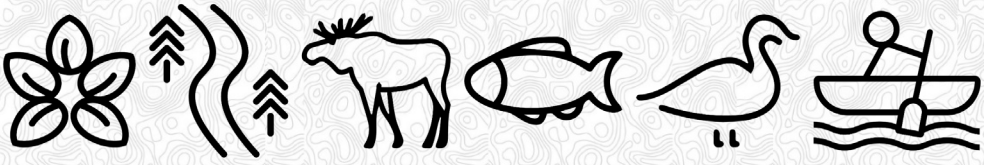
MARTEN FALLS FIRST NATION
ALL SEASON COMMUNITY ACCESS ROAD

FINAL

Groundwater and Geochemistry Study Plan

May 2021



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Revision History

Rev #	Date	Revision Description
Draft	May 2020	Submitted “Study Plan –Groundwater DRAFT FOR DISCUSSION” to the Agency
Final	May 2021	Revised to address federal and provincial agency comments

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Authors

Report Prepared By:

<Original Signed By>

Stephen Dickin, P.Geo.
Hydrogeologist
AECOM Canada Ltd.

<Original Signed By>

Mehrnoush Javadi, Ph.D.
Hydrogeologist / Geochemist
AECOM Canada Ltd.

Report Reviewed By:

<Original Signed By>

Matthew Bowman, B.Sc., P.Geo.
Hydrogeologist
Golder Associates Ltd.

<Original Signed By>

John Piersol, M.Sc., P.Geo.
Associate, Hydrogeologist-
Golder Associates Ltd.

<Original Signed By>

David Brown, P.Geo. ON, NL
Principal, Mine Water and Environment
Golder Associates Ltd.

<Original Signed By>

Leah Deveaux, BES, MCIP,RPP
Senior Environmental Planner
AECOM Canada Ltd.

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Acronyms

AECOM..... AECOM Canada Ltd.
Agency, the ... Impact Assessment Agency of Canada
CALA ..... Canadian Association for Laboratory Accreditation
CAR ..... Community Access Road
CCME ..... Canadian Council of Ministries of the Environment
CDWQG..... Canadian Drinking Water Quality Guidelines
EA ..... Environmental Assessment
EASR ..... Environmental Activity and Sector Registry
IA ..... Impact Assessment
IAA ..... *Impact Assessment Act*
ICA..... Issue Contributing Area
IS ..... Impact Statement
K ..... Hydraulic Conductivity
km ..... kilometre
LSA ..... Local Study Area
MECP ..... Ontario Ministry of the Environment, Conservation and Parks
MFFN..... Marten Falls First Nation
O.Reg.903..... R.R.O. 1990, Ontario Regulation 903 “Wells”, as amended
ODWQS ..... Ontario Drinking Water Quality Standards
OGS..... Ontario Geological Survey
PDA ..... Project Development Area
PTTW..... Permit To Take Water
PWQO..... Provincial Water Quality Objectives
PZ ..... Piezometer
ROW ..... Right-of-way
RSA ..... Regional Study Area
SAR ..... Species at Risk
SGRA..... Significant Groundwater Recharge Area
SWRT ..... Single Well Response Test
TISG ..... Tailored Impact Statement Guidelines
ToR..... Terms of Reference
VC..... Valued Component
WWIS..... Water Well Information System

1. Introduction

The Proponent of the Community Access Road (CAR or the Project) is Marten Falls First Nation (MFFN), a remote First Nation community in northern Ontario located at the junction of the Albany and Ogoki rivers, approximately 430 kilometres (km) from Thunder Bay, Ontario. The MFFN community is proposing an all-season Community Access Road that will connect the MFFN community to Ontario's provincial highway network (Highway 643) to the south via the existing Painter Lake Road. MFFN, as the Proponent of the Project, has formed a MFFN CAR Project Team that includes MFFN CAR Community Member Advisors and MFFN CAR Project Consultants who act with input, guidance and direction from the MFFN Chief and Council.

This document outlines the study plan for the Groundwater and Geochemistry discipline to support a co-ordinated Impact Assessment (IA) required for Project review by the Impact Assessment Agency of Canada (the Agency) under the federal *Impact Assessment Act* (IAA) and Environmental Assessment (EA) required for Project review by the Ontario Ministry of the Environment, Conservation and Parks (MECP) under the Ontario *Environmental Assessment Act*.

1.1 Federal and Provincial Terminology

The study plans have been prepared using federal terminology, however, the respective provincial terminology has been provided in **Table 1-1** for reference. The terms can be used interchangeably.

Table 1-1: Equivalent Federal and Provincial Terms

Provincial Term	Federal Term
Criteria	Valued Component
Impact Management Measure	Mitigation Measure
Net Effects	Residual Effects
Record of Consultation	Record of Engagement

1.2 Project Study Plans

This Study Plan is one of a group of study plans created for the Project. **Table 1-2** includes the study plans for each environmental[1] discipline currently planned for the Project and the valued components (VCs) covered by the study plans where applicable.

Table 1-2: Project Study Plans and Valued Components

Environmental Discipline	Study Plan Name	Valued Component(s)
Aboriginal and Treaty Rights and Interests	■ Aboriginal and Treaty Rights and Interests Study Plan	■ Indigenous Current Use of Lands and Resources for Traditional Purposes ■ Cultural Continuity (ability to practice and transmit cultural traditions)
Atmospheric Environment	■ Atmospheric Environment and Greenhouse Gases Study Plan	■ Air Quality ■ Greenhouse Gas Emissions
Climate Change	■ Climate Adaptation and Resiliency Study Plan	■ Climate Change
Acoustic and Vibration Environment	■ Acoustic and Vibration Environment Study Plan	■ Noise ■ Vibration
Physiography, Geology, Terrain and Soils	■ Physiography, Terrain and Soils Study Plan	■ Physiography, Terrain and Soils
Surface Water	■ Surface Water Study Plan	■ Surface Water
Groundwater and Geochemistry	■ Groundwater and Geochemistry Study Plan	■ Groundwater
Vegetation	■ Vegetation Study Plan	■ Wetland and Riparian Ecosystems ■ Upland Ecosystems ■ Designated Areas (Areas of Natural and Scientific Interest, Environmentally Significant Areas, Significant Woodlands, Critical Landform / Vegetation Associations) ■ Traditional Use Plants and SAR Plant Populations (including species with special conservation status or rarity in the province)
	■ Peatlands Study Plan	■ Peatland Ecosystems (bogs and fens)
Wildlife	■ Wildlife Study Plan	■ Bats (including SAR-bats such as: Little Brown Myotis [*Myotis lucifugus*], Northern Myotis [*Myotis septentrionalis*] and Tricolored Bat [*Perimyotis subflavus*])

1. *The use of the term environment in this document is inclusive of the components of the environment that are included in the Ontario Environmental Assessment Act definition, which includes a general description of the social, cultural, built and natural environments.*

Environmental Discipline	Study Plan Name	Valued Component(s)
		■ Fur Bearers (proxy VC[2] American Marten [*Martes americana*], Beaver [*Castor canadensis*] and Wolverine [*Gulo gulo*]) ■ Amphibians and Reptiles ■ Pollinating Insects
	■ Ungulates (Moose and Caribou) Study Plan	■ Moose (*Alces alces*) ■ Caribou, boreal population (*Rangifer tarandus*)
	■ Bird Study Plan	■ Forest Birds (proxy VC of Red-eyed Vireo [*Vireo olivaceus*] for deciduous forest, Ovenbird [*Seirus aurocapilla*] for mixedwood forest, Dark-eyed Junco [*Junco hyemalis*] for coniferous forest and disturbed forest ■ Raptors (proxy VC of Osprey [*Pandion haliaetus*] for diurnal raptors and Boreal Owl [*Aegolius funereus*] for nocturnal raptors ■ Shorebirds (proxy VC of Wilson's Snipe [*Gallingo delicata*]) ■ Waterfowl (proxy VC of Mallard [*Anas platyrhynchos*]) ■ Bog / Fen Birds and Other Wetland Birds (proxy VC of Palm Warbler [*Setophaga palmarum*] for bogs, Common Yellowthroat [*Geothlypis trichas*] for fens; and Northern Waterthrush [*Parkesia noveboracensis*] for swamps . ■ SAR birds: Canada Warbler (*Cardellina canadensis*), Chimney Swift (*Chaetura pelagica*), Common Nighthawk (*Chordeiles minor*), Eastern Whip-poor-will (*Antrostomus vociferous*), Eastern Wood-Pewee (*Contopus virens*), Evening Grosbeak (*Coccothraustes vespertinus*), Olive-sided Flycatcher (*Contopus cooperi*), Bald Eagle (*Haliaeetus leucocephalus)*, Peregrine Falcon (*Falco peregrinus*), Short-eared Owl (*Asio flammeus)*, Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Black Tern (*Childonias niger*), Rusty Blackbird (*Euphagus carolinus*), Yellow Rail (*Coturnicops noveboracensis*)
Fish and Fish Habitat	■ Fish and Fish Habitat Study Plan	■ Lake Sturgeon (*Acipenser fulvescens*) ■ Walleye (*Sander vitreus*) ■ Brook Trout (*Salvelinus fontinalis*) ■ Northern Pike (*Esox lucius*) ■ Lake Whitefish (*Coregonus clupeaformis*) ■ Chain Pickerel (*Esox niger*) ■ Yellow Perch (*Perca flavescens*) ■ Cisco (*Coregonus artedii*) ■ Burbot (*Lota lota*)

[2] *A proxy VC is used when looking at the effects of one species that represents many others.*

Environmental Discipline	Study Plan Name	Valued Component(s)
		■ Longnose Sucker (*Catostomus catostomus*) ■ White Sucker (*Catostomus commersonii*) ■ Forage / Prey Species (including species such as Lake Chub [*Couesius plumbeus*]) ■ Lower Trophic Organisms (e.g., benthic invertebrates)
Social	■ Social Study Plan	■ Housing and Accommodation ■ Community Service and Infrastructure ■ Transportation ■ Community Well-being ■ Populations and Demographics
Economy	■ Economic Study Plan	■ Regional Economy ■ Labour Force and Employment ■ Government Finances
Land and Resource Use	■ Land and Resource Use Study Plan	■ Land Use Compatibility ■ Parks and Protected Areas ■ Extractive Industry ■ Forestry Industry ■ Energy and Linear Infrastructure ■ Recreation and Tourism
Human Health and Community Safety	■ Human Health and Community Safety Study Plan	■ Public Safety ■ Public Health ■ Diet ■ Environmental Factors Influencing Health
Visual Aesthetics	■ Visual Aesthetics Study Plan	■ Visual Contrast / Character ■ Visibility ■ Visual Sensitivity
Archaeological and Cultural Heritage	■ Cultural Heritage Study Plan	■ Archaeological Sites and Resources ■ Built Heritage Resources and Cultural Heritage Landscapes

It should be noted that while there is not a consultation study plan, the Project has developed the *Consultation and Engagement Plan to Support the Environmental Assessment / Impact Statement* (AECOM 2020) (referred to as the Impact Statement [IS] / EA Consultation Plan).

2. Purpose and Objectives

The key objectives of conducting an IA / EA are to describe the existing environment, gather sufficient information to predict Project-related effects (positive and negative, direct and indirect) of the Project and alternatives on the environment, determine measures needed to avoid or minimize adverse Project effects, and enhance beneficial Project effects where feasible, and to undertake consultation and engagement. The purpose of this Study Plan is to explain:

- A baseline[3] study methodology that will result in a comprehensive description of the existing environment potentially impacted by the Project;
- How efficient and transparent data management and analysis will be undertaken;
- Effects assessment scoping inputs specific to Groundwater and Geochemistry that will allow for potential effects of the Project on the existing environment to be appropriately assessed in the IS / EA Report; and
- How the study plan aligns with federal and provincial requirements and guidance, including the Agency's Tailored Impact Statement Guidelines (TISG), dated February 24, 2020 (the Agency 2020c), for this Project and applicable provincial agency comments on the Draft Terms of Reference (ToR)[4].

As required by the IAA and referenced in TISG Section 7.3, work plans will also be developed for disciplines as required. It is anticipated the work plans will include further details on how to action the study plans; for example they would contain such information as location of sampling sites, scheduling, and sequencing.

For the purposes of establishing appropriate context, the study plan begins with background and relevant information on:

- Study-plan related discussions with the Agency, the MECP and applicable agencies to date (**Section 3**);
- The approach to Project consultation and engagement (**Section 4**);
- How Indigenous Knowledge will be collected and used in the IA / EA (**Section 5**); and
- The spatial and temporal boundaries that will be used for the IA / EA (**Section 6**).

3. *Baseline refers to the current conditions of the environment potentially impacted by the Project. Baseline conditions serve as a reference against which changes due the Project are measured.*
4. *If necessary, the Study Plan will be updated to reflect the approved ToR if approval is obtained.*

2.1 Approach to Handling Confidential Information

2.1.1 Indigenous Knowledge

Permission from the Indigenous community will be sought before including Indigenous Knowledge in the IS / EA Report, regardless of the source of the Indigenous Knowledge. Sensitive and / or confidential information will be specifically collected through the Indigenous Knowledge Program to inform the IS / EA Report, and its use and publication will be governed by Indigenous community-specific Indigenous Knowledge Sharing Agreements. Sensitive and / or confidential information collected through Indigenous Knowledge Sharing Agreements will be protected from public or third-party disclosure and will be established between the Proponent and Indigenous communities participating in the Indigenous Knowledge Program prior to the sharing and use of any sensitive information. Instances where Indigenous Knowledge sharing has taken place during consultation activities (e.g., meetings) will be recorded in the Record of Consultation and Engagement, including where Indigenous Knowledge was incorporated into Project decisions and into the IS / EA Report (i.e., specifics will not be included in the Record of Consultation and Engagement given the potential sensitivity and / or confidentiality of the information shared).

3. Study Plan Technical Discussions

To facilitate the development of satisfactory study plans and eventually a satisfactory IS / EA Report, MFFN previously submitted draft study plans in an effort to hold technical discussions with the Agency, the MECP and applicable agencies. However, no Groundwater and Geochemistry discipline specific technical study plan discussions have occurred to date.

4. IS / EA Report Consultation and Engagement Process

4.1 Interested Persons and Government Agencies

The Proponent will provide Project notices and advise of opportunities for consultation and engagement with interested persons[5] which includes, at a minimum, members of the public outlined in the *Public Participation Plan for the Marten Falls Community Access Road Project Impact Assessment* (The Agency, 2020) (referred to as the Public Participation Plan). This will include the opportunity to provide input on the existing environment, VCs, effects assessment methods, effects assessment results, and mitigation and follow-up program measures as applicable. A variety of activities will be offered so that members of the public are informed of the IS / EA Report as it progresses and are aware of the opportunities and means to provide their input. The study plans have recognized public and agency input received on the Project to date. Government agencies and interested persons will have the opportunity to comment on components of the study plans throughout the IS / EA Report consultation and engagement process. The Project's approach to handling confidential and sensitive information is outlined in **Section 2.1**.

4.2 Indigenous Communities

The Proponent will provide Project notices and opportunities for consultation and engagement with Indigenous communities identified in **Table 4-1**, which is inclusive of all Indigenous communities identified in the *Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment* (The Agency 2020a) (referred to as the Indigenous Engagement and Partnership Plan).

Indigenous communities will be provided the opportunity to be involved at critical decision-making points throughout the IS / EA Report so that the Proponent can consider and incorporate, where appropriate Indigenous Knowledge and Indigenous land and resource use information into the Project as it pertains to the existing environment, VCs, effects assessment methods, effects assessment results, and mitigation and follow-up program measures. A variety of activities will be offered so that Indigenous communities are

5. *Interested persons, as defined in the IS / EA Consultation Plan, are individuals and groups (e.g., associations, non-governmental organizations, industry and academia) who could have an interest in the Project, including but not limited to communities in the region, those with commercial interests (e.g., forestry, trappers, outfitters, other mineral tenure holders in the area) and recreational users or those with recreational interest (e.g., campers, hunters and environmental groups).*

informed of the IS / EA Report as it progresses and are aware of the opportunities, means and timelines to provide their input. The study plans have recognized Indigenous community input received on the Project to date. Indigenous communities will have the opportunity to comment on components of the study plans throughout the IS / EA Report consultation and engagement process.

Table 4-1: Identified Neighbouring Indigenous Communities, including their Provincial Territorial Organizations and / or Tribal Council Affiliations

Tribal Council Affiliation	Indigenous Community or Organization
Matawa First Nations Management *(Nishnawbe Aski Nation)*	■ **Marten Falls First Nation** (Proponent and potentially affected Indigenous community) ■ Aroland First Nation ■ Constance Lake First Nation ■ Eabametoong First Nation ■ Ginoogaming First Nation ■ Neskantaga First Nation ■ Nibinamik First Nation ■ Webequie First Nation
Matawa First Nations Management and the Union of Ontario Indians / Nishnawbe Aski Nation	■ Long Lake #58 First Nation**
Mushkegowuk Council *(Nishnawbe Aski Nation)*	■ Attawapiskat First Nation ■ Fort Albany First Nation ■ Kashechewan First Nation
Shibogama First Nations Council *(Nishnawbe Aski Nation)*	■ Kasabonika Lake First Nation ■ Kingfisher Lake First Nation ■ Wapekeka First Nation ■ Wawakapewin First Nation ■ Wunnumin Lake First Nation
Independent First Nations Alliance *(Nishnawbe Aski Nation)*	■ Kitchenuhmaykoosib Inninuwug First Nation
Independent First Nations *(Nishnawbe Aski Nation)*	■ Mishkeegogamang First Nation ■ Weenusk First Nation
Nokiiwin Tribal Council	■ Animbiigoo Zaagi'igan Anishinaabek First Nation (AZA)*
Métis Nation of Ontario	■ Métis Nation of Ontario; Region 2*
Independent Métis Nation	■ Red Sky Independent Métis Nation*

*Notes: * Indigenous communities or organizations identified by MECP who should be consulted on the basis that they may be interested in the Community Access Road.*
*** The MECP indicated in a letter to MFFN that Long Lake #58 First Nation was moved from interest-based to rights-based.*

4.3 Consideration of Identity and Gender-Based Analysis Plus in Engagement

To fulfill requirements of the IAA, the Consultation and Engagement Program will consider a diverse range of perspectives from interested persons and interested Indigenous communities and their members identified in the Agency's Indigenous Engagement and Partnership Plan and the Public Participation Plan. This will include at a minimum providing ongoing opportunities for engagement to:

- **Neighbouring Indigenous communities, including relevant subpopulations:**
  - Women;
  - Youth; and
  - Elders.
- **Non-Indigenous communities including:**
  - Women;
  - Youth; and
  - Activity-based subgroups (e.g., recreationalists, snowmobilers, tourism establishment operators).

The Proponent will also consult and engage with other subpopulations identified by communities during consultation and engagement. The information from these activities and any additional identity groups identified by communities through consultation and engagement will be considered by applicable environmental disciplines for the purposes of data collection and considering disproportionate effects.

During consultation and engagement, these aforementioned groups will be consulted and engaged with on targeted input**.**

When feedback is received from interested persons and Indigenous communities, issues, comments and questions will be tracked, which is consistent with the process described in the IS / EA Consultation Plan. Specific to Gender-Based Analysis Plus objectives, this will include efforts to engage with diverse populations. It is expected this will include activities specific to subgroups and tabulation of consultation and engagement participation with respect to identity factors. This will provide summary statistics to demonstrate the diversity achieved in consultation and engagement.

