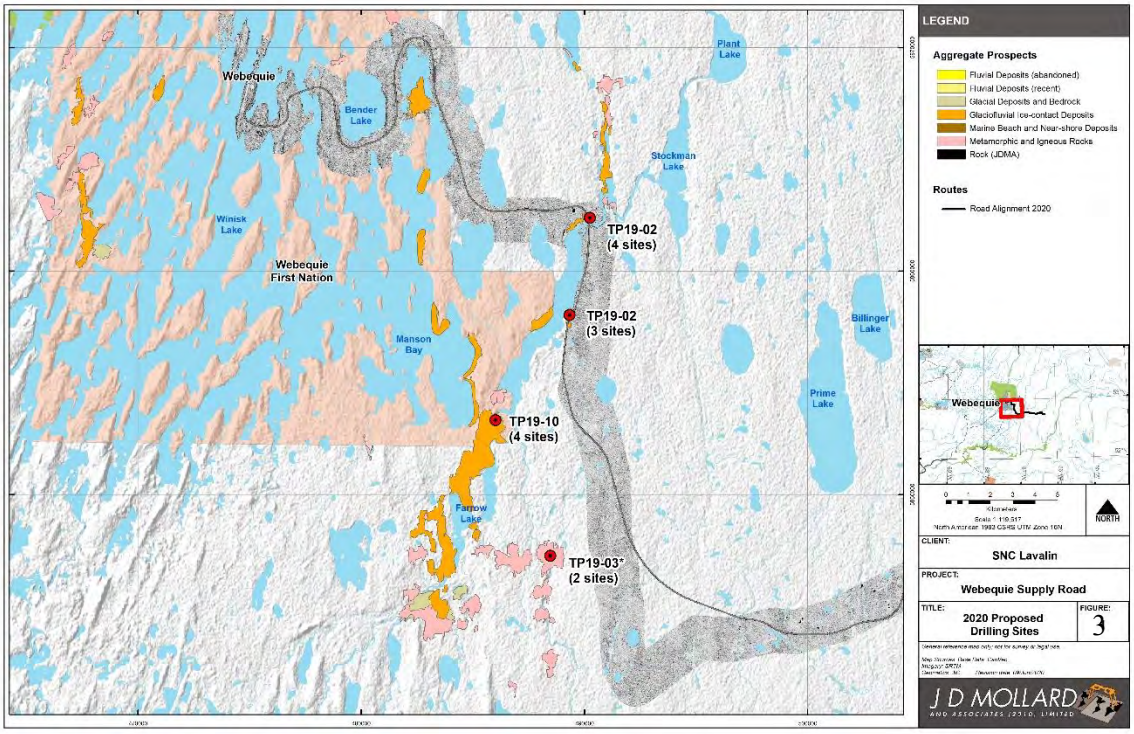


Figure 3: Overview map showing prospect areas to be tested in July 2020.