5. Consideration of Indigenous Knowledge in the IS / EA Report

The following provides a general description of how Indigenous Knowledge will be considered in the IA / EA process. The extent to which Indigenous Knowledge is considered by each specific VC will vary depending on the nature of the VC, the potential for Project effects on the VC and whether Indigenous knowledge that relates to a VC is provided / obtained. As such, not all aspects of the general approach described below may apply to all VCs / study plans.

There are two concurrent and complementary avenues for Indigenous communities and groups to be engaged with and provide input on the Project: the Indigenous Knowledge Program and the Consultation and Engagement Program. Both programs serve to support the collection of Indigenous perspectives, values, and input on the Project, including Aboriginal and Treaty Rights and how they may be impacted by the Project, to be integrated throughout the IA / EA process. However, the Indigenous Knowledge Program specifically aims to solicit and incorporate information that is considered sensitive and may have confidentiality requirements, including Indigenous Knowledge and information on Indigenous land and resource use. Indigenous Knowledge Sharing Agreements will be established between the Proponent and Indigenous communities participating in the Indigenous Knowledge Program prior to the sharing and use of any sensitive information.

All Indigenous communities and groups identified by the MECP and the Agency through the Indigenous Engagement and Partnership Plan have the opportunity to participate in the Indigenous Knowledge Program. The Indigenous Knowledge Program provides interested Indigenous communities an opportunity to: share existing Indigenous Knowledge and information on Indigenous land and resource use and cultural values that may be relevant to the Project, and / or complete Project-specific studies to collect and share Indigenous Knowledge and information on Indigenous land and resource use and cultural values. The Indigenous Knowledge program includes opportunities for Indigenous communities and groups to meet with the Proponent to discuss the program, ask questions, and share concerns and interests. In support of this, the Proponent has created an Indigenous Knowledge Program Guidance Document (the Guidance Document) that provides:

- An overview of the Indigenous Knowledge Program and information on how Indigenous Knowledge and Indigenous land and resource use can be collected and / or shared;

- Information on how Indigenous Knowledge and information on Indigenous land and resource use and cultural values and practices may be used in the planning and design processes; and
- A suite of guidance materials that were developed based on the information requirements of both the federal and provincial assessment processes, including: question guides to support the collection of information on historical and current community context; Indigenous Knowledge that may be relevant to the various technical disciplines; information on Indigenous land and resource use, cultural values and practices and associated spatial data; and perspective on potential Project-related effects and associated mitigation and / or enhancement measures.

The Guidance Document will also support participating Indigenous communities in providing Project-specific information in a manner that facilitates meaningful incorporation into the IS / EA Report.

The IS / EA Consultation Plan outlines the process for obtaining information and feedback about the Project from Indigenous communities (i.e., the Consultation and Engagement Program). All Indigenous communities identified by the MECP and the Agency have the opportunity to participate in the Consultation and Engagement Program through community-specific meetings, Public Information Centres, web conferences, and other formats. All Indigenous communities identified by the MECP and the Agency will be provided information related to the Project and invited to participate at various points throughout the IA / EA process.

There are also opportunities for technical teams to engage with Indigenous communities to solicit perspectives and information relevant to the Project, including information related to collection of existing information and the development of the IS / EA Report. The Proponent also invites feedback and inputs throughout the Project via the Project website and ongoing communications with the Proponent.

The Indigenous Knowledge and Consultation and Engagement programs are designed to be complementary and provide multiple opportunities for communities to offer feedback and information, including perspectives on Aboriginal and Treaty Rights and interests and how these may be impacted by the proposed Project. Relevant information collected through both the Indigenous Knowledge and Consultation and Engagement programs, including potential effect pathways on Aboriginal and Treaty Rights and interests, will be shared with each of the relevant disciplines throughout the IA / EA to: guide and inform VCs; support characterization of the existing environment; identify the potential effects of the Project on VCs; help identify mitigation measures and potential monitoring programs; and ultimately guide Project planning. The nature of how the Indigenous Knowledge becomes integrated into the IS / EA Report will be dictated by the specific information provided by each Indigenous community and the parameters set out in

the Indigenous Knowledge Sharing Agreements. A description of how Indigenous Knowledge was considered in the IA / EA and in each of the technical discipline areas will be included in the IS / EA Report.

It is also important to note that information collected through the various activities (e.g., field studies and programs, effects assessments) of each discipline area (e.g., wildlife, vegetation, cultural heritage) will be shared with the Indigenous Knowledge Program leads. This will support the establishment of the existing environment and the effects assessment for the Aboriginal and Treaty Rights and Interests environmental discipline, as well as the identification of potential mitigation measures and monitoring programs, given the interrelated nature of Indigenous peoples and other environmental disciplines.

The Proponent will strive to respectfully collaborate with Indigenous communities on how Indigenous Knowledge and information on Indigenous land and resource use and cultural values will become part of the IS / EA Report, and how potential effects to Aboriginal and Treaty Rights and Interests will be assessed. It is expected that measures to support this may include but are not limited to: engaging Indigenous communities to solicit information on Indigenous Knowledge and Indigenous land and resource use and cultural values to inform baseline conditions, providing Indigenous communities with draft sections of the IS / EA Report to illustrate how Indigenous Knowledge and information on Indigenous land and resource use and cultural values has been integrated and to confirm it has been presented appropriately, and completing collaborative working sessions with Indigenous communities for the effects assessment on Aboriginal and Treaty Rights and Interests. Further information on how potential effects on Indigenous rights will be assessed is provided in the Aboriginal and Treaty Rights and Interests Study Plan.

6. Assessment Boundaries

6.1 Temporal Boundaries: Project Phases

Project phases, which are temporal boundaries, are developed to establish the timeframes within which potential effects of the Project will be considered in the IS / EA Report. The Project is planned to occur in two phases, which are briefly described below and shown in **Figure 6-1**.

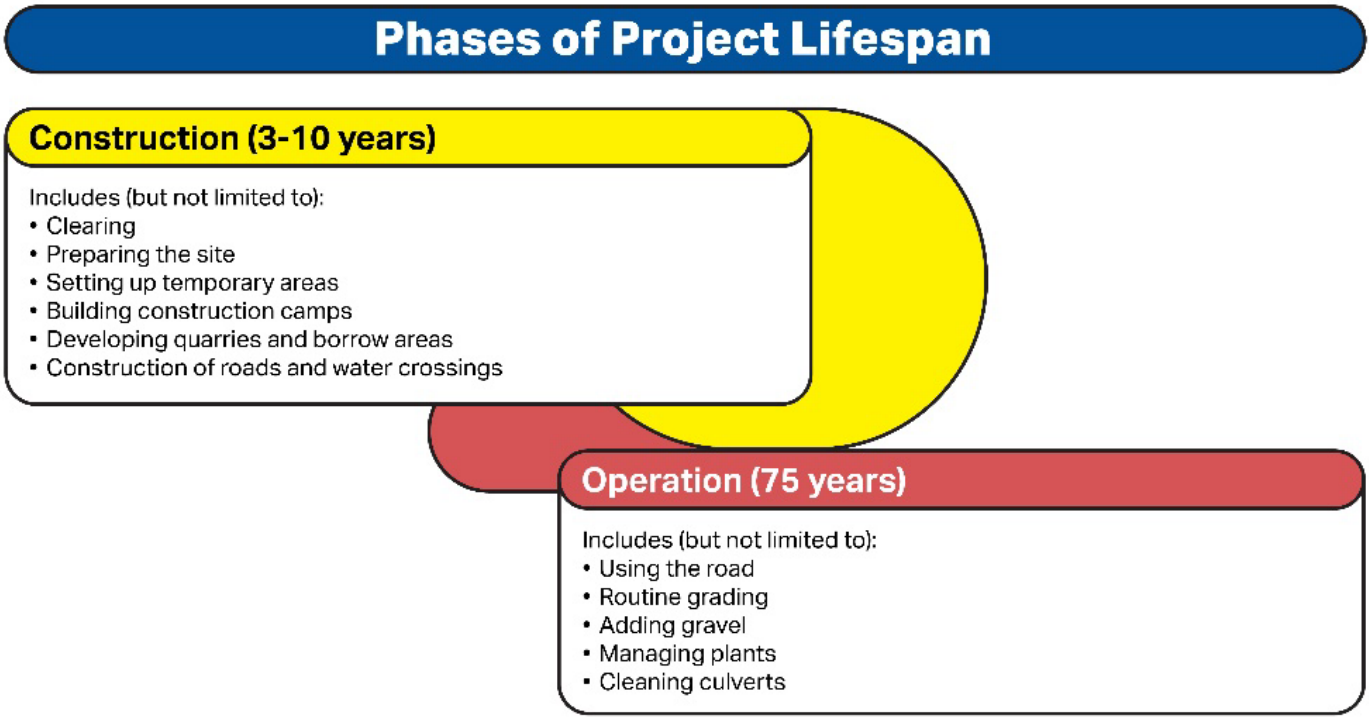
- **Construction Phase:**
  The time from start of construction, including site preparation activities, to the start of operations and maintenance of the CAR. Decommissioning of construction works is included in the construction phase. The construction phase is anticipated to take approximately 3 to 10 years to complete.
- **Operations and Maintenance Phase:**
  The operations and maintenance phase starts once construction activities are complete and lasts for the life of the Project. The operations and maintenance phase of the Project is considered to be 75 years based on the expected timeline for when major refurbishment of road components (e.g., bridges), is anticipated.

There are currently no plans to decommission the CAR as there is no expected / known end date for its need. Therefore, future suspension, decommissioning and eventual abandonment of the CAR will not be considered in the IS / EA Report. It will be considered if and when a decommissioning or abandonment application is made for the road.

In determining the temporal boundaries, in particular the long operations and maintenance phase, consideration was given to the long-term effects on the well-being of present and future generations (Sustainability Principle #2[6]). The final temporal boundaries to be used in the IS / EA Report will be based on regulatory agency guidance, professional judgement and input received through the Project consultation process.

6. *Sustainability Principles #2 is one of four sustainability principles included in Section 25 of the Project's TISG as further elaborated on Section 9.7.*

Figure 6-1: Project Schedule



6.2 Spatial Boundaries: Study Areas

6.2.1 General Information

Study areas identify the geographic extents within which potential effects of the Project are likely to occur and will be considered in the IS / EA Report. The existing conditions and potential effects are documented for three study areas selected for the Project:

- **Project Development Area (PDA):** area of direct disturbance;
- **Local Study Area (LSA):** the area where most of the direct effects of the Project are likely to occur; and
- **Regional Study Area (RSA):** the area where indirect effects of the Project are likely to occur.

The PDA encompasses the 100 metre wide CAR right-of-way (ROW), temporary construction access roads, work areas, worker camps, and pits, quarries, and associated access roads. The preliminary LSA currently

being considered within the scope of the ongoing provincial regulatory review process generally includes the area within 2.5 km of the centreline of Alternative 1 and Alternative 4. The preliminary study area generally allows for the documentation of existing conditions and prediction of potential environmental effects for the Project. A 5 km wide study area also allows for route refinements during development of Project design (e.g., adjustment of the alignment to avoid sensitive features).

The specific location of Project components, including the roadway, quarries, pits and temporary infrastructure, are not yet known and will be included in the IS / EA Report. While most of the Project components are expected to be located within the preliminary 5 km wide study area, benefits (e.g., reduced environmental disturbance, avoidance of sensitive features, technical considerations, concerns received through consultation) for locating Project components on lands outside of the 5 km wide study area may become known during the IA / EA process. If the need to locate Project components outside the 5 km wide study area is determined to be required or of benefit to the Project, the study area would be adjusted.

The study area for each environmental discipline may vary from the above-described general study area based on the potential for the Project to directly or indirectly affect each environmental discipline; therefore, discipline-specific LSAs and RSAs have been defined for the Project. In defining the final LSAs and RSAs, each environmental discipline will consider:

- Location and other characteristics of the environmental discipline relative to the Project;
- The anticipated extent of the potential Project effects;
- Federal, provincial, regional, and local government administrative boundaries;
- Indigenous groups listed in **Table 4-1**;
- 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.

The study areas included in this document are preliminary, covering the extent to which readily available information suggests the Project may have noticeable effects on the environment. The size, nature and location of past, present and reasonably foreseeable projects will be taken into consideration in the development of the cumulative effects assessment study area(s). The appropriate study area(s) to assess cumulative effects are dependent on the VCs predicted to have direct residual adverse effects as a result of the Project, and therefore, cannot be defined until the IS / EA Report has sufficiently advanced.

As further detailed in **Section 4**, the Proponent will continue to provide opportunities for neighbouring Indigenous communities and interested persons to provide input and inform the effects assessment, including the LSAs and RSAs.

6.2.2 Groundwater and Geochemistry Study Areas

The LSA and RSA boundaries for Groundwater and Geochemistry are detailed in **Table 6-1** and shown on **Figure 6-2**.

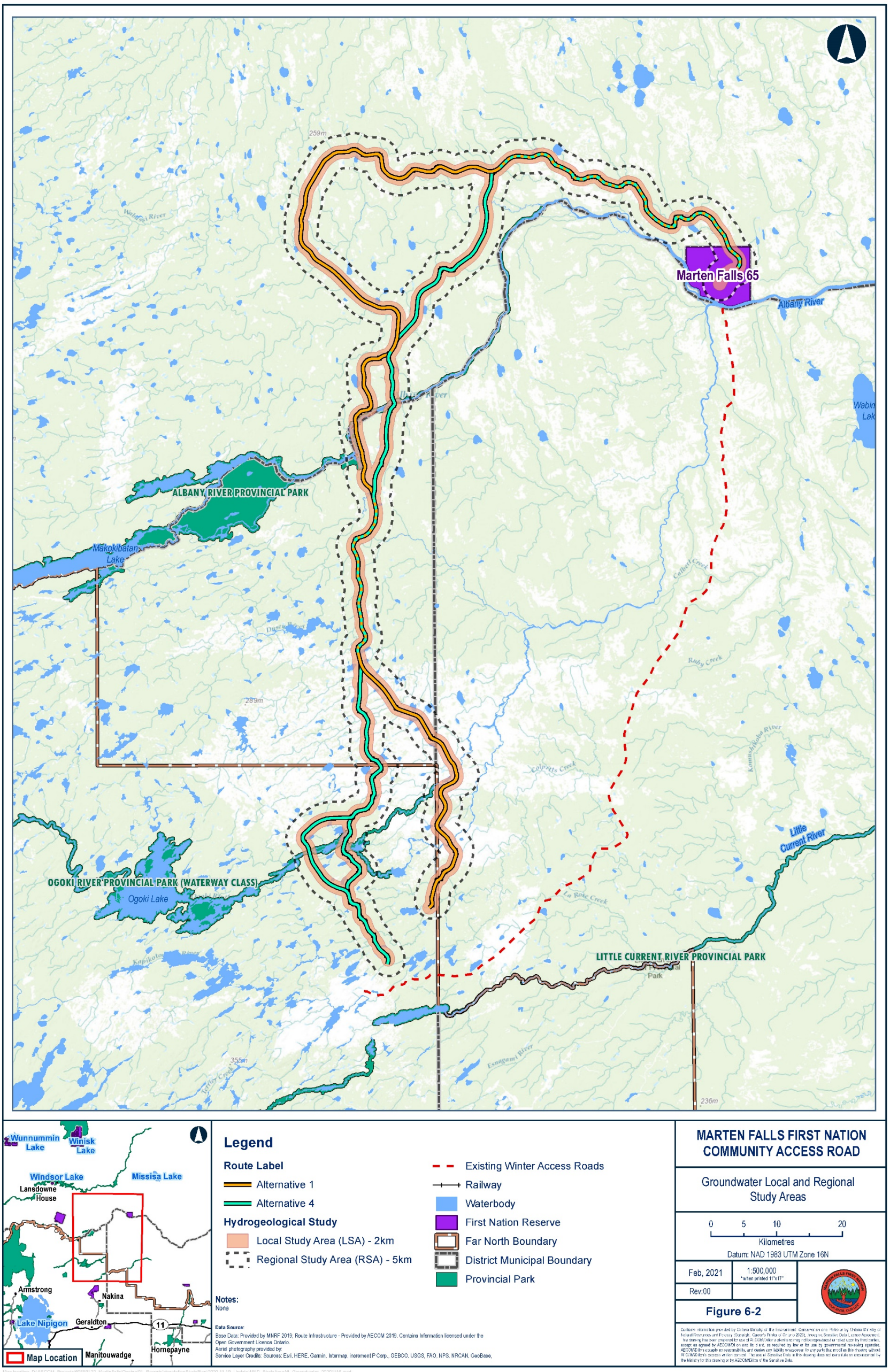
Table 6-1: Groundwater Study Areas

Study Area	Geographic Extent	Rationale
Local Study Area	■ PDA plus 1.0 km from the Project centreline of Alternative 1 and Alternative 4 and associated construction areas	■ Potential effects (s) to groundwater are considered to be localized and limited to areas disturbed by project construction and immediately adjacent lands. Disturbed areas include the alignment and associated quarries, camps, and access roads.
Regional Study Area	■ PDA plus 2.5 km from the Project centreline of Alternative 1 and Alternative 4 and associated construction areas	

Temporary or permanent changes to the water table as a result of construction are expected to be minimal as groundwater aquifers are inferred to be recharged by surficial water bodies (i.e., wetlands and rivers.). However, select Project disturbance areas (e.g., quarries) may induce larger temporary changes to water quantity. The LSA was based off Golder's draft hydrogeology desktop report (Golder 2020) and is considered reasonable due to the following:

- The extent of the drawdown cones from disturbed areas (dewatering wells and dewatered excavation footprints) is anticipated to be less than 1 km based on near surface geology (primarily granitic bedrock, silt rich till or poorly draining soils).
- Impacts from diverting water and flooding extents are anticipated to be less than 1 km, assuming best construction practices are followed (e.g., culverts).
- The extent of the drawdown cones from existing community water wells is unknown but anticipated to less than 1 km based on typical residential water demands.

Figure 6-2: Groundwater Local and Regional Study Areas



- Impacts to groundwater quality are not expected to migrate long distances based on the low hydraulic conductivity of granitic bedrock and silty clay till (Golder 2020). The relatively low topography of the Project area suggests a low hydraulic gradient and very slow groundwater migration (e.g., several to tens of metres per year). Furthermore, solutes dissolved in groundwater undergo a number of different process during transport that remove or slow contaminant migration. These processes include, but are not limited to, sorption, chemical or oxidation-reduction induced precipitation, abiotic as well as biodegradation, and decay of radioactive compounds. These natural processes, in addition to mixing and dilution along the groundwater flow path, will decrease the concentration of contaminants migrating off-site and reduce the size of the affected areas, if any.

A LSA of 1.0 km from the centre line of the disturbed areas is considered a conservative approach for monitoring groundwater quality and quantity during the Project. If impacts are detected, additional subsurface investigations will be conducted to delineate, monitor and further access the extent water quality or quantity impacts within the LSA. Additional monitoring will be conducted within the community of Marten Falls First Nation (e.g., water wells).

7. Baseline Study Design

Baseline conditions are used as a reference point for identifying environmental changes, and for qualitative and quantitative assessments of effects to groundwater regimes. This section outlines the proposed groundwater baseline study designed in support of the IA / EA for the Project. The groundwater baseline study focuses on areas where the Project has potential to affect groundwater quantity or quality, specifically in areas near sensitive receptors (wetlands, streams) and existing groundwater users (e.g., domestic water wells).

The groundwater field study tasks presented will allow for determination of baseline groundwater levels, hydraulic gradients, groundwater flow directions, groundwater flow velocities and groundwater quality. These data are required to adequately monitor and assess potential Project effects adjacent to and downgradient of the proposed CAR and associated development activities.

In addition to the groundwater baseline study, the TISG for the Project also requires the completion of a baseline geochemical characterization of the subsurface materials proposed for use in construction (e.g., eskers and quarries). Therefore, this section includes a description the proposed desktop analysis, field data collection and laboratory testing to conduct the required geochemical characterization studies in tandem with the concurrent groundwater assessment, recognizing that the field sampling locations for geochemistry will largely align with the corresponding monitoring locations for groundwater (referenced in **Section 7.2.2**), as well as where key geological features (e.g., eskers, bogs) and substantial construction works (e.g., quarries, lay down areas, and camps.) are expected to occur. The geochemical characterization of construction material will be used to determine acid rock drainage and/or metal leaching (ARD / ML) potential of identified subsurface materials, noting that the laboratory characterization of metal leaching potential will be evaluated in conjunction with the quality of groundwater in contact with subsurface materials. It is understood that the ARD / ML potential of the subsurface materials may have effects on VCs, specifically groundwater quality and possibly surface water quality. To that end, the results from the geochemical characterization studies will be used to advance the effects assessments for groundwater and potentially surface water.

7.1 Desktop Assessment

A desktop review of existing information sources will be completed to identify information gaps that will need to be addressed through further study. A preliminary list of applicable information sources has been included in **Appendix A** The desktop assessment will be focused on lands within the RSA.

7.1.1 Groundwater

The groundwater desktop review will focus on published information obtained from all local or interested First Nation communities (including Marten Falls), if any, the Ontario Ministry of the Environment, Conservation and Parks (MECP), Ministry of Transportation Ontario (MTO) Foundation Library (GEOCRES), and Ministry of Natural Resources and Forestry (MNRF), Ontario Geological Survey (OGS), the Geological Survey of Canada (GSC) and the Ontario Ministry of the Environment, Conservation and Parks (MECP) Water Well Information System (WWIS) to develop a conceptual understanding of local hydrogeological conditions.

The desktop assessment will include the following tasks:

- A review of previous studies pertaining to the Project or conducted within the RSA that may provide additional hydrogeological, geological, hydrological or biological data relevant to the Project. If any data are referenced, justification for utilizing these data (i.e., spatial and temporal relevance with respect to the Project RSA), detailed descriptions, and specific data sources will be provided in the baseline report. Note that site-specific data will also be collected, as described below. The Project will not be solely relying on surrogate data from reference sites.
- Review the desktop geological characterization proposed in the Physiography, Terrain and Soils Study Plan. The geological characterization will provide surficial, bedrock and structural geological maps from within the RSA using publicly available data from online geological mapping or provincial databases, such as the OGS and the GSC. Known or mapped structural geology information important with respect to groundwater flow, such as major faults, fracture density and orientation, will be documented.
- Conducting a review of the MECP WWIS database to identify the location of registered groundwater wells within the LSA and RSA. This review includes a review of water well logs to obtain additional hydrogeological information, such as well use, water levels, geology and well yield.
- Conducting community consultation and engagement to determine the location of current and historical drinking water sources (water wells, surface water points of diversion, and springs). See **section 7.2.1.1** for more detail.
- A review of the existing environments within the RSA to identify areas with sensitive hydrogeological receptors (e.g., peatlands, wetland, streams).

- A review of the Ontario government data-catalog to obtain additional relevant baseline groundwater information from the Ministry of the Environment, Conservation and Parks with respect to the Project.
- Preparation of a hydrogeology baseline report summarizing the findings and data gaps noted during the desktop review. The report will include detailed information on registered water well locations and depths (including borehole logs, if available) and a figure showing domestic and public water well locations within the RSA.

7.1.2 Geochemistry

The geochemistry desktop review will focus on published information obtained from all local or interested First Nation communities (including Marten Falls), the Ontario Ministry of the Environment, Conservation and Parks (MECP), Ministry of Transportation Ontario (MTO) Foundation Library (GEOCRES), and Ministry of Natural Resources and Forestry (MNRF), Ontario Geological Survey (OGS), the Geological Survey of Canada (GSC) and the preliminary and detailed (if available) terrain mapping developed through the Physiography, Terrain and Soils Study Plan, to develop a conceptual understanding of how the local geology may influence geochemical conditions.

The desktop assessment will include the following tasks:

- A review of previous studies pertaining to the Project or conducted within the RSA that may provide additional geochemical data relevant to the Project. If any data are referenced, justification for utilizing these data (i.e., spatial and temporal relevance with respect to the Project RSA), detailed descriptions, and specific data sources will be provided in the baseline report. Note that site-specific data will also be collected, as described below. The Project will not be solely relying on surrogate data from reference sites.
- Review the desktop geological characterization proposed in the Physiography, Terrain and Soils Study Plan. The geological characterization will provide surficial, bedrock and structural geological maps from within the RSA using publicly available data from online geological mapping or provincial databases, such as the OGS and the GSC.
- Review of the preliminary, and if available, detailed terrain mapping as described in the Physiography, Terrain and Soils Study Plan to support the location and spatial extent of potential pit and quarry materials, landform features, soils and thickness of overburden materials.

- Preparation of a geochemical characterization report, summarizing the findings and data gaps noted during the desktop review. The report will include a description of the overburden and bedrock lithological units, including a summary table of geologic descriptions, mineralization (if applicable) supported by geological maps and cross-sections at appropriate scale (normally 1:50 000). The summary table will also include an initial ARD/ML potential rating based on the desktop review of overburden and bedrock geology.

7.2 Groundwater Field Study

No baseline field investigations specific to groundwater (hydrogeology) in support of this Project have been completed to date. This section describes the methods and specific procedures that will be followed through the implementation of this study plan.

7.2.1 Study Area Reconnaissance & Determination of Key Groundwater Monitoring Locations

The groundwater baseline study will include installation of hydrogeological stations within the LSA. The study will focus on areas that have the greatest potential to negatively affect water quantity and quality of hydrology and hydrogeology systems. Stations will be installed in bedrock and/or overburden in areas of hydrogeological interest, including:

- Areas within close proximity (i.e., within the LSA) to water crossings or sensitive terrestrial or aquatic ecological receiving environments, such as ponds, lakes, creeks, streams, rivers and wetlands;
- Developed First Nation communities within the LSA, where structures, infrastructure and/or local wells or drinking water sources exist;
- Areas within one kilometre (i.e., within the LSA) of other existing groundwater users (e.g., registered and unregistered water supply wells) or potential groundwater users, including uses identified through indigenous consultation where applicable and practical; and
- Areas where significant construction or geotechnical works will be required, including areas subjected to excavation, dewatering, water discharge, groundwater extraction, blasting, backfilling, temporary or permanent damming of water, or diversion of water is likely to occur (e.g., along the CAR, borrow source areas, temporary access roads and temporary construction camps).

Due to the remote nature and large scale of the Project, helicopter surveys of proposed project areas will be conducted to identify the locations of sensitive receptors that require groundwater assessment. A helicopter survey will be conducted in collaboration with hydrologists and aquatic and terrestrial biologists to identify all areas with sensitive environmental receptors. Geologists, geochemists and geotechnical engineers will also be engaged to identify potential borrow source areas and areas where substantial geotechnical work is expected.

Helicopter survey results will determine the number of locations that require detailed groundwater studies. The need for detailed investigation of groundwater and surface water interaction will also be determined through discussions with biologists and hydrologists. These discussions will focus on identifying waterbodies where groundwater inputs may be occurring and supporting stream flows during the dry season, and therefore may require additional investigation. Results will be used to determine the relative environmental effects associated with each CAR alternative, which will assist the MFFN CAR Project Team in selecting the most feasible route.

Considering the extent of the wetland areas and the number of water crossings associated with the Project, it is not feasible to assess every area. For planning purposes, we have assumed that 20 locations will require additional field characterization. Focused study will be conducted on a range of water crossings (small to large), wetlands and borrow source areas. The most culturally and ecologically sensitive locations will be selected. The number of locations where baseline groundwater monitoring may be required will be refined during the next phase of work, when more detailed environmental assessments are ground-truthed (i.e., helicopter access and ground-truthing field work).

7.2.1.1 Water Well Locations

Community consultation and engagement activities will include discussions with local residents regarding the location of current and historical drinking water sources (e.g., water wells, surface water points of diversion, and springs). Afterwards, a groundwater professional will conduct water well surveys at the residences/locations where these drinking water sources were identified within the RSA to verify their location, condition and cultural importance. The water well survey will include information requests from the owner / operator of water well / spring, such as current water level, screened hydrostratigraphic unit, well yield, current and potential future well uses, current and historical water quantity and quality issues, if any, and to determine if consumption of water from the wells has Indigenous cultural or spiritual importance. The community consultation and water well survey will also include discussions regarding areas of groundwater upwelling (i.e., spring water) with Indigenous cultural importance and/or where community members currently use/consume spring water.

7.2.2 Proposed Groundwater Monitoring Well Installation Regime at Key Monitoring Locations

Installation and monitoring of groundwater monitoring wells will be completed in the LSA at least two years in advance of construction activities to determine seasonal baseline conditions. Specific details regarding monitoring well installation, testing and monitoring are discussed on a task by task basis in the subsequent sections of this report.

Groundwater monitoring stations will be installed in areas of different geology along the CAR to allow for groundwater quality and quantity monitoring in the geologic units within the LSA. Groundwater monitoring stations will also be installed where key geological features (e.g., eskers and bogs) and substantial construction works (e.g., quarries, lay down areas, and camps) will occur. At each groundwater monitoring location, up to four monitoring wells will be installed. Typical stations will involve two wells at one location (nested shallow and deep) to facilitate water level monitoring, water quality sampling and determination of vertical gradients. Where detailed groundwater / surface water interaction studies are required, detailed monitoring stations will be installed. These waterbodies will be identified through discussions with biologists and hydrologists to identify streams of ecological importance where groundwater inputs are likely contributing to baseline flows during the dry season. Detailed monitoring stations will consist of four monitoring wells. Three shallow monitoring wells will be installed to allow for horizontal gradient calculation and groundwater flow direction determination. The shallow groundwater monitoring wells will be installed in a triangular pattern, with one well installed on the inferred upgradient side of the PDA and two wells installed in the inferred downgradient side of the PDA. To allow for vertical gradient calculation and flow determination, a single deep well will be installed adjacent to one of the downgradient shallow well locations. Additional downgradient monitoring wells may be required to adequately assess conditions in large or highly sensitive areas, such as large water crossings, wetlands, borrow source areas or ecologically or culturally sensitive areas, or areas where endangered species are identified. Additional monitoring wells or drive-point piezometers may also be required to allow for adequate baseline characterization of all hydrostratigraphic units that are encountered (e.g., peat, silt/clay, till, shallow fractured bedrock).

This Study Plan assumes that 15 typical and five (5) detailed groundwater monitoring stations will be required. The locations of monitoring wells within the LSA will be determined in collaboration with the Indigenous Knowledge and the Consultation and Engagement Programs, and communities with interests in the LSA will be provided an opportunity to comment.

7.2.3 Groundwater Monitoring Well Installation

7.2.3.1 Conventional Monitoring Wells

Groundwater monitoring wells are required to collect water quality and quantity data at key groundwater study area locations. Its presumed that the majority of the groundwater monitoring wells (also referred to as "monitoring wells") will be installed in dense soils (till) or bedrock and therefore a drill rig will be required. The MFFN CAR Project Team proposes using a drill rig that can be disassembled and transported to key groundwater study areas using a helicopter. Prior to conducting this work, brush/tree clearing for drill rig and helicopter landing pads, surveying/marking of the PDA and target borehole locations will be required. The size of these pads will be determined by the size of the drill rig that is available to complete the works.

Monitoring wells will be constructed using 50 mm diameter PVC Schedule 40 well screens (10 slot) and solid riser pipes, respectively. Monitoring wells will be completed using a threaded PVC well point cap at the bottom end of the screen interval and a PVC slip-on cap will be used to cap the well at surface.

A filter pack consisting of clean, inert rounded to sub-rounded one to three mm diameter silica sand will be installed around and above each well screen interval. In general, the sand pack will extend to a minimum height of 0.6 m above the top of the well screen unless otherwise dictated by field or local site/geological conditions. The filter pack will be installed by free fall around the screen and the thickness confirmed by the drilling contractor through direct measurement upon completion of installation.

An approximately 1.0 m thick non-permeable seal will be installed within the borehole annulus atop the filter pack using bentonite in either pellet or granular form (free of chemical additives). The thickness of the bentonite seal will be confirmed by the drilling contractor through direct measurement. A small amount of potable water will be added to the borehole to initiate the bentonite hydration process. The annular space above the bentonite seal will then be backfilled to within 0.5 m of the local ground surface using either bentonite chips or a high solids bentonite grout prepared in accordance with O.Reg. 903 (as amended).

Each monitoring well will be completed using a monument-type steel protective casing. The remaining annular space will be filled to ground surface using either bentonite (pellets or granular), or where required, a cement mixture. Drill cuttings generated during borehole drilling will be raked out and mounded around the exterior of the protective casing to prevent pooling and to encourage runoff flow away from each monitoring well. To complete the installation, each monitoring well will be tagged in accordance with O.Reg. 903 (as amended), and a water well record will be prepared and submitted by the drilling contractor to MECP. Installation of drive-point piezometers may be suitable inexpensive alternatives for shallow wells in locations with soft soils or water crossings (discussed below in **Section 7.2.3.2**).

Monitoring wells will be used to monitor water quantity and quality before, during and following construction activities. When monitoring is no longer required, all installed monitoring wells are required to be abandoned in accordance with O.Reg. 903 (as amended). In accordance with the regulation, monitoring wells must be abandoned by an MECP licensed water well contractor.

7.2.3.2 Drive-Point Piezometers

In soft soils, installation of drive-point piezometers to monitor water levels and water quality may replace drilling and installation of conventional style monitoring wells. Drive-point piezometers can be installed in or near water crossings and wetlands to confirm groundwater quantity and quality. A helicopter will be required to transport materials and staff to site for installation; however, clearing of a drilling pad may not be required.

Drive-point piezometers will be constructed using a PVC or stainless-steel drive point (well screen) and several riser pipes. The number of the riser pipes required will depend on the depth to water table at each installation location. The piezometers will be capped but will not be protected by a monument-type steel casing.

When no longer required in the future, all installed monitoring wells are required to be abandoned in accordance with O.Reg. 903 (as amended).

7.2.3.3 Stilling Wells

Where groundwater monitoring locations are situated in standing water (e.g., stream, wetland) a stilling well will be installed adjacent to the groundwater monitoring well for surface water level monitoring. The difference in water levels between the groundwater and the surface water monitoring points are used to determine if the stream is a gaining or losing stream, with respect to groundwater and it essential for assessing groundwater-surface water interactions and groundwater recharge and discharge locations.

Stilling wells will be constructed of slotted PVC pipe with a solid slip-on end cap at the bottom. The stilling well will be secured to the monitoring well or drive-point piezometer within the water body or wetland. The top of the stilling well standpipe will be cut down to match the height of the monitoring well or drive-point piezometer so that groundwater and surface water level measurements will both be taken from the same reference point.

7.2.4 Well Surveying

Monitoring wells, including drive-point piezometers and stilling wells, will be surveyed to determine UTM co-ordinates, ground elevation and top of pipe elevation. Survey data are important for accurate determination of groundwater elevations, gradients and flow directions, which can be challenging to infer in areas with little topographic relief and a flat-water table. Point elevations will also be collected at nearby water bodies and wetlands to assist with groundwater flow determination.

7.2.5 Monitoring Well Development

Each monitoring well and drive-point piezometer will be developed following installation to remove sediment and drill fluids from the wellbore and geologic formation. Well development will be conducted concurrently with drilling and installation activities. Well development allows for collection of groundwater quantity and quality data that are representative of in situ conditions.

Appropriate well development methods will be determined on a location-by-location basis, based on the total depth of installation, local groundwater conditions/water column height and sediment content of the groundwater. It is assumed that the majority of the monitoring wells can be successfully developed using manual or automated inertial pumps and associated high density polyethylene (HDPE) tubing. The typical well development process to be employed for this Project will be as follows:

- A minimum of three (3) wellbore volumes of water will be removed from each monitoring well, using dedicated equipment (e.g., fitted inertial pumps and HDPE tubing);
- Where wells are screened in a low permeability media (e.g., silt and clay) it is expected that slow recharge and dry conditions will occur. At these locations, the monitoring well will be purged dry a minimum of one (1) time, following water level recovery to a minimum of 80% of the static levels;
- Where possible, repetitive groundwater field parameter measurements will be obtained during the development process (including pH, temperature, electrical conductivity, turbidity and visual appearance); and
- Where a dry condition is not reached, the monitoring well will be developed until a visual improvement is observed in the turbidity level of the purged water, or until field parameters stabilize.

7.2.6 Groundwater Quantity and Quality Monitoring Program

The groundwater level monitoring program will be completed in conjunction with the groundwater quality sampling program, discussed below. Due to the remote nature of the Project and large distances between key monitoring locations, a helicopter will be required to conduct these programs.

7.2.6.1 Water Level Measurements

Groundwater level measurements will be obtained at each monitoring well three times per year for a period of two (2) years following their installation to assess seasonal fluctuation of the groundwater table. It is the MFFN CAR Project Consultants' experience that accessing locations with thick snow cover during winter is difficult and potentially unsafe. Further, shallow groundwater may be frozen, inhibiting collection of water quantity and quality data. The initial groundwater level readings will be obtained at least one week following well installation and well development activities.

Groundwater level measurements will be obtained using an electronic water level indicator. The electronic water level indicator will be lowered into the riser pipe of each monitoring well until water is encountered, as indicated by the instrument signal. The groundwater level will be measured with respect to a fixed "top-of-casing" reference point and entered in a field log. Groundwater levels are anticipated to be within the 3 m of groundwater surface across the Project area.

Following completion of groundwater level measurement at each monitoring well, the electronic water level tape will be cleaned and decontaminated to eliminate the possibility of cross-contamination between monitoring well locations.

At select monitoring locations, all four monitoring wells will be instrumented with pressure transducers to allow for continuous monitoring of groundwater levels (at one-hour intervals), providing that the monitoring wells are deep enough to prevent freezing. Similarly, stilling wells will also be outfitted with pressure transducers to monitor changes in surface water levels. These data will be used to assess seasonal changes in groundwater levels and flow directions over all four seasons. In addition, one barometric pressure transducer (barologger) will be installed within 30 km of each station to allow for water level compensation of atmospheric pressure fluctuations. All pressure transducers will be downloaded and redeployed during each site visit.

It is assumed that a total of five stations will be instrumented. Instrumented stations will be in areas with the greatest potential to negatively affect water quantity and quality for groundwater users (i.e., near domestic water wells) and ecological habitats.