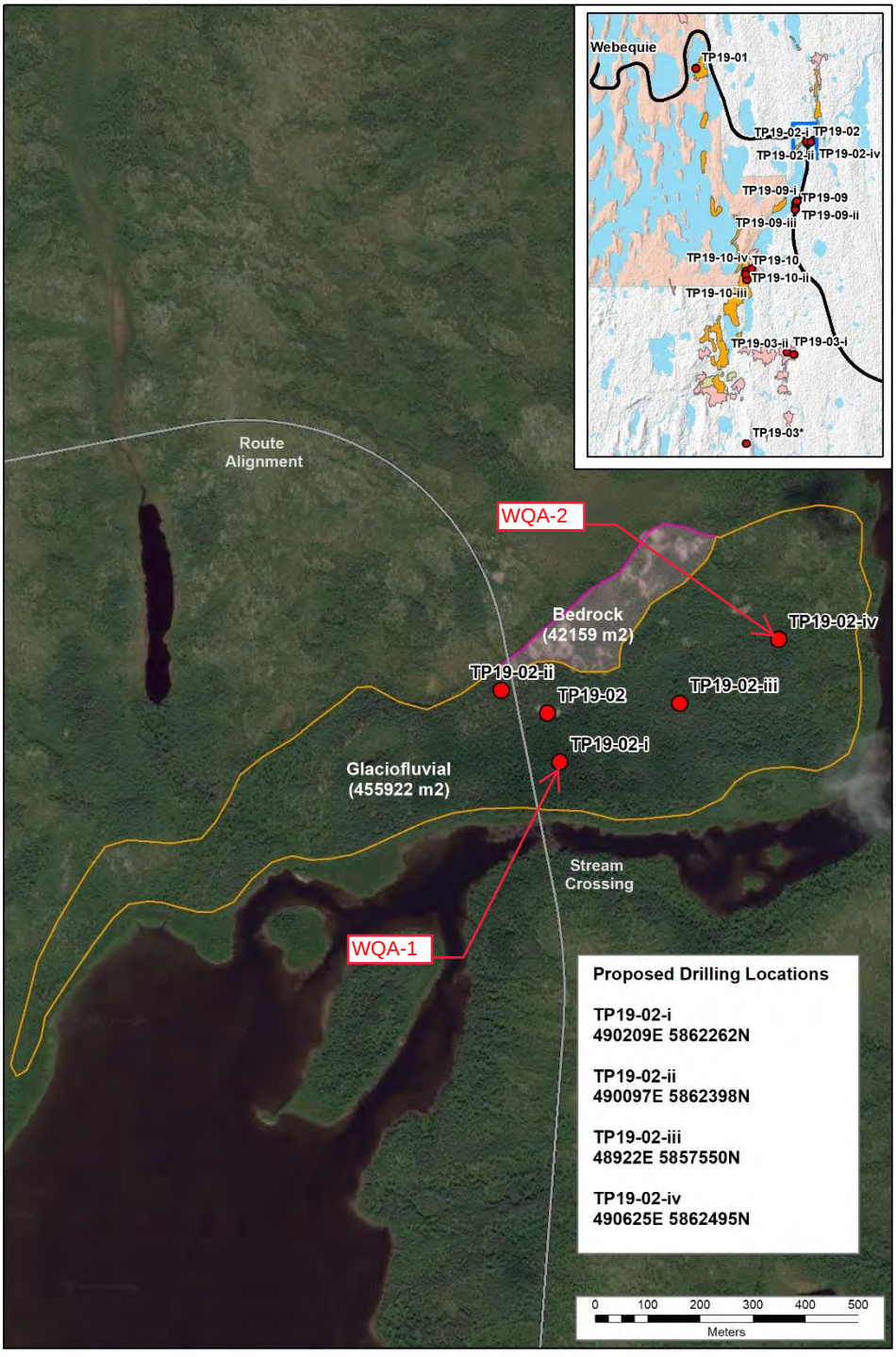


Figure 4: Proposed borehole locations within prospect area TP19-02.