7.2.6.2 Groundwater Quality Sampling

Monitoring Wells and Drive-Point Piezometers

Groundwater quality sampling will be completed at all groundwater monitoring stations. Two samples will be collected at each location, including one sample form the upgradient well and one sample from a downgradient monitoring well. Samples will be collected three times per year (spring, summer and fall) over a period of two (2) years to assess seasonal variability in water quality and build a baseline groundwater quality database. The initial groundwater samples will be collected at least one week following well installation and well development activities.

Industry standard QA/QC protocols will be followed for bottle preparation, groundwater sample collection and transportation, as outlined within pertinent MECP guidance documents (MOE 1999). Groundwater samples will be collected using a peristaltic pump or bladder pump, HDPE tubing and a YSI and a flow-through cell following stabilization of field parameters (pH, temperature, dissolved oxygen, turbidity, oxidation-reduction potential and specific conductance) to confirm that the groundwater samples are representative in in situ conditions. Using a combination of peristaltic and bladder pumps will allow for proper collection of samples for analysis of volatile parameters. Depending on the depth of the well, the thickness of the water column and the rate of recharge, bailers may also be suitable for collection of water quality samples.

Each groundwater sample will be examined in the field for visual and olfactory evidence of effects, then immediately placed in laboratory-supplied sample bottles prepared in advance with the appropriate preservatives, sealed, labelled and stored on ice to maintain a sample temperature of 10°C or lower during transportation under chain of custody documentation to a CALA-accredited environmental analytical laboratory within the specified sample analyte holding times. Field filtration for certain parameters (e.g., dissolved metals) will be completed at the time of sample collection using a 0.45 µm filter.

Collected groundwater samples will be submitted under chain of custody documentation for the following suite of analytical parameters:

- General parameters (pH and conductivity)
- Total metals;
- Dissolved metals, including:
  - Hardness (as $CaCO_3$)
  - Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum,

  - nickel, phosphorus, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc
  - Mercury and methylmercury
- Alkalinity (total as $CaCO_3$);
- Ammonia;
- Biological Oxygen Demand;
- Chemical Oxygen Demand;
- Total suspended solids;
- Total dissolved solids;
- Dissolved organic carbon;
- Anions (chloride, bromide, fluoride and sulphate);
- Nutrients (nitrate, nitrite, phosphorus);
- Volatile organic compounds (VOCs);
- Poly-aromatic hydrocarbons (PAHs); and/or
- Radionuclide parameters.

The above suite of analytical parameters is considered sufficient to assess baseline concentrations of potential contaminants of concern associated with Project work, including placement of fill material (general parameters, anions, metals and radionuclides), blasting residual (nutrients), acid rock drainage and buffering capabilities (metals and alkalinity), metal leaching (metals and general parameters), hydrocarbons and solvents (VOCs and PAHs) and permeant infrastructure, such as bridges, piles and culverts (metals). Radionuclide parameters will only be collected once from each groundwater monitoring well (i.e., only collected on the first sampling event). Monitoring parameters may be added or removed from the parameter list over the program based on a review of data (e.g., to remove parameters that are consistently below detection limits).

Samples will be shipped to the analytical laboratory every second day during the monitoring program to minimize holding-time exceedances.

Existing Water Supply Wells and Spring Water Sources

Subject to owner consent and sampling accessibility, sampling groundwater from existing/in use water supply wells or spring water sources within the RSA will be conducted twice within a one-year period to assess seasonal variability in water quality and build a baseline water well quality database. These data will

be used to assess complaints regarding changes to domestic water quality during or post-construction activities, if any.

Spring water sources will be collected by submersing sample bottles into the spring water. Water supply well samples will be collected from the point of consumption (e.g., the household tap) following disinfection of the faucet nozzle and flushing for five minutes. Immediately prior to sample collection, field parameters (pH, temperature, dissolved oxygen, turbidity, oxidation-reduction potential and specific conductance) will be measured.

Water samples will be submitted under chain of custody documentation for the following suite of analytical parameters:

- General parameters (pH and conductivity);
- Total metals;
- Dissolved metals, including:
  - Hardness (as $CaCO_3$)
  - Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, phosphorus, potassium, selenium, silicon, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium and zinc
  - Mercury and methylmercury
- Alkalinity (total as $CaCO_3$);
- Ammonia;
- Biological Oxygen Demand;
- Chemical Oxygen Demand;
- Total suspended solids
- Total dissolved solids
- Dissolved organic carbon;
- Anions (chloride, bromide, fluoride and sulphate);
- Nutrients (nitrate, nitrite, phosphorus);
- Volatile organic compounds (VOCs);
- Poly-aromatic hydrocarbons (PAHs);
- Radionuclide parameters; and
- Microbiological parameters (total coliforms and E.coli.)

Water samples will be shipped to the laboratory on the same day as sample collection to meet the 24-hour holding time requirement for microbiological parameters. Water quality sample results will be provided to the water owner/user within 30 days of receipt from the laboratory, with appropriate follow-up support by the consultant for results interpretation.

7.2.7 Hydraulic Conductivity Testing

Hydraulic conductivity testing will be conducted immediately after well development and recovery of water levels (in high permeability formations) or during the first groundwater monitoring event (in low permeability formations) when water levels and water quality samples are collected.

Single Well Response Testing (SWRT) will be completed at a minimum of two locations (the nested shallow and deep monitoring well pair) at each key monitoring location to provide an estimate of shallow and deep hydraulic conductivity (K) values of the screened geologic media. Additional testing may be required at select monitoring locations to determine hydraulic conductivity values in all encountered media (e.g., shallow bedrock, deep bedrock and overburden units). K-values are integral to the determination of potential dewatering volumes, estimation of the associated zone of drawdown influence, which will be included in future reporting (effects assessment) but is not included in the baseline report scope of work.

The SWRT method involves causing a rapid change in hydraulic head in a well and measuring the water level response within the well. SWRT methods may include one or a combination of rising head or falling head tests, depending on the position of the static groundwater level within the monitoring well being tested. In slow recharge wells, bail down tests may be used in place of rising head of falling head tests.

The SWRT process employed for this Project will be as follows:

- At the start of the test, a static water level will be initially measured within the monitoring well;
- An electronic pressure transducer (datalogger) will be installed in the well below the water level and configured to monitor water levels at one second intervals;
- Falling head tests will be carried out by inserting a solid slug into the well, and the reverse technique carried out (i.e., slug removal) for a corresponding rising head test;
- Immediately following the introduction of the slug into the well, manual groundwater level measurements will be collected to supplement the datalogger readings, and recovery of the water level will be timed; and

- Testing will be concluded when a minimum of 65% recovery of the static water level is achieved in each well (>90% preferred).

SWRT will not be completed at monitoring wells that are observed to be dry or possess an insufficient water column height (i.e., <0.5 m).

7.3 Geochemistry Field Study

No baseline field investigations specific to the development of a geochemical characterization of construction material in support of this Project have been completed to date. This section describes the methods and specific procedures that will be followed to develop the proposed geochemical characterization through the implementation of this Study Plan. The proposed groundwater monitoring stations referenced in **Section 7.2.2** will be installed where key geological features (e.g., eskers and bogs), substantial construction works (e.g., quarries, lay down areas, and camps) and geotechnical drilling investigations will occur. Therefore, the geochemistry field study will be completed in conjunction with the proposed groundwater, field study and is captured as part of this Study Plan.

7.3.1 Soil and Rock ARD / ML Sampling

Soil material and bedrock samples will be collected from the proposed pit and quarry areas and other areas that will expose subsurface rock and soil during construction, such as road cuts and blasting areas, for geochemical characterization to identify the potential of subsurface material to produce ARD and / or ML that could affect water quality in surface water and / or groundwater. Typically, materials are predicted to be potentially acid generating (PAG) or not potentially acid generating (non-PAG) based on the relative amounts of constituent minerals that can form acid and those that can neutralize acid. Samples will be collected from overburden and bedrock geological units encountered in the monitoring well installations and geotechnical boreholes with increased focus on geological units associated with higher potential for sulphide mineralization and areas within close proximity to surface and groundwater receptors.

Soil and rock samples will be inspected in the field by a trained geologist to confirm regionally mapped units and provide further characterization of soil / rock types, weathering and mineralization.

The number of samples that will be submitted for geochemical testing is dependent on the volume, location and geological and geochemical composition of material that will be disturbed or moved during construction. The preliminary Project description will be used to estimate borrow source excavation and blasting volumes. The sampling frequency will be based on the assumed tonnage of overburden and bedrock material that will

be disturbed / relocated and guidance provided in MEND (Mine Environment Neutral Drainage Program). Guidance on sample frequency is provided by Price (2009), as shown in Table 7-1, and field information from the different geological units encountered during field investigations will be used to determine the number and distribution of the samples submitted for ARD / ML characterization.

Table 7-1: Sampling Frequency based on Estimated Tonnage

Tonnage of Unit (metric tonnes)	Minimum Number of Samples
< 10,000	3
< 100,000	8
< 1,000,000	26
< 10,000,000	80

Although geological units associated with higher potential of sulphide mineralization, if observed, will be sampled more intensively, all geological units that will be disturbed in the LSA will be sampled and characterized as part of the laboratory analytical program. Prior to sample submission, key information including location, dimensions, volume, geologic unit, visual description of mineralogy, and weathering will be recorded. Samples of bedrock and overburden will be collected and placed in labelled plastic bags and transported to a CALA (Canadian Association for Laboratory Accreditation) accredited laboratory for geochemical analysis.

Additional geochemical samples may be required in the future based on the ARD / ML characterization completed in the study and /or should the final Project design require substantially more soil / rock tonnage or materials from a different location than identified the preliminary Project design. If required, these additional samples would be collected as part of ongoing investigations to refine the road design and borrow sources. The geochemical characterization study will also identify if additional confirmatory sampling and laboratory characterization is required during rock excavation.

For the purposes of this study, 150 samples will be collected across 30 groundwater monitoring well locations. Each geologic unit encountered in the borehole will be sampled separately. It is assumed that three geological units will be present in the overburden and bedrock samples will be collected from the top of bedrock (at the overburden contact) and one from lower depth in the borehole. In addition to these 150 samples, and allowance has been made for 100 samples from the soil plots, potential bedrock outcrops, geotechnical core, and sulphidic rock based on geological information collected during field investigations.

If bedrock outcrops are sampled, fresh outcrop, and not exposed / weathered bedrock, samples will be collected. Additional boreholes may be required if there is insufficient core from the hydrogeological

boreholes to collect the adequate number ARD / ML core samples. The depth of the drill core samples will be shallower than the proposed depths of quarry / blasting operations, if known, to provide samples that are representative of blast / fill material. Additional bedrock sampling may be required based on initial ML / ARD results and on the homogeneity of the geology encountered throughout the entire length of each borehole.

Geochemistry analyses on samples will be completed for the following tests:

- Mineralogy (on samples representative of major geologic units): To determine the mineralogical composition of the rock samples.
- Near-Total Recoverable Elemental Analysis (including total mercury): To determine concentrations of metals to allow for comparison to water quality data and interpretation of metal leaching analysis.
- Acid Base Accounting: To estimate net acid generation potential of the rock based on a comparison of the acid-generation potential and acid-neutralization potential.
- Shake Flask Extraction: To identify parameters potentially prone to leaching (including dissolved mercury) when materials are initially exposed on surface.

Analytical results will be assessed by a professional geochemist to indicate the ARD and ML potential of soil and bedrock associated with ground disturbance and material placement activities associated with the Project. The geochemical data review will include comparison of laboratory data to in situ groundwater data collected from the corresponding monitoring wells at the sample location, and if available, surface water quality samples to assess the potential for metal leaching. The metal leaching source terms/ water quality will be used to support the surface and groundwater quality assessments.

The ARD potential will be assessed based on guidance provided in MEND (Price, 2009) using the following classification:

- **Negligible** – Laboratory testing indicates that the geological unit disturbed by the Project is non-PAG (NPR >2)
- **Low** – Laboratory testing indicates the majority of the geological unit disturbed by the Project is non-PAG, with a limited volume of “Uncertain” material excavation (NPR value between 1 and 2) but the overall NPR of the material is non-PAG.
- **Moderate** – Laboratory testing indicates that the majority of the geological unit be disturbed by the Project is Uncertain (NPR between 1-2) with a limited volume of PAG material (NPR <1) but the overall NPR of the material is also Uncertain.

- **High** – Laboratory testing indicates that the majority of the volume of the geological unit disturbed by the Project is Uncertain and the overall blend is PAG (NPR between 1-2, or <1, respectively) or the majority of the material is PAG

Should results suggest moderate to high potential for ARD, the following phased characterization approach and impact management measures / mitigation plans will be considered and implemented based on the recommendations of a qualified professional geochemist:

- Conducting additional laboratory (e.g., static or kinetic) testing to confirm ARD and ML potential.
- Avoiding disturbing or using the suspect rock.

The need for an ARD / ML Management Plan will be determined following the assessment of field data and completion of the baseline report.

8. Data Management and Analysis

Data management including quality assurance / quality control (QA / QC) will be employed to minimize potential for data entry and analysis errors, prepare data sets for analysis and limit sensitive data distribution in accordance to established agreements.

8.1 Data Management

It is expected that a standard spreadsheet software package, such as MS-Excel, will be sufficient to manage data collected for this Project. Field sheets, Laboratory Certificates of Analysis and original electronic data files provided by the laboratory will be archived as reference materials for the Project.

8.2 Groundwater Quality

8.2.1 Quality Control (QC) Samples

Quality control (QC) procedures will adhere to recommendations of CCME (2016) for sample collection. For water quality, QC samples will be collected to include travel blanks, field blanks and duplicate samples. The total number of QC samples will represent a minimum of 10% of the total samples collected during the program. The QC samples will be submitted “blind” to the laboratory for analysis of the full suite of water quality parameters being analyzed for the program.

Water samples will be analyzed at a Canadian Association for Laboratory Accreditation (CALA) certified laboratory, where possible, and using the lowest feasible method detection limit (MDL).

8.2.2 Data Analysis and Reporting

Upon completion of the two-year groundwater monitoring program, water quality and quantity data will be analyzed and the findings will be presented in a hydrogeology baseline report. This report will be prepared in support of the Project IS / EA Report and will be focused on areas where the Project has the potential to affect groundwater quantity or quality, specifically along the selected CAR, quarries and pits, associated

access roads and laydown areas, and near groundwater users (e.g., the MFFN community). The hydrogeology baseline report will include:

- A conceptual site model of the hydrogeological environment, including a discussion of geomorphic, hydrostratigraphic, hydrologic, climatic and anthropogenic controls on groundwater flow along the CAR.
- Figures showing:
  - The Project location and key features (i.e., the selected CAR, quarries and pits, access roads, camp and laydown areas, the Marten Falls First Nation community and registered and unregistered water wells and springs);
  - The distances between the Project location and existing infrastructure (building and water wells);
  - Expected excavation/dewatering drawdown cone and inferred wellhead capture zones;
  - Project study areas, encompassing the spatial boundaries of the Project, including any associated project components and the anticipated boundaries of the Project effects that may potentially affect local communities, municipalities and Indigenous groups;
  - Bedrock and surficial geology, including major structural features (e.g., faults) and inferred hydrostratigraphic units;
  - Groundwater monitoring locations and interpreted groundwater flow directions;
  - Interpreted groundwater flow divides;
  - Permanent and intermittent water bodies (e.g., streams, wetlands); and
  - Areas of groundwater recharge and discharge.
- Tables summarizing data, such as:
  - Information on current water well or surface water point of diversion owners within the Project RSA will be presented, including: water levels, well bottom, inferred available drawdown, reported yield, screened hydrostratigraphic unit, distance to Project disturbance areas, estimated wellhead capture zones, cultural significance, type, (e.g., drinking water, irrigation, and agricultural) and uses (domestic, communal, municipal, commercial/industrial), if available;
  - Discussion on the likelihood and magnitude of potential impacts (permanent, seasonal, periodic or temporary) to identified drinking water sources and groundwater/surface water features.
  - Borehole co-ordinates and monitoring well details;

  - Summary of hydraulic conductivity testing results;
  - Assumed properties of hydrostratigraphic units;
  - Measured groundwater elevations;
  - Measured horizontal and vertical groundwater gradients; and
  - Groundwater quality results.

- Groundwater quality results will be compared to all applicable guidelines and standards for aquatic life and drinking water uses, including the Canadian Drinking Water Quality Guidelines (CDWQG), Ontario Groundwater Quality Standards (ODWQS) and the Ontario Soil, Groundwater and Sediment Standards (SGSS). Any samples collected from groundwater springs will also be compared against the above applicable criteria. Exceedances of any guideline or standard will be flagged in the report, which includes the most stringent guideline values;
- Water chemistry plots (i.e., time-series graphs of water quality);
- Registered and unregistered water wells installation logs and discussion on whether consumption of water from any of the wells has Indigenous cultural importance;
- Hydraulic conductivity analysis;
- Discussion on groundwater-surface water interactions at water crossing and wetland locations;
- Discussion on general water management (groundwater withdrawal and discharge and surface water diversion) during access corridor construction activities; and
- Water balance and zone of influence modelling methods, assumptions and results.

Predictive modelling, such as analytical equations, numerical groundwater models and / or water balance models, will be completed to estimate the effects of construction on groundwater quality and quality. Where practical, these modelling efforts will include input from the surface water component. The groundwater quantity modelling will include calculation of zones of influence / drawdown cones to assess potential interference with groundwater systems, ecological systems (surface water and wetlands) and drinking water sources. In addition, groundwater quality modelling will be conducted to assess potential contaminant migration and assess temporary / permanent changes to groundwater quality at potential receptors as a result of intrusive construction work (e.g., quarrying).

The geochemical characterization report, summarizing the results of the desktop review (**Section 7.1.2**) and soil and rock sampling (**Section 7.3**) will be prepared to support the assessment of effects on groundwater

and surface water quality, and will be included as an appendix to the hydrogeology baseline report. The geochemical characterization report will include:

- Figures showing:
  - The Project location and key features (i.e., the selected CAR, quarries and pits, access roads, camp and laydown areas, the Marten Falls First Nation community and registered and unregistered water wells and springs);
  - Bedrock and surficial geology;
  - Soil and bedrock ARD / ML sampling locations; and
  - Interpreted ARD characterization.
- Tables summarizing data, such as:
  - Soil and rock ARD / ML sample information, including location and geologic unit;
  - ARD/ML laboratory characterization data; and
  - Comparison metal leaching laboratory data with surface and groundwater quality data.
- Determination of ARD potential based on guidance provided in MEND (Price, 2009);
- Discussion of metal leaching source terms/water quality for inclusion in the groundwater and surface water quality assessment; and
- Discussion on the ARD/ML potential along the proposed routes and identification of soil / rock types requiring either additional characterization or special management.

9. Effects Assessment

The following sections provide discipline-specific input and considerations as they pertain to the methodology for effects assessment. The Project is in the early stage of the IS / EA Report preparation and it is expected that the effects assessment methodology will be refined iteratively based on regulatory agency guidance, professional judgment and input received through the Project consultation and engagement process.

9.1 Project-Environment Interactions

The Project activities that may result in changes to the environment are described within the identified temporal and spatial boundaries. This includes identification of both direct and indirect changes by comparing the existing setting to the conditions anticipated to occur as a result of the Project. For each environmental discipline, the likely Project-environment interactions will be identified based on professional judgment, activities listed in TISG Section 3.2 as well as projects of similar magnitude and / or location.

A preliminary analysis of Project-environment interactions for the Groundwater and Geochemistry discipline is provided in **Table 9-1** and will be confirmed during the IA / EA process to identify the Project-environment interactions that are likely to have a potential effect, and to identify measures to avoid or minimize potential negative effects and enhance benefits.

Table 9-1: Project – Environment Interactions

Project Phases	Project Activities	Groundwater
Construction Phase	*Mobilization of Equipment and Supplies*	
	Temporary Construction Staging Areas[1]	X
	Temporary Access Roads and Trails[1]	X
	Temporary Construction Camps[1]	X
	ROW Clearing and Grubbing	X
	Brush and Timber Disposal	
	Pits and Quarries[1]	X
	Drilling / Blasting / Aggregate Production	X
	Road Construction (stripping, subgrade excavation, embankment fill placement, grading, ditching)	X
	Bridge and Culvert Installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls)	X
	Construction Site Restoration	X

Project Phases	Project Activities	Groundwater
Construction Phase: Decommissioning	*Pits and Quarries*	**X**
	Temporary Camps, Roads / Trails and Staging Areas	**X**
Operations Phase	*Road Usage*	
	Maintenance[2]	**x**

Notes: 1. Includes construction and use of
2. Includes General Maintenance (e.g., grading, erosion control, quarrying, borrow pits), Seasonal Maintenance (e.g., snow clearing, bridge and culvert maintenance), and Special Maintenance (e.g., slope failures, road settlement / break-up.).

9.2 Valued Components and Indicators

VCs are the environmental, health, social, economic or additional elements or conditions of the natural and human environment that may be impacted by a proposed project and are of concern or value to the public, Indigenous peoples, federal authorities and interested parties (the Agency 2020b). Indicators represent the resource, feature, or issue related to the VC that, if changed, may demonstrate an effect on the environment. The indicators and rationale for selection and measurement of potential effects, to be used to assess and evaluate the alternative routes in the IS / EA Report are provided in **Table 9-2.** The table includes both quantitative and qualitative indicators. The final list of VCs and indicators to be used in the IS / EA Report will be based on regulatory agency guidance, professional judgement and input received through the Project consultation and engagement process.

The VCs of the Groundwater and Geochemistry discipline have been determined through consideration of the following factors listed in the TISG[7]:

- VC presence in the study area;
- the extent to which the VC is linked to the interests or exercise of Aboriginal and Treaty Rights of Indigenous peoples, and whether an Indigenous group has requested the VC;
- the extent to which the effects (real or perceived) of the Project and related activities have the potential to interact with the VC;
- the extent to which the VC may be under cumulative stress from other past, existing or future undertakings in combination with other human activities and natural processes;
- the extent to which the VC is linked to federal, provincial, territorial or municipal government priorities (e.g., legislation, programs, policies);

7. *The TISG also states that information from ongoing and completed regional assessments in the proposed area of the Project should be used to inform VCs for the Project. In February 2020 a regional assessment of the Ring of Fire region commenced; however, it is not sufficiently advanced at this time to inform the Project VCs. The VCs will be consulted and engaged on early in the IA/ EA process and finalized taking into consideration the input received. Therefore, only information relevant to the Project that arises from the regional assessment of the Ring of Fire within an appropriate timeline will inform the VCs for the Project.*

- the possibility that adverse or positive effects on the VC would be of particular concern to Indigenous groups, the public, or federal, provincial, territorial, municipal or Indigenous governments; and
- whether the potential effects of the Project on the VC can be measured and / or monitored or would be better ascertained through the analysis of a proxy VC.

Inputs received to date from Indigenous communities, agencies and interested persons through the Consultation and Engagement Program, including inputs received on the Draft ToR, have also been used to inform the selection of the VCs and indicators for the Groundwater and Geochemistry discipline.

Table 9-2: Groundwater Indicators

Valued Component	Indicators	Rationale for Selection
Groundwater	■ Groundwater Quality: Degradation of physical and chemical characteristics of groundwater.	■ Importance for the protection of aquatic and terrestrial life ■ Importance for potable water supplies ■ Indigenous cultural importance for consumption
	■ Groundwater Quantity: Change in groundwater levels.	■ Quantify effects to landowners, users and ecosystems.

Geochemistry is not considered a VC, but rather a supporting technical discipline to other VCs. This considers that the results of the geochemical characterization of construction material, specifically the ARD potential and metal leaching source terms, will be used to support the assessment of Project-related effects to the groundwater and surface water quality indicators, and, in turn, the determination of significant of effects to the groundwater and surface water VCs.

9.3 Potential Effects

A direct effect occurs through the direct interaction of an activity with an environmental discipline. The Project-environment interactions currently anticipated, based upon preliminary analysis, to result in direct effects to the Groundwater and Geochemistry discipline have been identified in **Table 9-1**. The potential direct effects resulting from the Project-environment interactions will be confirmed during the IA / EA process and will be based on input received through the Indigenous knowledge Program and Consultation and Engagement Program, regulatory agency guidance, and professional judgement.

An indirect effect occurs when a change to one environmental discipline resulting from a Project activity causes a change to another environmental discipline (e.g., changes in vegetation could indirectly affect wildlife). **Table 9-3** provides a preliminary identification of how changes to groundwater may result in indirect effects to other environmental disciplines.

Table 9-3: Potential Discipline Interactions

Discipline and Associated Valued Components	Aboriginal Treaty Rights and Interests	Atmospheric Environment	Acoustic and Vibration Environment	Physiography, Geology, Geochemistry, Terrain and Soils	Surface Water	Groundwater and Geochemistry	Vegetation	Wildlife	Fish and Fish Habitat	Social	Economy	Land and Resource Use	Human Health and Community Safety	Visual Aesthetics	Archaeological and Cultural Heritage
Groundwater and Geochemistry ■ **Groundwater**	X	-	-	X	X		X	X	X	-	-	X	X	-	-

Notes: X = Potential pathway for indirect effect as a result of the Project.
- = No pathway for indirect effect is anticipated as a result of the Project.

9.4 Methods for Predicting Future Conditions

With respect to quantitative models and predictions, the IS / EA Report will detail the model assumptions, parameters, the quality of the data and the degree of certainty of the predictions obtained.

Analytical calculations and analysis software packages (e.g., AQTESOLVE) will be utilized for the estimation of K-values and results will be presented in the baseline report. Hydraulic conductivity values and measured hydraulic gradients can be used to estimate groundwater travel times between Project areas and downgradient receptors, such as drinking water wells, wetlands, and streams in future Groundwater related assessments. Hydraulic conductivity values will be used to estimate the water quantity and quality impacts on water resources based on preliminary design plans. Assessments will include:

- withdrawal of groundwater or surface water;
- changes to the groundwater recharge/discharge areas;
- temporal and spatial changes in groundwater quantity, quality and flow (e.g., long-term changes in water levels), including how these changes may relate to domestic, communal or municipal water supply wells;
- the flow or volume of water available in the water bodies; and
- management of any groundwater or wastewater discharge.

Analytical equations and/or numerical groundwater models will use field derived aquifer properties to estimate CAR construction related zones of influence / drawdown cones to assess for potential interference with ecological systems or drinking water sources. In addition, a water balance model approach will be utilized to evaluate the impact of groundwater extraction on valued ecosystem components (receptors).

Calculations will be required to estimate the volume of rock / aggregate available from potential sources based on a survey of each specific area and assumption of aggregate thicknesses and quarry extents. These calculations can be completed using AutoCAD / GIS. To assess the magnitude of potential ARD / ML impacts on water quality downgradient of borrow source / quarry areas, borrow material placement areas and disturbed areas (i.e., blasting) may require geochemical modelling. These calculations will be completed using industry standard software (such as PHREEQC) during the effects assessment.

9.5 Mitigation and Enhancement Measures

Once potential effects have been identified, the effects assessment will explore technically and economically feasible mitigation measures to avoid or minimize the identified negative effects and enhancement measures to increase positive effects beyond those that are already inherent to the design. These measures will consist of industry-standard practices, federal and provincial standard specifications, regulator-mandated measures, best management practices, Indigenous and community recommendations and recommendations from industry and environmental professionals based on expertise, scientific publications, experience and judgement.

It is important that mitigation and enhancement measures are achievable, measurable and verifiable and monitored for compliance and effectiveness during all temporal phases as part of the Project follow-up monitoring plan. Required environmental monitoring will verify the potential environmental effects predicted in the IS / EA Report, evaluate the effectiveness of mitigation and enhancement measures, and identify the process the Proponent will follow if mitigation and enhancement measures are not effective.

9.6 Residual Effects

Residual effects are the effects remaining after the application of mitigation measures. The IS / EA Report will describe in detail the potential adverse and positive residual effects in relation to each temporal phase of the Project (e.g., construction, operation). Residual effects will be described using criteria to quantify or qualify adverse and positive effects, taking into account any important contextual factors. The residual effects will therefore be described in terms of the direction, magnitude, geographic extent, duration, frequency, likelihood, and whether effects are reversible or irreversible[8].

Ecological and socio-economic context may also be relevant when describing a residual effect. Context relates to the existing setting, its level of disturbance and resilience to adverse effects. Context can also relate to timing as it applies to assessing the worst-case scenario (e.g., effect during migratory or calving season for wildlife). Where appropriate, information regarding residual effects will be disaggregated by sex, gender, age and other community relevant identifying factors to identify disproportionate residual effects for diverse subgroups.

8. *TISG Section 13.1 identifies additional effects characteristics for certain disciplines (e.g., wetlands, birds, terrestrial wildlife, species at risk). These additional effects characteristics are described in the respective discipline-specific study plans.*

9.6.1 Magnitude

For magnitude, groundwater-specific definitions are required and are proposed below **Table 9-4** and **Table 9-5**. The magnitude of residual effects on groundwater quality will consider potential contaminants of concern, and how these are predicted to change relative to baseline conditions and applicable guidelines, objectives or other specified threshold values.

Table 9-4: Groundwater Quantity Magnitude Definition

Magnitude Level	Definition	Rationale
Negligible	■ Range of seasonal fluctuation in groundwater levels or the predicted water balance remains within the range of natural seasonal variability.	■ Monitoring wells show no discernable change to water levels, therefore no effect on ecological life or water well supply.
Low	■ Range of seasonal fluctuation in groundwater levels or the predicted water balance is marginally outside the range of natural seasonal variability (up to 20% higher/lower than existing condition values).	■ Temporary or permanent change to water levels is discernable but water supply remains protective of ecological life and enough for existing water well supply.
Medium	■ Range of seasonal fluctuation in groundwater levels or the predicted water balance is modestly outside the range of natural seasonal variability (between 20 and 50% higher/lower than existing condition values).	■ Temporary or permanent change to water levels is substantial but water supply remains protective of ecological life and sufficient for existing water well supply.
High	■ Range of seasonal fluctuation in groundwater levels or the predicted water balance is substantially outside the range of natural seasonal variability (up to over 50% higher/lower than existing condition values).	■ Temporary or permanent change to water quality is substantial and can potentially impair ecological use or existing water well supply.

Table 9-5: Groundwater Quality Magnitude Definition

Magnitude Level	Definition	Rationale
Negligible	■ There is little to no variation predicted in measurable parameters and is within the range of natural variation.	■ Monitoring wells show no discernable change to water quality, therefore no effect on ecological life or potable use.
Low	■ There is a small variation predicted in measurable parameters, that are outside the range of natural variation and below the applicable water quality criteria or within 20% of existing condition values.	■ Temporary effect or permanent change to water quality is discernable but remains protective of ecological life and potable water sources.

Magnitude Level	Definition	Rationale
Medium	■ There is a modest variation predicted in measurable parameters, that is significantly different from existing conditions and is below the applicable water quality criteria or is between 20% to 50% of existing condition values.	■ Temporary effect or permanent change to water quality is discernable but remains protective of ecological life and potable water sources.
High	■ There is a large variation predicted in measurable parameters, exceeds applicable water quality criteria, or is greater than 50% of existing condition values.	■ Temporary effect or permanent change to water quality is discernable and can potentially impair ecological or potable uses of water.

9.7 Consideration of Sustainability Principles

The following provides a generic description of how sustainability principles will be considered in the effects assessment. The extent to which sustainability principles apply to a specific VC will vary depending on the nature of the VC and the potential for Project effects on the VC.

The effects assessment approach for the Project has included the consideration of the sustainability principles outlined in the Project TISG and the Agency's guidance on sustainability. The sustainability principles that have been considered include:

1. Consider the interconnectedness and interdependence of human-ecological systems;
2. Consider the well-being of present and future generations;
3. Consider positive effects and reduce adverse effects of the Project; and
4. Apply the precautionary principle by considering uncertainty and risk of irreversible harm.

The interconnectedness and interdependence of human-ecological systems will be considered through the assessment of potential indirect effects of each alternative. An indirect effect occurs when a change to one environmental discipline resulting from a Project activity causes a change to another environmental discipline (e.g., changes in vegetation could indirectly affect wildlife). A preliminary assessment of indirect effects has been included in **Section 9.3**.

The well-being of present and future generations will be considered in the effects assessment through the application of the long-term operations phase temporal boundary of 75 years (**Section 6.1**) and through the effects characteristics description of duration and reversibility for each residual effect predicted.

The consideration of positive effects and reducing adverse effects of the Project is fundamental to the effects assessment methodology through the identification of mitigation measures to reduce potential adverse effects and the identification of the preferred alternative through the evaluation of advantages (e.g., positive effects) and disadvantages (e.g., adverse effects).

The effects assessment will apply the precautionary principle by clearly describing and documenting all uncertainties and assumptions underpinning the analysis and identifying information sources. The effects assessment will consider risk of irreversible harm through the effects characteristics description of reversibility for each residual effect predicted and will describe any uncertainty associated with the assessment of residual effects.

The scope of the sustainability assessment will be defined by issues of importance identified by Indigenous communities and interested persons through consultation and engagement activities, while also ensuring to be inclusive of the diversity of views expressed. The selection of VCs that will be the focus of the sustainability assessment will be aligned with the issues of importance identified by Indigenous communities and interested persons, as well as residual effects identified through the effects assessment process. The sustainability assessment will describe how the planning and design of the Project, in all phases including follow-up monitoring, considered the sustainability principles.

9.8 Consideration of Identity and Gender-Based Analysis Plus in Effects Assessment

The Proponent recognizes that communities and sub-populations within those communities may be impacted differently by the Project with respect to VCs and indicators. As such, the Project aims to collect baseline information for the purpose of assessing differential effects and establishing relevant mitigation measures, as further elaborated on in **Section 4.3**. Gender-Based Analysis Plus will not be limited to community feedback, when offered or discussed in secondary texts, additional sub-population information as is applicable to the relevant assessment will be incorporated.

9.9 Follow-up Programs

A follow-up program verifies the accuracy of the effects assessment and evaluates the effectiveness of mitigation measures. Identification of follow-up programs for the Project are not described in this Study Plan as the information needed to determine environmental monitoring requirements is dependent on the outcome of the effects assessment and consultation with Indigenous communities, agencies and interested persons. Therefore, the Proponent will include information on follow-up programs, that address the requirements outlined in Section 26 of the TISG, in the IS / EA Report and will identify the compliance and effects monitoring activities to be undertaken during all phases of the Project, as required.

10. Assumptions

The following assumptions were used when determining the above effects assessment methodology:

1. Existing condition values for groundwater quantity will be based on the seasonal range of groundwater levels collected three times per year (spring, summer and fall) over a period of two (2) years at all monitoring stations.
2. Existing condition values for groundwater quality will be based on the seasonal range of groundwater concentrations obtained from samples collected three times per year (spring, summer and fall) over a period of two (2) years at all monitoring stations.
3. Geochemistry soil and bedrock samples will be collected at 30 monitoring well locations (15 typical and five) detailed locations, which each have three monitoring well locations). Each geologic unit encountered in the borehole will be sampled separately. It is assumed that three geological units will be present in the overburden. Bedrock samples will be collected from the top of bedrock (at the overburden contact) and one from a lower depth in the borehole. In addition to these 150 samples, an allowance has been made for 100 samples from the soil plots, potential bedrock outcrops, geotechnical core and sulphide rock.
4. Geochemistry analyses on samples will be completed for the following tests:
    a. Mineralogy (on samples representative of major geologic units): 25 samples.
    b. Near-Total Recoverable Elemental Analysis (including total mercury): 250 samples.
    c. Acid Base Accounting: 250 samples
    d. Shake Flask Extraction: 250 samples

11. Concordance with Federal and Provincial Guidance

This section provides the best information currently available on how federal and provincial requirements identified for the Project to date will be addressed. The final concordance with federal and provincial requirements will be included in the IS / EA Report, and will be based on regulatory agency guidance, professional judgement and input received through the Project consultation and engagement process.