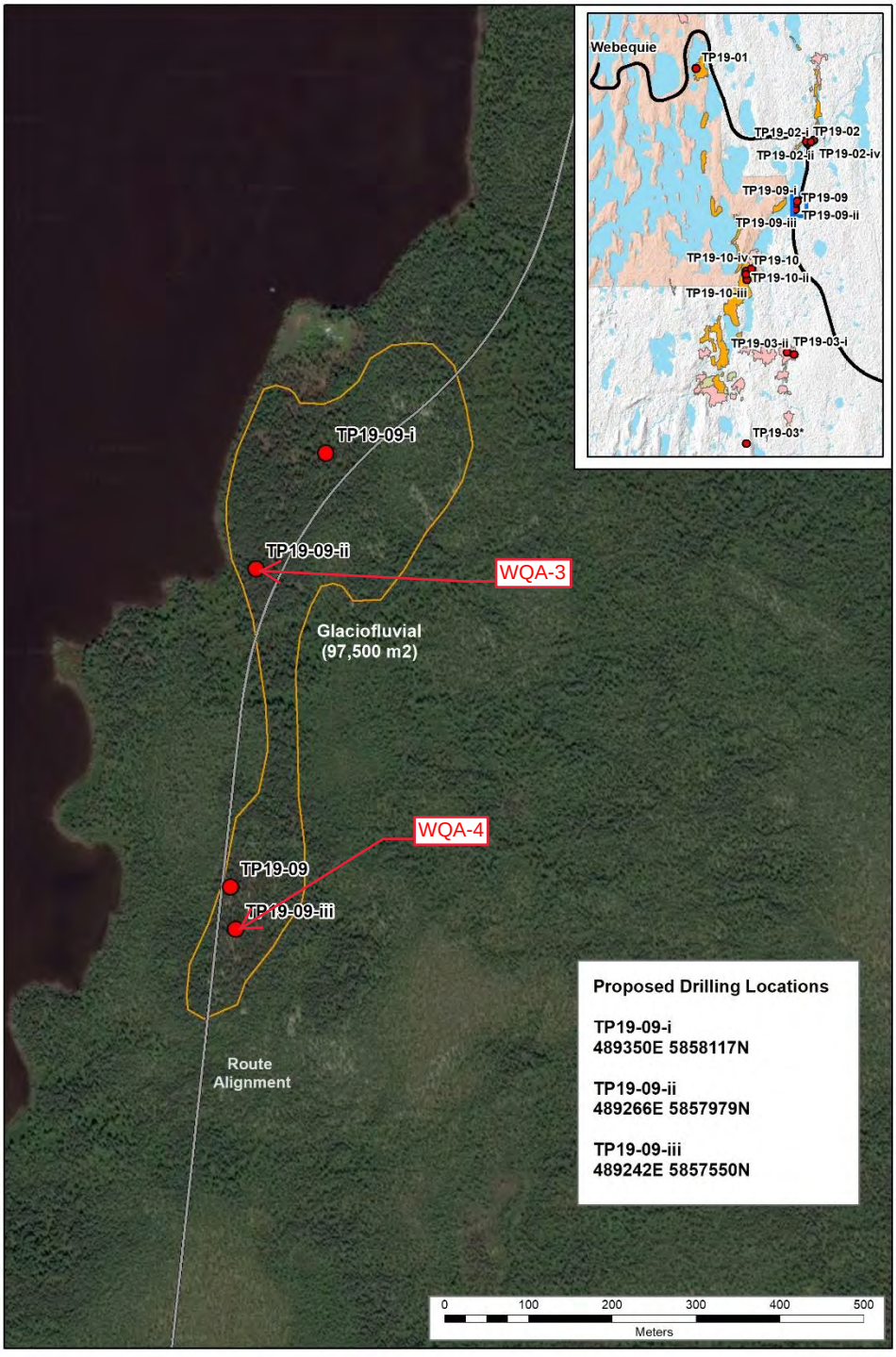


Figure 5: Proposed borehole locations within prospect area TP19-09

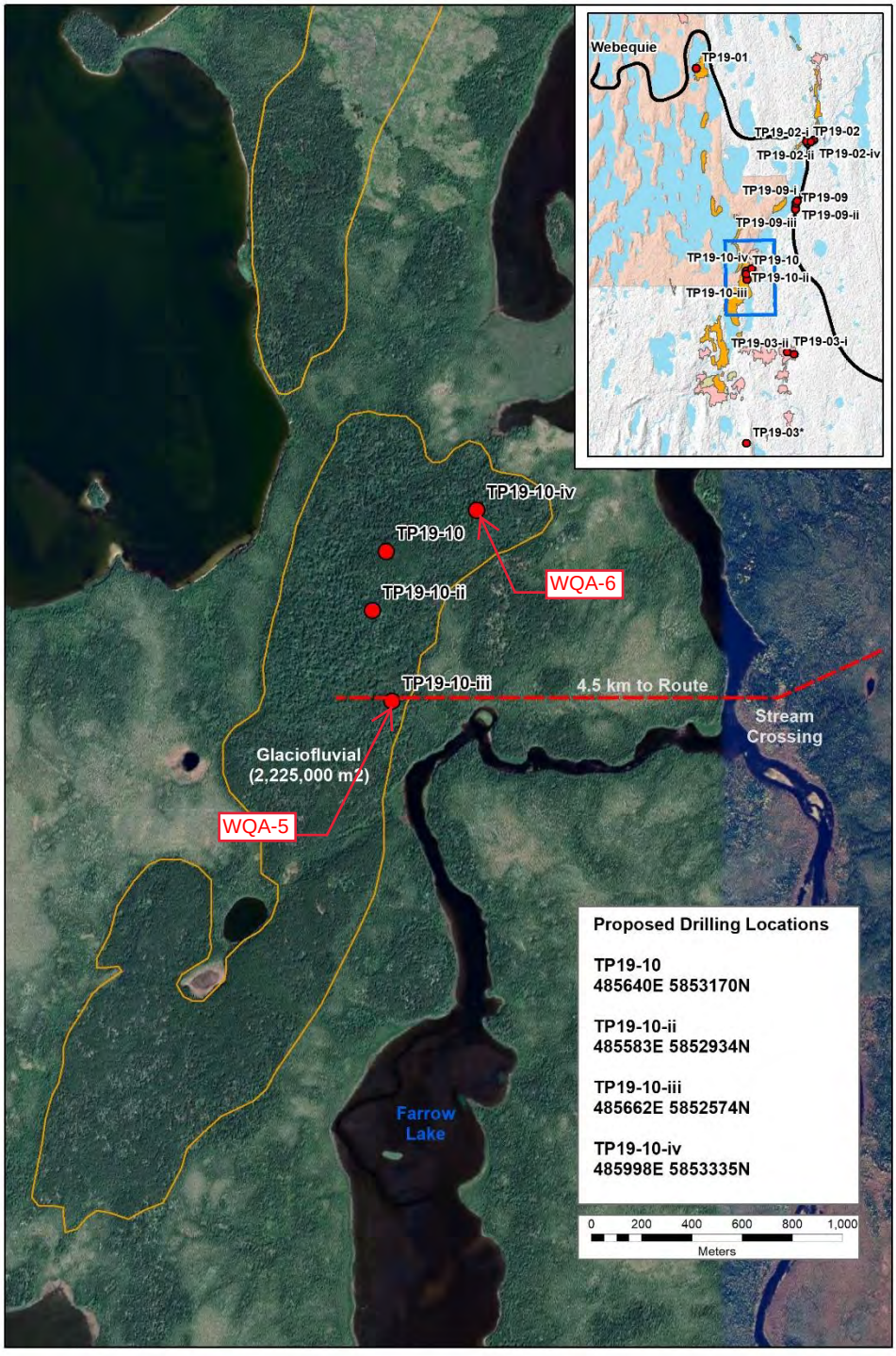


Figure 6: Proposed borehole locations within prospect area TP19-10

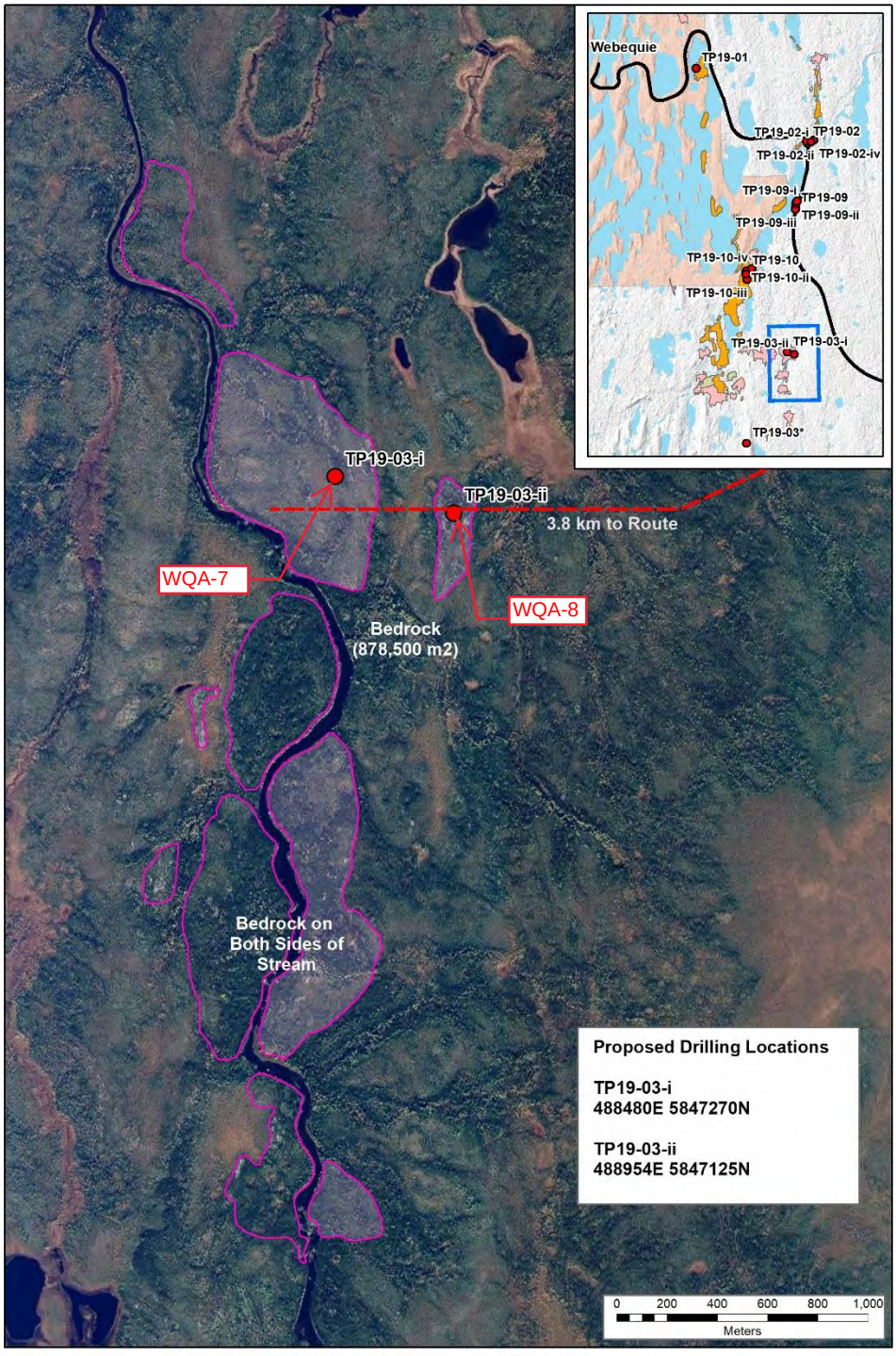
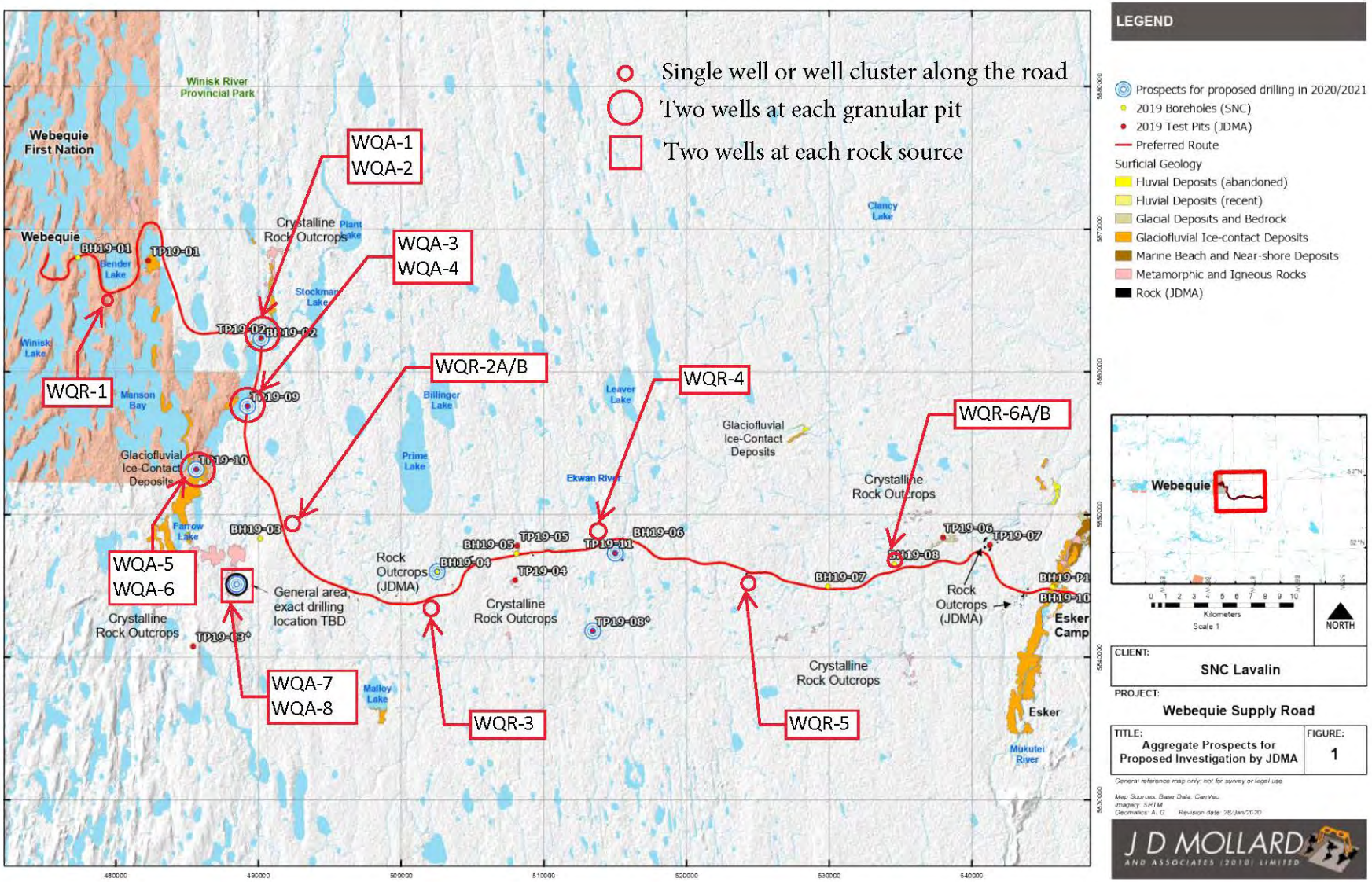


Figure 7: Proposed borehole locations within TP19-03



LEGEND

- Prospects for proposed drilling in 2020/2021
- 2019 Boreholes (SNC)
- 2019 Test Pits (JDMA)
- Preferred Route

Surficial Geology

- Fluvial Deposits (abandoned)
- Fluvial Deposits (recent)
- Glacial Deposits and Bedrock
- Glaciofluvial Ice-contact Deposits
- Marine Beach and Near-shore Deposits
- Metamorphic and Igneous Rocks
- Rock (JDMA)

CLIENT: SNC Lavalin

PROJECT: Webequie Supply Road

TITLE: Aggregate Prospects for Proposed Investigation by JDMA

FIGURE: 1

General reference map only; not for survey or legal use.