Table 11-1: Study Plan Federal Concordance – Conformance with Requirements

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
1	The Agency	TISG Section 4.4, page 19	■ In its alternative means analysis, in addition to the potential environmental, health, social and economic effects, the proponent must address all project elements, including, but not limited to, the following project elements and components, where relevant to the Project activities and design: – management of mobilized metals (such as chromium and other naturally occurring metals) from aggregate extraction and stockpiling activities;	■ This work plan outlines the proposed desktop assessment and field sampling program that will be conducted to assess the likelihood of ML / ARD impacts on groundwater quality within the Project area. Should results suggest moderate to high potential for ARD, the following phased characterization approach and impact management measures / mitigation plans will be considered and implemented based on the recommendations of a qualified professional geochemist: – Conducting additional laboratory (e.g., static or kinetic) testing to confirm ARD and ML potential. – Avoiding disturbing or using the suspect rock. ■ The need for an ARD / ML Management Plan will be determined following the assessment of field data and completion of the baseline report. ■ The soil sampling component of this work plan is outlined in Section 7.3.1 and includes analysis of metals, as well as numerous other parameters. ■ Calculations will be required to estimate the volume of rock / aggregate available from potential sources based on a survey of each specific area and assumption of aggregate thicknesses and quarry extents. These calculations can be completed using AutoCAD / GIS. To assess the magnitude of potential ARD / ML impacts on water quality downgradient of quarry areas, borrow material placement areas and disturbed areas (i.e., blasting) may require geochemical modelling. These calculations will be completed using industry standard software (such as PHREEQC) during the effects assessment. A limited amount of modelling may be required during the effects assessment; however, modelling is not planned for the baseline report	■ Section 7.3.1 and 9.4
2	The Agency	TISG Section 14.2, page 87	■ If the proponent undertakes quarrying activities to extract aggregate material that may results in effects on groundwater and surface water levels (i.e., quarrying below the water table), the Impact Statement must describe the risk to the receiving environment related to effects to the quantity and quality of all effluent streams released from the site, including surface runoff from aggregate and overburden stockpiles, and dewatering discharge;	■ Potential changes to groundwater (quality and quantity) will be assessed as part of the EA. Changes to surface water (quality and quantity) will be assessed under the Surface Water Study Plan	■ Section 7.1, 7.2, and Section 9.4 ■ ■ Surface Water Study Plan
3	The Agency	TISG Section 14.2, page 88	■ With respect to potential effects on water quality resulting from acid rock drainage and/or metal leaching, the Impact Statement must: provide estimates of the potential for aggregate extraction activities (i.e., eskers and quarries) and rock exposed in permanent rock cuts to be sources of acid rock drainage or metal leaching; "	■ Analytical results will be assessed by a professional geochemist to indicate the ARD and ML potential of soil and bedrock associated with ground disturbance and material placement activities associated with the Project. The geochemical data review will include comparison of laboratory data to in situ groundwater data collected from the corresponding monitoring wells at the sample location, and if available, surface water quality samples to assess the potential for metal leaching. The metal leaching source terms/ water quality will be used to support the surface and groundwater quality assessments. The assessment of ARD potential will be assessed based on guidance provided in MEND (Price, 2009) using the following classification: – Negligible – Laboratory testing indicates that the geological unit disturbed by the Project is non-PAG (NPR >2)	■ Section 7.3

9. *Federal TISG Reference should be the Section or subsection, page etc. that clearly identifies where comment/issue we are addressing can be found (ex. Section 8.1 of TISG)*

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
				– Low – Laboratory testing indicates the majority of the geological unit disturbed by the Project is non-PAG, with a limited volume of "Uncertain" material excavation (NPR value between 1 and 2) but the overall NPR of the material is non-PAG. – Moderate – Laboratory testing indicates that the majority of the geological unit be disturbed by the Project is Uncertain (NPR between 1-2) with a limited volume of PAG material (NPR <1) but the overall NPR of the material is also Uncertain. – High – Laboratory testing indicates that the majority of the volume of the geological unit disturbed by the Project is Uncertain and the overall blend is PAG (NPR between 1-2, or <1, respectively) or the majority of the material is PAG	
4	The Agency	TISG Section 14.2, page 88	■ If the proponent undertakes quarrying activities to extract aggregate material that may results in effects on groundwater and surface water levels (i.e., quarrying below the water table), the Impact Statement must describe the methods used to predict acid rock drainage and/or metal leaching for construction materials, including sample collection and laboratory testing; "	■ Sampling and laboratory analysis methods will be discussed in the baseline report. Details of the ML / ARD potential determination methods for borrow source material will also be provided in the IS / EA Report	■ Section 7.3
5	The Agency	TISG Section 14.2, page 88	■ If the proponent undertakes quarrying activities to extract aggregate material that may results in effects on groundwater and surface water levels (i.e., quarrying below the water table), the Impact Statement must provide an acid rock drainage assessment and mitigation plan that describes the confirmatory monitoring of construction materials and potential mitigation strategies to prevent or control acid rock drainage and metal leaching during construction, operation, decommissioning and abandonment; and	■ This Study Plan outlines the proposed desktop assessment and field sampling program that will be conducted to assess the likelihood of ML / ARD impacts on surface water or groundwater quality within the Project area. Should results suggest moderate to high potential for ARD, the following phased characterization approach and impact management measures / mitigation plans will be considered and implemented based on the recommendations of a qualified professional geochemist: – Conducting additional laboratory (e.g., static or kinetic) testing to confirm ARD and ML potential. – Avoiding disturbing or using the suspect rock. ■ The need for an ARD / ML Management Plan will be determined following the assessment of field data and completion of the baseline report.	■ Section 7.3
6	The Agency	TISG Section 14.2, page 88	■ If the proponent undertakes quarrying activities to extract aggregate material that may results in effects on groundwater and surface water levels (i.e., quarrying below the water table), the Impact Statement must describe contingency plans, monitoring during operation, decommissioning and abandonment, and maintenance plans.	■ Monitoring programs will be identified as part of the IA / EA.	■ Section 9.9
7	The Agency	TISG Section 14.2, page 88	■ If the proponent undertakes quarrying activities to extract aggregate material that may results in effects on groundwater and surface water levels (i.e., quarrying below the water table), the Impact Statement must identify potential risks to surface and seepage water quality from the aggregate and overburden stockpiles and project infrastructure during construction, and operation, decommissioning and abandonment;	■ Potential changes to surface and groundwater (quality and quantity) will be assessed as part of the IA / EA.	■ Section 7, Section 9
8	The Agency	TISG Section 1.1, page 4	■ The Guidelines correspond to factors to be considered in the impact assessment. These factors are listed in subsection 22(1) of IAAC and prescribe that the impact assessment of a designated project must take into account any change to the designated project that may be caused by the environment;	■ The potential effects of the project on the quality and quantity of groundwater and the potential effects of the environment on the project will be assessed in accordance with applicable standards and guidance.	■ Section 9
9	The Agency	TISG Section 2.3, pages 6-7	■ The description should focus on aspects of the Project and its setting that are important in order to understand the potential environmental, health, social and economic effects and impacts of the Project. The following information must be included and, where appropriate, located on map(s): – geographic co-ordinates (i.e., longitude/latitude using international standard representation in degrees, minutes, seconds) for the beginning and end points of the proposed road; – current land and/or aquatic uses within the study areas;	■ The information related to landscape features, sensitive or protected areas and select others listed in the TISG will be illustrated on detailed maps and/or described within the IS / EA Report, where appropriate. This information will be gathered through the desktop analysis, consultation and community engagement and field studies as described in the Study Plan.	■ Section 7; Section 8

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
			– distance of the project components to any federal lands and the location of any federal lands within the study areas; – all waterbodies and their location on a map; – navigable waterways; – the environmental significance and value of the geographical setting in which the Project will take place and the study areas; – environmentally sensitive areas, such as national, provincial, territorial and regional parks, UNESCO World Heritage Sites, geological heritage sites, ecological reserves, ecologically and biologically sensitive areas, wetlands, and habitats of federally or provincially listed species at risk and other sensitive areas; – Dedicated Protected Areas3 and any other areas of ecological and social significance identified by the community during the community-based land use planning processes with the Province of Ontario (e.g., Enhanced Management Areas; see Section 6.1 for requirements related to confidentiality); – lands subject to conservation agreements; – current mineral development proposals, and areas of early and advanced mineral exploration in the study areas; – current areas of aggregate extraction; – description and locations of all potable drinking water sources (i.e., municipal or private), including spring water sources; – description of local communities and Indigenous groups that is culturally relevant and gender sensitive; – if the information is not confidential, provide a description and location of Indigenous traditional territories and/or consultation areas, Treaty and/or Title lands, Indian Reserve lands, Indigenous harvesting regions (with permission of Indigenous groups), Métis settlements; and – culturally important features of the landscape.		
10	The Agency	TISG Section 3.1, page 10	■ The Impact Statement must describe all project components including but not limited to: – water management infrastructure to divert, control, collect and discharge surface drainage and groundwater seepage to the receiving environment; – the location and details of single and multi-span watercourse crossings and types of structure used for water crossings (e.g., crossing type, design and length); – the location and details of culverts for water flow connectivity and water level balancing (e.g., crossing type, design and length.);	■ The baseline groundwater report will include language regarding general water management (groundwater withdrawal and discharge and surface water diversion) during access corridor construction activities.	■ Section 8.2.2
11	The Agency	TISG Section 5.1, page 22	■ Any proposed mitigation measures are to be clearly linked, to the extent possible, to valued components in the Impact Statement as well as to specific project components or activities, as well as comments raised during engagement activities	■ Once potential effects have been identified, the effects assessment will explore technically and economically feasible mitigation measures to avoid or minimize the identified negative effects and enhancement measures to increase positive effects.	■ Section 9.5

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
12	The Agency	TISG Section 7.1, page 30	■ The Impact Statement must establish appropriate study area boundaries to describe the baseline conditions. The study area boundaries need to encompass the spatial boundaries of the Project, including any associated project components or activities, and the anticipated boundaries of the Project effects, including all potentially impacted local communities, municipalities and Indigenous groups. Considerations in assigning appropriate study areas or boundaries would include, but not be limited to: – areas potentially effected by changes to water quality and quantity or changes in flow in the watershed and hydrologically connected waters; – areas potentially effected by airborne emissions or odours; – areas determined by dispersion and deposition modelling; – areas within the range of vision, light and sound and the locations and characteristics of the most sensitive receptors; – species habitat areas, usage timing and migratory patterns; – emergency planning and emergency response zones; – the geographic extent of local and regional services; – any impacted local communities, including municipalities; – all potentially impacted Indigenous groups; – areas of known Indigenous land, cultural, spiritual and resource use; and – existing effected infrastructure.	■ The Study Areas are defined and described in the Study Plan.	■ Section 6
13	The Agency	TISG Section 7.1, page 30	■ If the baseline data have been extrapolated or otherwise manipulated to depict environmental, health, social and/or economic conditions within the study area, modelling methods must be described and must include assumptions, calculations of margins of error and other relevant statistical information. Models that are developed should be validated using field data from the appropriate local and regional study areas. Ensure baseline data are representative of project site conditions. If surrogate data from reference sites are used rather than site-specific surveys, the proponent should demonstrate that the data are representative of project site conditions.	■ We will include details on modelling methods and discuss confidence in using desktop and/or field studies when describing baseline conditions.	■ Sections 7.2, 8.2.2, and 9.4
14	The Agency	TISG Section 7.1, page 31	■ Where baseline data are available in geographic information system (GIS) format, this information is to be provided to the Agency as electronic geospatial data file(s) compliant with the ISO 19115 standard19. This would support the Government of Canada's commitment to Open Science and Data and would facilitate the sharing of information with the public through the Canadian Impact Assessment Registry Internet Site and the Government's Open Science and Data Platform. The Agency intends to make the geospatial data files available to the public under the terms of the Open Government License – Canada.	■ Data provided will meet ISO 19115 standards.	■ Section 8
15	The Agency	TISG Section 7.2, page 32	■ The Impact Statement must provide detailed descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental, health, social and economic condition that is described, in order to corroborate the validity and accuracy of the baseline information collected.	■ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan.	■ Section 7
16	The Agency	TISG Section 7.2, page 33	■ Baseline data must be collected in a manner that enables reliable analysis, extrapolations and predictions. Resulting data should be suitable for analyses to estimate pre-project baseline conditions, derive predictions of impacts, and evaluate and compare post-project conditions and at scales of within and across the Project, Local and Regional Assessment areas. Modelling methods, error estimates and assumptions should be reported (as per section 7.1). Modelling and simulations should be used early in the planning phase to estimate the necessary sampling intensity and to quantitatively evaluate the effectiveness of design options. Ethical guidelines and relevant cultural protocols governing research, data collection and confidentiality must be adhered to.	■ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan.	■ Section 7

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
17	The Agency	TISG Section 7.2, page 33	■ If using existing data sources, the Impact Statement must provide justification to show that the data sources are relevant in spatial and temporal coverage to the Project. Some data sources may have good coverage in Southern Ontario or existing road networks but be unsuitable as a baseline for these northern areas where there are not roads.	■ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA Report.	■ Section 7; Appendix A
18	The Agency	TISG Section 7.2, page 33	■ With regard to field studies, survey work must be planned to include multiple sampling locations and multiple visits to each location to support all required assessment analyses. Existing data should be considered as a limited augmentation of this new data. See the “Establishing Baseline Conditions” (sections 8.5, 8.9, 8.10, 8.11) in this Tailored Impact Statement Guidelines for recommendations on survey design and methodology. Surveys and analyses should be conducted by qualified experts. Baseline data must be collected in a manner that enables reliable analysis, extrapolations and predictions. Resulting data should be suitable for analyses to estimate pre-project baseline conditions, derive predictions of impacts, and evaluate and compare post-project conditions and at scales of within and across the Project, Local and Regional Assessment areas. Modelling methods, error estimates and assumptions should be reported (as per section 7.1). Modelling and simulations should be used early in the planning phase to estimate the necessary sampling intensity and to quantitatively evaluate the effectiveness of design options. Ethical guidelines and relevant cultural protocols governing research, data collection and confidentiality must be adhered to.	■ Descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental condition will be provided in the IS / EA Report and are summarized in this Study Plan.	■ Section 7
19	The Agency	TISG Section 7.2, pages 31-33	■ Information sources and data collection methods used for describing the baseline environmental, health, social and economic setting may consist of the following sources of information. For specific sources of baseline information, see Appendix 1. – Federal government (e.g., Environment and Climate Change Canada, Health Canada, Indigenous Services Canada, Statistics Canada, Women and Gender Equality Canada); – Ontario provincial government (e.g., Ministry of Environment, Conservation, and Parks, Ministry of Natural Resources and Forestry; – Bird Conservation Region plans; – academic institutions; – field studies, including site-specific survey methods; – database searches, including: • federal, provincial, territorial, municipal and local data banks; • Breeding Bird Atlas - Ontario (2001-2005); • monitoring program databases protected areas, watershed or coastal management plans; • natural resource management plans; • species recovery and restoration plans; – field measurements to gather data on ambient or background levels for air, water, soil and sediment quality, light levels or acoustic environment (soundscape); – land cover data, including: • terrestrial ecosystem mapping products; • forest cover maps; • remote sensing resources; • important habitats and features to include: ○ water bodies, wetlands, watercourses; ○ riparian habitat; ○ river banks or other eroded habitats; ○ artificial water sources; ○ forest, tree patches, solitary trees (especially old decaying trees); ○ forest edges and tree rows;	■ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA reports.	■ Section 7; Appendix A

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
			○ ridges, including eskers; ○ caves and mines; ○ cliffs, rock outcrops, exposed bedrock, talus, and other karst topography; ○ buildings, bridges, and other anthropogenic features, including linear features; ○ sources of artificial lighting attracting insects; ○ critical habitat; and ○ and any other habitat features known to be important in the area. – Published literature, such as peer reviewed journals, reports by think tanks, non-government organizations and government reports; – environmental assessment documentation, including monitoring reports, from prior projects in the area and similar projects outside the area; – regional studies, project assessments and strategic assessments; – renewable harvest data; – Indigenous knowledge, including oral histories and knowledge gathered by spending time on the land with knowledge holders; – community based monitoring and studies conducted by Indigenous communities; – expert, community, public and Indigenous engagement and consultation activities, including workshops, meetings, open houses, surveys; – qualitative information gathered from interviews, focus groups or observation; – census data; – baseline human health risk assessments; • community and regional economic profiles; • community well-being studies; and • statistical surveys, as applicable.		
20	The Agency	TISG Section 7.3, page 34	■ The list of valued components must be informed, validated and finalized through engagement with the public, Indigenous groups, lifecycle regulators, jurisdictions, federal authorities, and other interested parties. The Impact Statement must describe valued components, processes, and interactions that are identified to be of concern or that the Agency considers likely to be impacted by the Project and are included in the Guidelines.	■ A summary of the consultation plan for Indigenous communities, government agencies, and interested persons has been provided in Section 4 of the Study Plan; further details can be found in the IS / EA Consultation Plan included as Appendix B of the Proposed ToR. Specific consultation and engagement activities and schedules are currently in development and will be shared with MECP and IAAC once available.	■ Section 4
21	The Agency	TISG Section 7.3, page 35	■ The valued components must be described in sufficient detail to allow the reviewer to understand their importance and to assess the potential adverse and positive environmental, health, social and economic effects and impacts arising from the Project activities.	■ The IS / EA will include detailed descriptions of the VCs and the rationale for their inclusion to describe their importance and the predicted residual effects (adverse and positive) as a result of the project.	■ Section 9
22	The Agency	TISG Section 7.3, page 35	■ For each of the valued components that will be assessed in the Impact Statement, the proponent must create a study plan and a work plan to be validated by the Agency. Upon receipt of a study plan, the Agency may request that the proponent present and discuss the study plan at technical meetings, which will be scheduled during the impact statement phase.	■ The Study Plan meets this requirement. A summary of the Technical discussions with agencies have been summarized in Section 3 of the Study Plan.	■ Section 3
23	The Agency	TISG Section 7.3, pages 34-35	■ In selecting a valued component to be included, the following factors should be considered: – valued component presence in the study area; " – "the extent to which the valued component is linked to the interests or exercise of Aboriginal and Treaty rights of Indigenous peoples, and whether an Indigenous group has requested the valued component; – "the extent to which the effects (real or perceived) of the Project and related activities have the potential to interact with the valued component; – "the extent to which the valued component may be under cumulative stress from other past, existing or future undertakings in combination with other human activities and natural processes;	■ The IS / EA will include detailed descriptions of the VCs and the rationale for their inclusion to describe their importance and the predicted residual effects (adverse and positive) as a result of the project.	■ Section 9

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
			– "the extent to which the valued component is linked to federal, provincial, territorial or municipal government priorities (e.g., legislation, programs, policies); – "the extent to which the valued component is being addressed through any ongoing or completed regional assessment processes; – "the possibility that adverse or positive effects on the valued component would be of particular concern to Indigenous groups, the public, or federal, provincial, territorial, municipal or Indigenous governments; and – whether the potential effects of the Project on the valued component can be measured and/or monitored or would be better ascertained through the analysis of a proxy valued component.		
24	The Agency	TISG Section 7.4.1, page 36	■ For valued components establish three study area spatial boundaries to assess impacts to each valued component: 1) Project Study Area: defined as the project footprint for each alternative route; " 2) Local Study Area: defined for each valued component – see below; 3) Regional Study Area: defined for each valued component – see below ■ Provide a rationale for boundaries of the project study area, local study area, and regional study area for each valued component and indicate how the above objectives were met in establishing the boundaries.	■ The Study Areas are defined and described in the Study Plan.	■ Section 6
25	The Agency	TISG Section 7.4.1, pages 35-36	■ The Impact Statement must describe the spatial boundaries, including project, local and regional study areas, for each valued component included in assessing the potential adverse and positive environmental, health, social and economic effects of the Project and provide a rationale for each boundary. Spatial boundaries are defined taking into account the appropriate scale and spatial extent of potential effects and impacts of the Project; community knowledge and Indigenous knowledge; current or traditional land and resource use by Indigenous groups; exercise of Aboriginal and Treaty rights of Indigenous peoples, including cultural and spiritual practices; and physical, ecological, technical, social, health, economic and cultural considerations. The size, nature and location of past, present and foreseeable future projects and activities are factors that should be included in the definition of spatial boundaries. It should be noted that in some cases, spatial boundaries might extend to areas outside of Canada. These transboundary spatial boundaries should be identified where transboundary effects are expected.	■ The Study Areas are defined and described in the Study Plan.	■ Section 6
26	The Agency	TISG Section 7.4.2, page 37	■ The temporal boundaries of the impact assessment span all phases of the Project determined to be within the impact assessment. If potential effects are predicted after project decommissioning or abandonment, this should be taken into consideration in defining specific boundaries. In order to assess a project's contribution to sustainability, consideration should be given to the long-term effects on the well-being of present and future generations. When defining temporal boundaries, the proponent should consider how elements of environmental, health, social and economic well-being that local communities, including municipalities, and Indigenous groups identify as being valuable could change over time.	■ The temporal boundaries for the IA / EA are defined and described in the Study Plan.	■ Section 6
27	The Agency	TISG Section 8.1, page 39	■ The Impact Statement must provide the approximate number, distance and identity factors of likely human receptors, including any foreseeable future receptors, that may be impacted by changes in air, water, country food quality (e.g., dust deposition on vegetation), and noise levels. At minimum, provide a map showing approximate locations of permanent residences, temporary land uses (e.g., cabins and traditional sites) and known locations of sensitive human receptors (e.g., schools, hospitals, community centres, retirement complexes or assisted care homes).	■ Project features, such as the proposed CAR, quarries and pits, access roads, camp and laydown areas will be shown on a plan map in the baseline report. The distances between the Project features and likely human receptors (e.g., residences, water wells and springs) will also be included on the plan map.	■ Section 8.2.2
28	The Agency	TISG Section 8.6, page 45	■ The Impact Statement must provide a delineation and characterization of groundwater–surface water interactions, including an identification of groundwater-dependent ecosystems, wetlands, discharge and recharge areas;	■ The baseline groundwater report will assess the magnitude and flow directions of groundwater-surface water interactions and discuss the ecological significance to nearby ecological receptors (wetlands, streams) at select hydrogeology monitoring locations.	■ Section 7.2 and Section 8.2.2
29	The Agency	TISG Section 8.6, page 45	■ The Impact Statement must provide baseline groundwater quality data for physicochemical parameters (temperature, pH, electrical conductivity, dissolved oxygen, turbidity) and relevant chemical constituents (major and minor ions, trace metals, radionuclides, nutrients and organic compounds, including those of	■ The groundwater sampling and analysis program will be summarized in the baseline groundwater report, and will include field sampling methods, field measured physiochemical parameters and laboratory measured	■ Section 7.2.6