Map Sources: Base Data: GeoVec
Imagery: SRTM
Geomatics: ALG Revision date: 28/Jan/2020

J D MOLLARD AND ASSOCIATES (2010) LIMITED

Appendix C

Drill Rig Specifications

2400 SK-1

MULTI-PURPOSE SHALLOW DEPTH DRILL RIG

- 2-SPEED DRILLHEAD
  (2,400 ft. lbs. / 90 rpm)
  (1,200 ft. lbs. / 180 rpm)
- 6' OR 10' STROKE MASTS AVAILABLE
(pullback/pushdown 7,600 lbs 45 fpm. max.)

OPTIONS

- CATHEAD
- WINCH (2550 max. cap. 190 fpm)
- WATER PUMPS
- LONG STROKE MAST
- RUBBER TRACK CARRIER
- HIGH SPEED CORING DRILLHEAD
  (240 ft. lbs./905 rpm)

Field proven reliability backed by over 40 years of experience.

SIMCO DRILLING EQUIPMENT, INC.

P.O. BOX 448 - 802 FURNAS DRIVE

OSCEOLA, IA 50213

PHONE: 1-800-338-9925 - FAX: (641) 342-6764

www.simcodrill.com

2400 SK-1

SPECIFICATIONS

STANDARD RIG

Engine – Deutz Diesel – 3 cylinder F3L1011

Continuous HP @ 2800 RPM	40 HP
Fuel Consumption – Full Load	2.3 GPH
Fuel Tank Capacity	10 gal.

Topheads – Max. Torque & Max. Rotation Speed

Standard -

Two Speed – (Standard)	2,400/1,200 ft. lbs./ 90/180 RPM
High Speed -	195 ft. lbs./915 RPM
Feed Rate -	0 – 45 FPM
Pull up/Pull down	7600 lbs.

Mast – For drilling with 5' Tools Drillhead

Travel – Net Stroke	74 in.
Hydraulic Foot Stabilizer	8 in.
Reservoir Capacity	32 Gal.
Minimum Height (Mast Vertical)	121 in.

Hydraulic System

Main Pump (rotation)	20 GPM
Aux. Pump (feed)	10 GPM
Relief Valve Settings	2500/2000 PSI
Hydraulic Oil Cooler	20,000 BTU/Hr.

Weights

Base Rig (Including Oil)	2,450 lbs.
Cathead with Mast Extension	170 lbs.
Winch	135 lbs.

Dimensions

Overall Width	48 in.
Overall Height-	
Mast Lowered	52 in.
Mast Raised	122 in.
With Extension	187 in.

OPTIONS & ACCESSORIES

Cathead (5.75" Dia.) with extension

Capacity	2150 lbs.
Max. Drum Speed	275 RPM
Rope 30' of ¾" manila	

Hoisting Winch - Hydraulic

Capacity	1800 lbs.
Bare Drum Line Speed	195 FPM
Includes 50' of 5/16" cable	

Hydraulic Slide Base

Travel (In/Out)	16 in.

Long Stroke Mast (No extension)

Drillhead Travel – Net Stroke	135 in.

Pump (Water or Grout)

3L6 Moyno Progressing Cavity 0-31 GPM, 225 PSI
(Other Sizes Available)

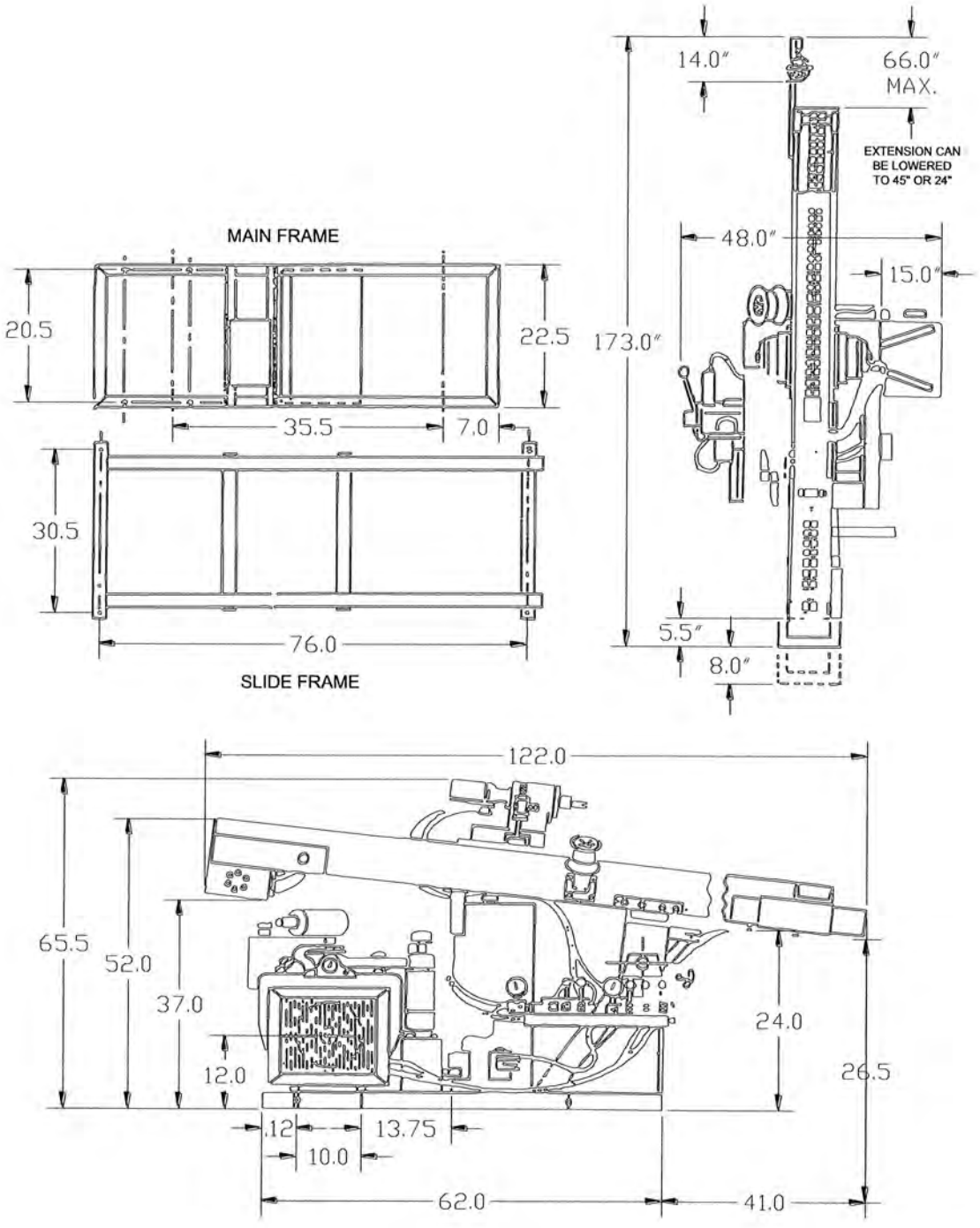
GENERAL DRILLING CAPACITIES - In typical soil conditions. Capacity will vary with drilling conditions and style of tophead.

Conventional Flight Auger	5" dia., 60-100' 10" dia., 20-35'
Hollow Stem Augers	3-¼" ID. 30-40' 6-¼" ID. 15-20'
Core	AWX (1-⅞") dia., 100-250' NWX (3") dia., 50-150'

Specifications are based on engineering calculations and are subject to change without notice.

SIMCO Drilling Equipment, Inc.
802 Furnas Dr., P.O. Box 448
Osceola, IA 50213
(641) 342-2166 (800) 338-9925
FAX: 641-342-6764
www.simcodrill.com

2400 SK-1



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Osceola, IA 50213
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FAX: 641-342-6764
www.simcodrill.com

FEATURES AND OPTIONS

SIMCO MODEL 2400 SK-1 – BASE UNIT (Includes items A-H)

A. Two Speed High Torque Top-head – Provides increased drilling efficiency and better borehole clean out when auger drilling. Shifting of speed and torque ranges is done hydraulically. Output spindle is 1 ⅝" hex pin. (2,400 ft.lbs./180 RPM)

B. Mast – 72" Stroke with hydraulic foot

C. Triple Hydraulic Pumps – Three 10 GPM gear pumps provide hydraulic oil to power all functions. Separate circuits allow for independent operation of the feed and rotary functions. The output from two pump sections is combined to provide 20 GPM to power the rotary/auger drill head. All pump circuits have separate pressure gauges, relief valves and are filtered. A 32 gallon hydraulic reservoir and a separate hydraulic oil cooler are standard along with clearly marked side facing control valves that allow for clear view of all drilling and probing operations.

D. Universal Joint – A heavy duty 1-5/8" to 1-5/8" hex u-joint connects the rotary top-head spindle to the augers.

E. Auger Guides – Hinged, clam shell style. The I.D. of the guides is sized to be slightly larger than the O.D. of the auger. State auger size.
A.For up to 7" OD Augers
B.For greater than 7" OD augers

F. Hydraulic Slide Base - In/Out, Hydraulically operated slide base provides up to 16" of total travel. Helps position unit in and out of truck and provides better weight distribution during transit.

G. Hydraulic control valves – over/under style with flow control valve. An adjustable flow control valve provides infinite down-feed rate control of the rotary top-head or percussion tool. This provides precise control when drilling in hard materials.

H. Power Unit – Deutz F3L1011, 40 H.P. @ 2800 RPM air cooled diesel engine with 12 V electric key start. Includes throttle control, engine gauges and emergency shut-down switches. Also includes separate hydraulic oil cooler with thermostatically controlled fan and a 15 gallon fuel tank.

OPTIONS

1. Hoisting Winch – Mast mounted hoisting winch has bare drum line speed of 150 FPM, 1800 lbs. capacity. Winch is hydraulically powered and includes 50' of 5/16" wire rope and safety hook. This option requires mast extension with crown sheaves.

2. Cathead Hoist - Mast mounted, hydraulically powered, 275 RPM maximum speed, 1600 lbs. capacity, and a 5 ¾" diameter drum. Includes sheave wheel and 30' of ¾" manila rope. Requires use of mast extension.

3. Mast Extension – A rectangular tube extension allows for pulling 10' sections of tools or handling safety hammer. Extension height is adjustable with a maximum of four different positions approximately 21 inches apart.

4. Long Stroke Mast – Welded structural steel, rectangular formed section, single piece mast. Provides 135" of net stroke with hydraulic motor driven #60 double roller chains. Includes hydraulic foot with 8" of stroke, mast travel rest, crown sheave, and/or snatch block hook point. Sideways pilot feature not available.

5. Auger Guides – Hinged, clam shell style. The I.D. of the guides is sized to be slightly larger than the O.D. of the auger. State auger size.
   A. For up to 7" O.D. augers
   B. For 7" and larger O.D. augers.

6. Progressing Cavity Water/Grout Pump – Integral to drill rig hydraulic system. Includes pump speed controls, gauges, and pressure relief, suction and discharge hoses with foot valve or strainer.
    A. 3L6 style o-30 GPM, 0-225 PSI

7. Side Feed Water Swivel – For use when coring or drilling with wet rotary type tools. Standard connection is 1 ⅛" hex pin to AW box.

8. High Speed Coring Tophead - High speed head for use when core or rotary drilling with a maximum spindle speed of 915 RPM, 195 ft.lbs. of torque, 1 ⅛" hex spindle, driven by a single hydraulic motor with double chain sprocket coupling. Includes quick disconnect hydraulic fittings for switching from auger head to coring head, bit pressure and rotary speed control valves.

9. 3800 Trailer
   11,000 lb. GVW, tandem axle trailer, Includes 2-5/16" ball hitch, electric brakes, 12" x 10" x 72" tool box, tool racks, lights, and three hydraulic leveling jacks. Includes safety breakaway brake system. Trailer weight is approx. 2225 lbs.

10. Skid with Towing Winch - Rugged, all steel skid is specially designed for use in hard to access locations. Skid is 19" high with 15" of ground clearance. The two 4" wide rails provide a 48" x 92" base. Skid is available with an 8000 lb. hydraulic tramming winch and is equipped with cable roller guides for towing in either direction. Four lifting eyes are also included.

Appendix D

Letters of Authority

stry of Natural Resources
restry

gon District

5 Wadsworth Dr.
Nipigon ON P0T 2J0
Tel.: 807 887-5000
Fax.: 807 887-2993

Ministère des Richesses
Naturelles et des Forêts

District de Nipigon

5 Wadsworth Dr.
Nipigon ON P0T 2J0
Tél. : 807 887-5000
Téléc. : 807 887-2993

Ontario

September 23, 2019

SNC-Lavalin Inc
Environment and Geoscience
195 The West Mall
Toronto, Ontario
M9C 5K1

Attention: Angela Brooks, Senior Ecologist

Subject: Letter of Authority to Undertake Geotechnical Work

This Letter of Authority granted pursuant to Section 27.1 of the Public Lands Act provides SNC Lavalin Inc, its agents and contractors the authority to proceed with geotechnical testing on Crown land as per the proposal to the Ministry of Natural Resources and Forestry dated September 6, 2019.

The following conditions apply to the authorized activities:

1. This letter of authority is effective from September 20, 2019 to October 30, 2019.
2. Work shall be carried out according to the application submitted (appended hereto as Schedule A), and in accordance with this Letter of Authority. Any changes in design or location will require an amendment to the Letter of Authority.
3. This approval includes only the work proposed on provincial Crown lands. It is the responsibility of the permittee to gain legal access over or through any private lands, lands held by other Ministries or Federal lands.
4. The Permittee shall comply with all applicable laws, regulations, by-laws, government orders and directions in its use of the described lands.
5. The Permittee shall be solely responsible for obtaining any other necessary permits, licenses and approvals relating to the use of the described lands by the Permittee.
6. The approved work does not include road, trail or water crossing construction or upgrades.
7. This authorization shall not be construed as approval to carry out work on shorelands or in waterbodies.
8. Sites are always to be kept in a clean and tidy condition.
9. Appropriate safely warnings/fences shall be installed in the project area as required.
10. The permittee will not disturb or interfere with authorized uses of public lands by other persons except with prior approval of a Public Lands Officer.
11. This letter does not convey and right, title or interest in the land.
12. The permittee must provide the contractor and/ equipment operator with a copy of this Letter of Authority, including all conditions. It is KGS Group's responsibility to ensure that all conditions are followed.
13. Appropriate, and effective, erosion and control measures shall be proactively implemented as required.

14. Should species at risk be encountered work must cease immediately and the district office must be contacted as authorization may be required.

An officer appointed under the Public Lands Act may conduct inspections of the work being done to ensure compliance of the conditions listed in this Letter of Authority. The Ministry of Natural Resources and Forestry retains the right to alter or stop immediately the proposed or on-going operations should they be considered detrimental in any way to the environment or public interest.

Authorized by:

<Original signed by>

Patti Westerman
Resource Management Supervisor
Nipigon District

Ontario

Nipigon District
Ontario Government Building
5 Wadsworth Drive, PO Box 970
Nipigon ON P0T 2J0

Ministry of
Natural Resources and Forestry

Ministère des
Richesses Naturelles et des Forêts

Tel: (807) 887-5000
Fax: (807) 887-2993

February 14, 2019

SNC-Lavalin Inc
Environment and Geoscience
195 The West Mall
Toronto, Ontario
M9C 5K1

Attention Angela Brooks, Senior Ecologist

Subject: Letter of Authority to Undertake Geotechnical Work

This Letter of Authority, granted pursuant to Section 27.1 of the Public Lands Act provides SNC Lavalin Inc, its agents and contractors the authority to proceed with geotechnical testing on Crown land as per the proposal to the Ministry of Natural Resources and Forestry dated January 24, 2019.

The following conditions apply to the authorized activities:

1. This letter of authority is effective from February 15, 2019 to February 30, 2019.
2. The activities shall be performed in accordance with the MNRF Work Permit Application (appended hereto as Schedule A) submitted by SNC Lavalin at the locations specified in the application.
3. This letter does not convey and right, title or interest in the land.
4. The permittee must provide the contractor and/ equipment operator with a copy of this Letter of Authority, including all conditions. It is the permittees responsibility to ensure that all conditions are followed.
5. All domestic and industrial wastes (e.g. oils, cables, scrap metals, oil fitters, etc.) must be property disposed of in accordance with the requirements of the Environmental Protection Act and/or the Public Lands Act.
6. The permittee is responsible to report any spill of any material harmful to the environment (e.g. fuel, fluids, silt. etc.) immediately to the Ministry of Environment and Climate Change Spills Action Centre at 1-800-288-8080. This service operates 24 hours a day 365 day a year (Part 9, Chapter 141, Environmental Protection Ad. RS.0.1990).
7. Work shall be carried out according to the application submitted and in accordance with this letter of Authority. Any changes in design or location will require authorization from the Ministry of Natural Resources and Forestry.

8. The approved work does not include road, trail or water crossing construction or upgrades. A work permit Is required to undertake road or trail construction or upgrades.
9. No debris, rocks, soils trees, or any other deleterious substances as defined in the Canada Fisheries Act are to be deposited or allowed to enter or re-enter any water body (Canada Fisheries Act and Lakes and Rivers Improvement Act).
10. Appropriate, and effective, erosion and control measures shall be proactively implemented as required.
11. Sites are to be kept in a clean and tidy condition at all times.
12. Appropriate safely warnings/fences shall be installed in the project area as required.
13. The permittee will not disturb or interfere with authorized uses of public lands by other persons except with prior approval of a Public Lands Officer.
14. This authorization shall not be construed as approval to carry out work on shorelands or in waterbodies.
15. This approval includes only the work proposed on unoccupied Crown lands and does not include locations on private lands, or lands under existing Public Lands Act tenure, Federal lands and lands where consent from existing mining claim holders have not been obtained.
16. Should species at risk be encountered work must cease immediately and the district office must be contacted as authorization may be required.

An officer appointed under the Public Lands Act may conduct inspections of the work being done to ensure compliance of the conditions listed in this Letter of Authority. The Ministry of Natural Resources and Forestry retains the right to alter or stop immediately the proposed or on-going operations should they be considered detrimental in any way to the environment or public interest.

Authorized by:
<Original signed by>

Chris Magee
District Manager
Nipigon District

Appendix E

Tables 1 and 2

Table 1: Proposed Groundwater Monitoring Wells - along the Proposed Road Alignment

Well ID	Depth (m bgs)	Screen (m bgs)	Strata	Location	Geotechnical Investigation (m bgs)	Water Level (m bgs)	Notes
Along Road Alignment							
WQR-1	6.5	3.5 to 6.5	Bedrock	Near BH19-01	BH19-01: Silt and sand till to 2.1 m Granite 2.1 to 4.9 m, slightly weathered	0.3	Overburden is too shallow to install a well. The well needs to be completed installed and sealed in bedrock.
WQR-2A	4.5	1.5 to 4.5	Overburden	NE of BH19-03, north of the alignment	Organic to 0.6 m Silt and sand till 0.6 to 2.6 m Sandy silt till 2.6 to 8.1 m	1.67	Well cluster (within 2 m) to test vertical hydraulic gradient.
WQR-2B	7.5	4.5 to 7.5	Overburden				
WQR-3	6.0	3.0 to 6.0	Bedrock	Near BH19-04	BH19-04: Organic to 0.5 m Sand and gravel till 0.5 to 1.4 m Granite 1.4 to 5.8 m, good quality	0.3	Slightly fractured
WQR-4	4.5	1.5 to 4.5	Overburden	Near TP19-06	BH19-06: Organic to 0.6 m Sandy silt to silty sand till 0.6 to 15.3 m	0.46	
WQR-5	4.5	1.5 to 4.5	Overburden	Between BH19-06 and BH19-07	Organic to 0.6 m Sandy silt and clay till 0.6 to 4.1 m Sand and gravel till 4.1 to 5.5 m	1.22	
WQR-6A	4.5	1.5 to 4.5	Overburden	Near BH19-08, south of the alignment	Organic to 0.5 m Silty Sand 0.5 to 3.0 m Silt and Sand till 3.0 to 9.1 m Clayey sandy silt 9.1 to 15.2 m	1.5	Well cluster (within 2 m) to test vertical hydraulic gradient.
WQR-6B	7.5	4.5 to 5.5	Overburden				

Table 2: Proposed Groundwater Monitoring Wells - around the Potential Aggregate and Rock Extraction Areas

Well ID	Depth (m bgs)	Screen (m bgs)	Strata	Location	Previous Geotechnical Investigation (m bgs)	Proposed BH/TP Locations	Coordinates
Aggregate and Quarry Sites							
WQA-1	6.5	3.5 to 6.5	Bedrock	Near TP19-02 and BH19-02	Same as BH19-02	TP19-02-i	490209E, 5862262N
WQA-2	6.5	3.5 to 6.5	Bedrock			TP19-02-iv	490625E, 5862495N
WQA-3	4.5	1.5 to 4.5	Overburden	Near TP19-09	Assumed to be same as BH19-03	TP19-09-ii	489266E, 5857979N
WQA-4	4.5	1.5 to 4.5	Overburden			TP19-09-iii	489242E, 5857550N
WQA-5	4.5	1.5 to 4.5	Overburden	Near TP19-10	Assumed to be same as BH19-03	TP19-10-iii	485662E, 5852574N
WQA-6	4.5	1.5 to 4.5	Overburden			TP19-10-iv	485998E, 5853335N
WQA-7	4.5	1.5 to 4.5	Bedrock	Between TP19-03 and BH19-03		TP19-03-i	488480E, 5847270N
WQA-8	4.5	1.5 to 4.5	Bedrock			TP19-03-ii	488954E, 5847125N