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
			potential concern); the data should illustrate the seasonal and inter-annual variability in baseline groundwater quality, including possible changes due to groundwater–surface water interactions;	parameters, including general parameters, anions, nutrients, metals, VOC's, PAH's and radionuclides. The monitoring program takes seasonal and annual variability into account.	
30	The Agency	TISG Section 8.6, page 45	■ The Impact Statement must identify all domestic, communal, or municipal water wells within the local and regional project areas, including their screened hydrostratigraphic unit and piezometric level; describe their current use, potential for future use, and whether their consumption has any Indigenous cultural importance;	■ Registered groundwater supply wells and springs will be identified during the desktop assessment. ■ Following the desktop assessment, a water supply survey will be conducted within the Marten Falls First Nation Community, and any other residences/ communities within the LSA of the proposed CARs to determine the details of registered water wells and unregistered water wells and springs. ■ Locations and well completion details of all identified water supply wells will be presented in the baseline groundwater study report. ■ As part of the baseline studies, a water supply well water sampling program has been proposed to determine baseline water quality. Should complaints/ issues surrounding well water quality arise, the wells can be resampled and compared to baseline results.	■ Section 7.1, 7.2 and 8.2.2
31	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must describe and provide the hydraulic properties of the hydrostratigraphic units;	■ The baseline groundwater report will include a description of the hydrostratigraphic units encountered along the proposed CARs.	■ Section 8.2.2
32	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must describe the structural geology of the hydrogeological environment, including major faults, fracture density and orientation with respect to groundwater flow directions;	■ The baseline groundwater report will include mapped / known structural geology information that is pertinent to groundwater flow.	■ Section 7.1 and Section 8.2.2
33	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must describe the groundwater flow boundaries of the hydrogeological environment for the purposes of the Impact Statement;"	■ The baseline groundwater report will include discussion on known or inferred groundwater flow boundaries.	■ Section 8.2.2
34	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must provide hydrogeological maps and cross-sections of the study area showing water table elevations, potentiometric contours, interpreted groundwater flow directions, groundwater divides and areas of recharge and discharge; and	■ The baseline groundwater report will include hydrogeological maps of the hydrogeology monitoring locations, showing water table elevations, potentiometric contours, interpreted groundwater flow directions, groundwater divides and areas of recharge and discharge.	■ Section 8.2.2
35	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must present a conceptual model of the hydrogeological environment, including a discussion of geomorphic, hydrostratigraphic, hydrologic, climatic and anthropogenic controls on groundwater flow.	■ The baseline groundwater report will include a conceptual model of the hydrogeological environment, including a discussion of geomorphic hydrostratigraphic, hydrologic, climatic and anthropogenic controls on groundwater flow.	■ Section 8.2.2
36	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must provide groundwater elevation data from any monitoring wells showing seasonal water level variations when pertinent to the period of quarry and borrow area operation;	■ The groundwater monitoring program will be summarized in the baseline groundwater report and will include manual water level measurements and continuous automated water level measurements using pressure transducers.	■ Section 7.2.6
37	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must describe the groundwater quality baseline characterization program including sampling site selection, monitoring duration and frequency, sampling protocol and analytical protocol including quality assurance and quality control measures;	■ The groundwater monitoring and sampling program will be summarized in the baseline groundwater report, and will include sampling site selection, monitoring duration and frequency, sampling protocol and analytical protocol including quality assurance and quality control measures;	■ Section 7.2 and Section 8.2.1
38	The Agency	TISG Section 8.6, page 46	■ The Impact Statement must identify any groundwater monitoring wells in proximity to rock quarries and borrow areas, including their location, completion details (diameter, screen depth), geological log, screened hydrostratigraphic unit, piezometric level, and monitoring frequency;	■ All groundwater monitoring wells will be identified including details on their locations, completion details, geology, piezometric levels and monitoring frequency.	■ Section 7.1, 7.2 and Section 8.2.2
39	The Agency	TISG Section 9, Page 69	■ describe drinking water sources which may be affected by the Project, including surface and/or groundwater (permanent, seasonal, periodic or temporary), their distance from project activities and approximate wellhead capture zones;	■ Estimated water well and construction area zone of influence calculations will be completed to assess and identify drinking water sources and sensitive ecological receptors that may be affected by Project works.	■ Section 8.2.2 and Section 9.4
40	The Agency	TISG Section 13, pages 80-83	■ This section of the TISG describes the methodology for the effects assessment, including definitions of scope, severity, and irreversibility.	■ This information will be included in the IS / EA Report and is summarized in the Study Plan.	■ Section 9

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
41	The Agency	TISG Section 14.2, page 86	■ With respect to potential project effects on the physical hydrogeological system, the Impact Statement must provide a project-specific water use assessment identifying and describing the quantity and quality of water resources potentially affected by the Project, including: – any withdrawal of groundwater or surface water; – changes to the groundwater recharge/discharge areas; – temporal and spatial changes in groundwater quantity, quality and flow (e.g., long- term changes in water levels), including how these changes may relate to domestic, communal or municipal water supply wells; – the flow or volume of water available in the water bodies; and – how any waste waters or dewatering water would be managed and where it would be discharged.	■ A project-specific water use assessment identifying and describing the quantity and quality of water resources potentially affected by the Project will be included in IS / EA Report.	■ Section 9.4
42	The Agency	TISG Section 14.2, page 87	– compare the quality of all effluent streams to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life, and to provincial water quality objectives for contaminants of concern (e.g., arsenic, chromium, mercury) that do not have CCME guidelines. CCME's Water Quality Guideline values are national science-based voluntary guidelines developed collaboratively among provincial, territorial and federal jurisdictions for the protection of freshwater and marine life56;	■ Water quality criteria will be established specific to each sampled location as outlined in the Study Plan.	■ Section 8.2.2
43	The Agency	TISG Section 14.2, page 87	■ With respect to potential project effects on water quality in the receiving environment, the Impact Statement must describe any changes to groundwater quality that could affect surface water quality;	■ Predicted changes to groundwater quality that could affect surface water quality will be included as part of the IS / EA Report.	■ Section 8.2.2
44	The Agency	TISG Section 14.2, page 87	■ With respect to potential project effects on water quality in the receiving environment, the Impact Statement must provide an assessment for off-site migration pathways for affected groundwater and an analysis of contaminant attenuation capacities within the hydrogeological units of the project study area; and	■ An assessment of potential off-site migration pathways for affected groundwater, and an analysis of contaminant attenuation capacities within the hydrogeological units of the project study area will be included as part of the IS / EA Report.	■ Section 8.2.2
45	The Agency	TISG Section 14.2, page 87	■ If the proponent undertakes quarrying activities to extract aggregate material that may results in effects on groundwater and surface water levels (i.e., quarrying below the water table), the Impact Statement must describe spatial and temporal (i.e., all project life cycle) changes to groundwater quality at potential receptor locations (e.g., existing or future drinking water wells and spring water sources), including traditional land users, due to effluents from the Project including changes to physicochemical parameters (temperature, pH, salinity, dissolved oxygen, dissolved organic carbon), chemical constituents (major and minor ions, trace metals, nutrients, organic compounds);	■ Numerical and water balance modelling will be run to estimate inferred temporary or permanent changes to groundwater quality at potential receptors as a result of all intrusive construction works, including quarrying.	■ Section 8.2.2 and Section 9.4
46	The Agency	TISG Section 14.2, page 87	■ If the proponent undertakes quarrying activities to extract aggregate material that may results in effects on groundwater and surface water levels (i.e., quarrying below the water table), the Impact Statement must: – present an integrated site water balance model incorporating surface and groundwater fluxes for the construction, operation and decommissioning of large quarrying sites	■ Potential changes to surface and groundwater (quality and quantity) will be assessed as part of the IS / EA.	■ Section 8.2.2 and Section 9.4
47	The Agency	TISG Section 14.2, page 87	■ With respect to potential project effects on water quality in the receiving environment, the Impact Statement must describe groundwater and surface water monitoring programs during the construction, operation and decommissioning and abandonment.	■ Monitoring programs during the construction, operation and decommissioning and abandonment will be identified as part of the IS / EA Report.	■ Section 8.2.2

ID	Regulatory Agency/ Guidance	Federal TISG Reference[9]	Requirement / Comment / Concern	Response	Study Plan Reference
48	The Agency	TISG Section 14.3, page 88	■ The Impact statement must describe any contaminants of concern (e.g., arsenic, chromium, mercury) potentially associated with the Project (including from spills or accidental discharges) that may affect soil, sediment, wetlands, and surface and groundwater (including substances used during summer and winter maintenance activities);	■ Potential changes to surface and groundwater (quality and quantity), including subsequential effects on other VCs, will be assessed as part of the IA / EA. Sampling of contaminants of potential concern has been described in the Groundwater and Geochemistry Study Plan and the Surface Water Study Plan.	■ Section 7.2.6.2 Section 8.2.2 and Section 9.4 of Surface Water Study Plan
49	The Agency	TISG Section 14.3, page 88	■ The Impact statement must describe how hydrological or drainage changes may disturb soils, wetlands, peatlands or muskeg and result in the release of mercury or methylmercury from disturbed soils, which may affect water and groundwater quality, fish, wildlife and human health;	■ The project will be designed to minimize or avoid changes in water flow and / or drainage - further information is available in the Surface Water Study Plan. Sampling for mercury and methylmercury is proposed to collect baseline data and assess the risk associated with mercury and methylmercury.	■ Section 7.2.6.2 Human Health and Community Safety Study Plan Surface Water Study Plan
50	The Agency	TISG Section 16.1, Page 103	■ With respect to biophysical determinants of health, the Impact Statement must provide an assessment of adverse and positive effects on human health in current and future availability (including contamination/ quality) of country foods (i.e., food that is trapped, fished, hunted, harvested or grown for subsistence, cultural or medicinal purposes)	■ Groundwater quality results will be compared against applicable water quality criteria to protect human and ecological receptors. If it is identified by the IA / EA that residual effect pathways from groundwater to human health exists, additional baseline studies may be proposed. Details regarding potential bioaccumulation of contaminants and consumption by Indigenous groups will be discussed in the Human Health and Community Safety VC Study Plan.	■ Section 8.2.2, Human Health and Community Safety Study Plan
51	The Agency	TISG Section 17.2, Page 108	■ Identify predicted effects of the Project on the quality and quantity of ground or surface water and implications for recreational uses.	■ The IA / EA will evaluate the potential effects on surface and groundwater and the indirect effects to other disciplines (e.g., Land and Resource Use). If it is determined by the IA / EA that a residual effect to land and resource use exists (i.e., after mitigation), additional baseline studies may be proposed. In addition to this Study Plan, please see the Physiography, Terrain and Soils Study Plan and the Surface Water Study Plan for details on methods and approaches for assessing the potential effects on surface water and groundwater. Please refer to the Land and Resource Use Study Plan for details on assessing effects to recreational use.	■ Section 8.2.2, Section 9.4, Physiography, Terrain and Soils Study Plan ■ ■ Surface Water Study Plan ■ ■ Land and Resource Use Study Plan
52	The Agency	TISG Section 20, page 119-128	■ Section 20 of the TISG describes the requirements around mitigation and enhancement measures that must be considered in the Impact Statement.	■ Mitigation measures will be informed by best management practices, applicable resource management and/or recovery plan, Indigenous input, and industry standards.	■ Section 9.5
53	The Agency	TISG Section 21, pages 129-130	■ Section 21 of the TISG describes the requirements and guidance associated with determining residual effects.	■ Residual effects will be assessed in the IA / EA.	■ Section 9.6
54	The Agency	TISG Section 22, pages 131-133	■ Section 22 of the TISG describes the guidance around conducting cumulative effects assessment for the project.	■ Cumulative effects assessment will be conducted as part of the IA / EA.	■ Effects Assessment Methodology
55	The Agency	TISG Section 25, pages 139-140	■ Section 25 of the TISG provides guidance on how to demonstrate the Project's contributions to sustainability.	■ The IS / EA Report will include discussion on how the project contributes to sustainability	■ Section 9.7
56	The Agency	TISG Section 26, Page 141	■ Section 26 of the TISG includes a description of the considerations for developing a follow-up program for environmental, health, social or economic effects, as applicable.	■ The IA / EA will include descriptions of follow-up programs, as required by VC.	■ Section 9.9

Table 11-2: Study Plan Provincial Concordance – Conformance with Requirements

ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
1	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ Considering the extent of wetland areas and number of water crossings associated with the project, additional baseline data are required on the geochemistry of aggregate rock source (i.e., quarry) materials/blasted rockfill. Acid Rock Drainage and Metal Leaching (ARD/ML) from potential aggregate rock source materials must be determined prior to quarry selection and development along the proposed route, and prior to use in construction.	■ This issue is now addressed in the Groundwater and Geochemistry Study Plan. This includes the proposed desktop assessment and field sampling program that will be conducted to assess the likelihood of ML / ARD impacts on surface water or groundwater quality within the Project area. ■ Groundwater monitoring is discussed in the Groundwater and Geochemistry Study Plan.	■ Section 7.4.2
2	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ ARD/ML sample analysis must be completed during the EA, and a commitment must be made in the Terms of Reference for inclusion of the 'Geochemistry' discipline in Table 7-1. Table 7-1: Environmental Disciplines to be Considered during the Environmental Assessment in the Terms of Reference must include 'Geochemistry' in the discipline list for the Natural Physical and Biophysical Environment.	■ This issue is now addressed in the Groundwater and Geochemistry Study Plan. This includes the proposed desktop assessment and field sampling program that will be conducted to assess the likelihood of ML / ARD impacts on surface water or groundwater quality within the Project area. ■ Groundwater monitoring is discussed in the Groundwater and Geochemistry Study Plan.	■ Section 7.4.2
3	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ #7 Draft Terms of Reference (Nov. 2019), Section 7.2 Potential Environmental Effects; Subsection 7.2.5 Groundwater, p. 50.Subsection 7.2.5 provides an overview of potential effects on groundwater resources associated with the project.This section must include potential groundwater quality effects associated with use of quarried aggregate rock source materials that have acid rock drainage and/or metal leaching (ARD/ML) potential.This section must also include potential groundwater quality effects from construction camp sewage systems.Subsection 7.1.4.5 Groundwater of the Terms of Reference must be edited to include the following effects:· Use of quarried aggregate rock source materials during construction has the potential to result in groundwater and surface water quality effects from acid rock drainage and/or metal leaching (ARD/ML).· Groundwater quality may be affected by discharge from construction camp sewage systems.	■ This issue is now addressed in the Groundwater and Geochemistry Study Plan. This includes the proposed desktop assessment and field sampling program that will be conducted to assess the likelihood of ML / ARD impacts on surface water or groundwater quality within the Project area. ■ Groundwater monitoring is discussed in the Groundwater and Geochemistry Study Plan.	■ Section 7.4.2
4	MNRF	■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference	■ Sec. 7.2.3 – Physiology, Geology, Terrain and Soils pg. 42 Appendix A The proponent acknowledges the importance of identifying and securing the aggregate materials that will be required for road construction and maintenance. MNRF shares the view that the availability of suitable and sufficient amounts of aggregate for the project will be a major consideration in route selection and overall feasibility. The rationale is to be transparent on the quantity and sources of aggregate at the ToR stage because of the wetland dominated landscape with limited sources. The associated potential effects in obtaining sufficient volume to construct and maintain the proposed road because it is possible that sources will need to be accessed beyond the defined local study area resulting in additional roads. Although potential aggregate sources (fig 7.2 pg 26) is provided, detailed information about the type and volume of aggregate needed to implement the project and that exists in the project area will need to be presented, along with an assessment of environmental impacts of new aggregate extraction operations that are proposed and how these will be mitigated. The assessment approach to evaluating potential effects for aggregates is weak (see Appendix A) because it appears to be included in the general local geology criteria with no mention of indicators that are sensitive to ecological changes at the project, local and regional levels. For example, attention should be given to developing criterion and indicators that reflect the potential ecological and hydrologic effects associated with construction and maintenance of the proposed road.	■ The Groundwater and Geochemistry Study Plan identifies potential quarries and pits and sampling activities will be conducted to develop a baseline for existing conditions and to assess the potential for ML / ARD or elevated soil concentration issues. This information will be used in conjunction with data from other disciplines to assess the risk on ecological habitats in the pit, quarry and construction areas.	■ Section 7 and 9

ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
5	MNRF	■ Letter received from Ariane Heisey, Paul MacInnis, Claire Pineau, ENDM on the Draft Terms of Reference	■ In the list in 7.1.3 and in 7.1.4, there may be merit to include the studies that have already been undertaken specific to the Project or it can be included in the more detailed descriptions in 7.1.4· Description of Existing Environment – may have merit to review language developed by Marten Falls First Nation and Ontario for MFFN CBLUP and broadband project to help monitor consistency between the documents. Can discuss further with ENDM ROF if desired.· Consider including information about the completed studies to date.· Consider reviewing language in other related documents to help monitor consistency, as appropriate."	■ Review of historical studies will be included as part of the desktop assessment and language used in these documents will be carried forward in reports, where applicable.	■ Section 7.1
6	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ Subsection 7.1.4.5 pg 28-29 states that baseline groundwater elevation measurements will be recorded during the geotechnical drilling program, and signs of groundwater upwelling will be recorded if encountered during the surface water field program. Additional baseline groundwater quality and quantity monitoring field programs are required to evaluate groundwater effects associated with the Project."	■ In addition to geotechnical works, where some hydrogeological data will be measured, a baseline groundwater study will be conducted.	■ Section 7.2
7	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ In Section 9, the proponent indicated that environmental commitments and monitoring plans will be developed and included in the EA. Based on the absence of baseline groundwater quality and quantity monitoring information and the potential environmental risks associated with quarry material geochemistry, the following plans will be required in addition to the groundwater effect management/mitigation measures and compliance/effects monitoring plans:· Draft Baseline Groundwater Work Plan (description of baseline groundwater quality and quantity field programs); and· Aggregate Material Geochemical Management Plan (testing, results interpretation, storage, handling and mitigation measures for materials that are likely to result in acid rock drainage and/or metal leaching [ARD/ML])."	■ This Study Plan outlines the proposed desktop assessment and baseline groundwater study that will be conducted to determine baseline groundwater quantity and quality within the Project area and assess potential geochemical risks to propose a geochemical management plan.	■ Section 7
8	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ Section 9 Commitments and Monitoring of the Terms of Reference must provide additional detail on the required baseline groundwater quality and quantity monitoring programs that will be undertaken during the EA. Submission of a Draft Baseline Groundwater Work Plan is required prior to the EA, with review by a Ministry of the Environment, Conservation and Parks (MECP) Northern Region Technical Support Hydrogeologist. The baseline groundwater monitoring program must include the collection of groundwater quality samples and groundwater elevation measurements from representative areas along the proposed road corridor route, and at proposed aggregate source locations and construction camps.	■ This Study Plan outlines the proposed desktop assessment and baseline groundwater study that will be conducted to determine baseline groundwater quantity and quality within the Project area. It includes collection of water levels and water quality data from representative areas along the proposed road corridor, and at proposed pit and quarry areas, construction camps and laydown areas.	■ Section 7
9	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ Subsection 7.1.4.5 pg 28-29 states that the Marten Falls First Nation community relies on groundwater for domestic and public water supplies. Registered and unregistered groundwater supply wells were not identified on any maps within the Nov. 2019 Draft Terms of Reference. The proponent must provide more detailed information on the well locations and depths (including borehole logs, if available), with maps displaying the location of domestic and public water wells in the Marten Falls First Nation community and surrounding inhabited areas within two km of the proposed road corridor/aggregate pits and quarries/work camps. Radius of influence calculations for groundwater takings associated with the Project should be completed to determine risk to local well water supplies.	■ Registered groundwater supply wells and springs will be identified during the desktop assessment. Following the desktop assessment, a water supply survey will be conducted within the Marten Falls First Nation Community, and any other residences/communities within the LSA of the proposed CARs to determine the details of registered water wells and unregistered water wells and springs. ■ Locations and well completion details of all identified water supply wells will be presented in the baseline groundwater study report. ■ As part of the baseline studies, a water supply well water sampling program has been proposed to determine baseline-water quality. Should complaints/issues surrounding well water quality arise, the wells can be resampled and compared to baseline results.	■ Section 7.1 ■ Section 7.2 ■ Section 8.2.2

ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
10	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ Subsection 7.1.4.5 Groundwater of the Terms of Reference must describe and identify on a map, the registered domestic and public groundwater supply wells within the Marten Falls First Nation community and surrounding inhabited areas. Registered wells and water well records can be found at the following website [https://www.ontario.ca/environment-and- energy/map-well-records].The EA must include the results of a door-to-door water well survey for inhabited areas within two km of the proposed road corridor/aggregate pits and quarries/work camps, to identify unregistered water supply wells and to verify the locations of registered wells. Dewatering radius of influence (ROI) calculations must be included in the EA for any planned groundwater takings associated with the Project. Additional baseline groundwater level and groundwater quality measurements will be required for MECP PTTW and ECA applications, where registered and/or unregistered water supply wells may be affected by blasting, water taking or discharge activities associated with the Project."	■ Registered and unregistered groundwater supply wells will be identified during the desktop assessment and subsequent field program. A water supply survey will be conducted within the Marten Falls First Nation Community, and any other residences/comminutes within the LSA of the selected road corridor route to determine the location of registered water wells and unregistered water wells. A baseline well water monitoring program will also be completed to acquire baseline water quality and quantity data. Locations of all water supply wells will be presented in the baseline groundwater study report. ■ Estimated zone of influence calculations will be conducted using aquifer property data obtained from field investigations to help approximate the extent of construction dewatering works impacts.	■ Section 7 ■ Section 9.4
11	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ Subsection 7.1.4.5 Groundwater of the Terms of Reference must provide additional detail on the required baseline groundwater quality and quantity monitoring field programs that will be undertaken during the EA. Specifically, groundwater quality samples and groundwater elevation measurements must be collected from representative areas along the proposed road corridor route, and at proposed aggregate source locations and construction camps. Baseline groundwater flow measurements will also be required for proposed aggregate source locations. The identification of representative areas must consider: terrestrial terrain, local hydrogeology, bedrock and overburden geology and geochemistry. Level loggers in monitoring wells are recommended to record seasonal groundwater elevation fluctuations, if wells are deep enough to prevent freezing."	■ This Study Plan outlines the proposed baseline groundwater study that will be conducted to determine baseline groundwater quantity and quality within the Project area. This includes collection of groundwater samples, manual and automated (data logger) collected groundwater levels, hydraulic conductivity tests and calculation of hydraulic gradients and groundwater flow velocities at numerous sites along the propose access corridor route. Monitoring locations will be situated in areas with the greatest potential to negatively affect water quantity and quality of hydrology and hydrogeology systems.	■ Section 7.2
12	MECP	■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ #17 Section 8 Page 54 Consultation on Assessment Methodology - MFFN acknowledges that the proposed methodology will be open to input during the draft ToR review, but also says a more detailed method will be presented in the EA. Page 47 indicates the effects assessment criteria will be developed during the EA. While it is appropriate to defer some detailed work planning to the EA phase, the ToR should include commitments for how technical reviewers, and other interested persons, will be consulted during the development of specific evaluation methodologies or technical work plans. It is strongly recommended that those opportunities for review occur prior to the completion of studies (e.g., prior to the submission of a draft or final EA document).It is not clear whether MFFN plans to consult on the more detailed methodology and criteria during the EA phase or if the ToR phase is the main opportunity to provide input. Please indicate how consultation on the ToR has informed the preliminary criteria and indicators. Please clarify when MFFN will consult and provide opportunity for input on the detailed assessment method, including criteria and indicators (and work plans as MECP has proposed), with agencies, communities and stakeholders during the EA phase in order to finalize the methodologies before EA studies get advanced.	■ This Study Plan will be reviewed by relevant federal and provincial agencies, interested persons and indigenous communities.	■ Section 4

ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
13	MECP	■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ #21 Section 10.2.4 Page 73 Technical Work Plans - Page 73 states that MECP has indicated it will not be commenting on work plans associated with field work until the ToR is finalized. This statement does not reflect MECP's guidance to the project team. MECP's guidance, which is documented on page 69 of the RoC, is that the ToR is the mechanism to seek technical review of work plans and that discipline- specific work plans should be included with the ToR. As well, discussions that MECP has had with the project team to date are considered pre-consultation, since it is the ToR that sets out what work is to be done during the EA phase. ■ Please revise the statement on page 73 to state: "MFFN provided MECP and MNRF work plans associated with field work planned during 2019 for review, however MECP advised this is considered-consultation and that discipline-specific work plans should be appended to the ToR to allow full technical review. "As the draft ToR did not include detailed discipline-specific work plans, the other option the ministry strongly recommends is to include commitments to develop work plans at the outset of the EA phase, including opportunities for technical review.	■ This Study Plan will be reviewed by relevant federal and provincial agencies, interested persons and indigenous communities.	■ Section 4
14	MECP	■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental, MECP Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ Assessment Methods - For the most part, section 7.2 provides a description of potential environmental effects for each discipline. However this section also includes assessment methodologies for some subsections (7.2.1 and 7.2.2 AERMOD modelling, quantitative noise assessment) while the majority do not (7.2.3 – 12). The level of detail in the ToR about assessment methods should be consistent for all environmental components. ■ It is strongly recommended to include commitments to develop work plans at the outset of the EA phase, including opportunities for technical review by agencies and others. The work plans should include assessment methodology appropriate for each environmental component. The ToR could include a high level summary table for each environmental discipline listing data collection and assessment methods, with a commitment to develop the work plans at the outset of the EA phase to provide more details. Consider where the information about air and noise modelling is best placed.	■ Methodology concerning data collection (including desktop and field-based, where appropriate) are summarized in this Study Plan.	■ Section 7.1 ■ Section 7.2
15	MECP	■ Email from Agni Papageorgiou & Sasha McLeod, Special Project Officer Environmental, MECP Assessment Services Section, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ #16 Section 8 Page 54 Work Plans - Section 8 describes the approach that will be taken to evaluate alternative methods during the EA, including proposed criteria and indicators (presented in Appendix A). The information presented is high level and does not provide an opportunity for technical review of the methodologies that will be applied to evaluate those specific criteria and indicators. It is strongly recommended to include commitments to develop work plans at the outset of the EA phase, including opportunities for technical review by agencies and others.	■ This Study Plan will be reviewed by relevant federal and provincial agencies, interested persons and indigenous communities.	■ Section 4
16	MECP	■ Email from Mike Landers, Senior Environmental Officer, Thunder Bay District Office, Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ #4 7.2.5 Groundwater Pg. 50 ■ Adverse effect for user/owner of wells. Identify in the EA location of wells and to include a Well monitoring plan to ensure issues (if any) are identified forthwith and mitigated. Minimize the complaints/issues surrounding the well had previously produced potable water, after the blasting, the well no longer produces potable water. The plan must include risk level, mitigation and corrective actions.	■ Registered groundwater supply wells and springs will be identified during the desktop assessment. Following the desktop assessment, a water supply survey will be conducted within the Marten Falls First Nation Community, and any other residences/communities within the LSA to determine the details of registered water wells and unregistered water wells and springs. ■ Locations and well completion details of all identified water supply wells will be presented in the baseline groundwater study report.	■ Section 7.1 ■ Section 7.2

ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
17	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ #7 Draft Terms of Reference (Nov. 2019), Section 7.2 Potential Environmental Effects; Subsection 7.2.5 Groundwater, p. 50. ■ Subsection 7.2.5 provides an overview of potential effects on groundwater resources associated with the project. This section must include potential groundwater quality effects associated with use of quarried aggregate rock source materials that have acid rock drainage and/or metal leaching (ARD/ML) potential. This section must also include potential groundwater quality effects from construction camp sewage systems. Subsection 7.1.4.5 Groundwater of the Terms of Reference must be edited to include the following effects:· Use of quarried aggregate rock source materials during construction has the potential to result in groundwater and surface water quality effects from acid rock drainage and/or metal leaching (ARD/ML).· Groundwater quality may be affected by discharge from construction camp sewage systems.	■ Details regarding assessment of ARD / ML potential are described in this Study Plan. Best practices will be used when placing road fill (e.g., using low ARD / ML potential materials) ■ Additional water quality monitoring will be required if discharge of construction camp sewage within the RSA occurs. This comment will be revisited once camp locations and sewage management methods are confirmed.	■ Section 7.4.2
18	MECP	■ Email from Shannon Heggie, Hydrogeologist - Groundwater Unit, Technical Support Section, Northern Region, Drinking Water and Environmental Compliance Division Ministry of the Environment, Conservation and Parks with comments of the Draft ToR	■ #14 Draft Terms of Reference (Nov. 2019), Appendix A – Draft Criteria & Indicators for Alternatives Evaluation, p. A- 1. ■ In Appendix A, it is recommended that the following Ontario government data source is used for additional baseline Groundwater and Surface Water information from the Ministry of the Environment, Conservation and Parks with respect to the project: Data Catalogue [https://www.ontario.ca/search/data- catalogue?Publisher=%5B%22Environment,%20Conservation%20and%20Parks%22%5D&sort=asc&status=%5B%2230%22%5D]Include the following source of information in Appendix A – Draft Criteria & Indicators for Alternatives Evaluation of the Terms of Reference: Ministry of the Environment, Conservation and Parks – Data Catalogue [https://www.ontario.ca/search/data- catalogue?Publisher=%5B%22Environment,%20Conservation%20and%20Parks%22%5D&sort=asc&status=%5B%2230%22%5D]	■ A search of the data catalog will be conducted as part of the desktop assessment.	■ Section 7.1
19	MNRF	■ Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference	■ Draft Criteria and Indicators for Alternatives Evaluation Appendix A Available resources to help inform the draft criteria and indicators include research publications and expert knowledge on topics such as stressor-effects pathways, cumulative effects, and associated environmental components and indicators. Contacting researchers such as Rob Mackereth (MNRF) who has published research on these topics and related subjects is encouraged. - Rempel, R.S., et al. 2016. Support for development of a long term environmental monitoring strategy for the Ring of Fire area. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Information Report IR-08. 34 p. + append. Catalogue-natural-resource-scientific-and-technical-publicationsWhile no specifics are provided in this submission, MNRF welcomes a discussion with MECP and ENDM to explore what (if any) role this project could play in advancing baseline information and long-term environmental monitoring for the Ring of Fire in partnership with First Nations communities.	■ Data sources are being reviewed for their appropriateness and will be included in Study Plans where applicable. Information on specific data sources and their relevance to the Project will be included in the IS / EA Report.	■ Section 7 ■ Appendix A
20	MECP	■ Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM	■ Study areas are missing and lack clarity – maps show study area for 4 routes even though only 2 (or 1?) routes are proposed to be assessed; no indication of local and regional study areas for each environmental component (e.g., groundwater, surface water, caribou, etc.).	■ The Study Areas are defined and described in the Study Plan.	■ Section 6.2 ■ Figure 6-2

12. References

AECOM Canada Ltd., 2020:
Marten Falls First Nation Proposed Terms of Reference Marten Falls Community Access Road – Environmental Assessment, Appendix B: Consultation & Engagement Plan to Support the Environmental Assessment / Impact Statement.

CCME (Canadian Council of Ministers of the Environment). 2016:
Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, 2016, Canadian Council of Ministers of the Environment.

Golder Associates Ltd. (Golder). 2020. Marten Falls First Nation Community Access Road Project: Geology and Groundwater Existing Conditions Report. Draft.

Impact Assessment Agency of Canada, 2019:
Impact Assessment Act. https://laws-lois.justice.gc.ca/eng/acts/I-2.75/

Impact Assessment Agency of Canada, 2020:
Public Participation Plan for the Marten Falls Community Access Road Project Impact Assessment. https://iaac-aeic.gc.ca/050/documents/p80184/133934E.pdf

Impact Assessment Agency of Canada, 2020a:
Indigenous Partnership and Engagement Plan for the Marten Falls Community Access Road Project Impact Assessment. https://iaac-aeic.gc.ca/050/documents/p80184/133936E.pdf

Impact Assessment Agency of Canada, 2020b:
Glossary of Terms for the impact assessment of designated projects under the IAA. https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/glossary-of-terms.html

Impact Assessment Agency of Canada, 2020c:
Tailored Impact Statement Guidelines for the Marten Falls Community Access Road Project. https://iaac-aeic.gc.ca/050/documents/p80184/133937E.pdf

Ministry of Environment (MOE), 1999:

Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater. Queen's Printer. January 1999

Ontario Government, 1990a:

Environmental Assessment Act. https://www.ontario.ca/laws/statute/90e18

Price, W.A., 2009:

Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report

Appendix A

Preliminary List of Data Sources

- Field investigations (undertaken for surface water and other environmental disciplines)
- Indigenous Knowledge
- Data from previous environmental assessments
- Ontario Integrated Hydrology Data
- Land Information Ontario base mapping data (Ministry of Natural Resources and Forestry [MNRF] 2020)
- Natural Heritage Information Centre
- Ontario Flow Assessment Tool Version 3
- Hydrometric data from Water Survey of Canada and MECP, or from Ontario Hydro
- Archived water quality data from the MECP provincial (Stream) Water Quality Monitoring Network
- The MECP Source Protection Information Atlas
- Archived water taking data from the MECP Permits to Take Water Database
- The MECP Water Well Inventory
- Aquatic Ecosystem Assessments for Rivers (Metcalfe et al. 2013)
- Support for development of a long-term environmental monitoring strategy for the Ring of Fire area: Background documents, workshop report, pathway diagrams and indicator list (Rempel et al., 2016)
- The MECP and the Ministry of Transportation Ontario (MTO) Foundation Library (GEOCRES)
- The Ministry of Natural Resources and Forestry (MNRF), Ontario Geological Survey (OGS)
- The Geological Survey of Canada (GSC)
- The MECP Water Well Information System (WWIS)

Appendix B

Agency Comments on the Draft Study Plan

Draft Study Plan Comments – Federal

Comment # / Ref #	Study Plan Section	TISG Section	Agency/Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
General Comment	■ General Comment	■ **Sections 5, 6, 7, 13, 19.2, and 25**	The Agency	■ In addition to the required actions detailed below, other required actions to be addressed in the update to this study plan are detailed in a separate table titled "2020-07-02 – IAAC to MFFN - General Comments on MFCAR Draft Study Plans". The Agency has provided these other required actions to highlight common sections of the Tailored Impact Statement Guidelines (the Guidelines) where requirements were not met in the draft study plans submitted to the Agency. These additional actions must be addressed in the updated study plans.	■ Please see Comment / Context	■ We have reviewed the relevant comments and incorporated where appropriate. Please refer to the General Comments Table Response submitted separately to the Agency for specific responses.	■ Various Sections
GW-01	■ **Table 3-1: Groundwater Study Areas** – Local Study Area (LSA): 2.0 km Regional Study Area (RSA): 5.0 km Rationale: Potential effects (s) to groundwater are considered to be localized and limited to the alignment and area immediately surrounding the alignment within the zone of influence (ZOI) that may be affected by Project construction activities. ■ **4.1 Desktop Assessment** – "…The desktop review will focus on published information obtained from Marten Falls First Nation… The report will include detailed information on registered water well locations and depths (including borehole logs, if available) and a figure showing domestic and public water well locations within two kilometres of the Project works." ■ **4.2.1 Study Area Reconnaissance & Determination of Key Groundwater Monitoring Locations** – "The groundwater baseline study will include … • Areas within two kilometres of the developed Marten Falls First Nation communities, particularly with potential dewatering and other effects to existing structures,	■ **Section 6** – "The proponent must engage with all Indigenous groups that may be impacted by the Project. The Indigenous Engagement and Partnership Plan, issued by the Agency, is available to assist the proponent in further developing or refining their engagement strategy and supporting ongoing trust and relationship-building. – In addition to the requirements set out in section 6.1, 6.2 and 6.3, the proponent must provide Indigenous groups with an opportunity to: • provide Indigenous knowledge during baseline data collection; • comment on the list of valued components and indicators;…" ■ **Section 7.4.1** – "…Spatial boundaries are defined taking into account the appropriate scale and spatial extent of potential effects and impacts of the Project; community knowledge and Indigenous knowledge; – current or traditional land and resource use by Indigenous groups; exercise of Aboriginal and Treaty rights of Indigenous peoples, including cultural and spiritual practices; and physical,	The Agency	■ The field study is proposed to occur within two kilometres from the centreline of the proposed Community Access Road (CAR), including the Marten Falls First Nation community, associated borrow source areas, associated roads and construction lay down. Given that groundwater flow may continue beyond this distance depending on hydrogeological conditions, with the potential for impacts to drinking water sources, it is not clear how the arbitrary distance from project activities is relevant to effects on groundwater. Additionally, Marten Falls First Nation appears to be the sole Indigenous group engaged to confirm the spatial boundaries and identify sensitive locations (e.g., potable water wells) during the desktop and field groundwater studies. ■ It remains unclear why engagement with the other Indigenous groups listed in the Indigenous Engagement and Partnership Plan (IEPP), including those communities with members who rely on potable water wells in the vicinity of the Project Study Area or who may access natural springs while involved in land use activities within the project area, are not considered for the development of the spatial boundaries and selection of sensitive locations.	■ Provide details to demonstrate the approach that will be used to identify all domestic, communal, or municipal water wells within the local and regional project areas as per the Guidelines. ■ Clarify the inconsistency between the geographic extent of the Regional Study Area mentioned in the Desktop Assessment report and the geographic extent of the Regional Study Area shown in Table 3-1. ■ Describe in the study plan how Indigenous groups will have opportunities to provide Indigenous knowledge on the groundwater study plan and validate the baseline data collected. ■ All Indigenous groups listed in the IEPP must be provided opportunities to: – provide Indigenous knowledge during baseline data collection;	■ Section 4 was updated to clarify that government agencies, first nation communities and any interested persons will have the opportunity to comment on components of the study plans throughout the IS / EA Report consultation and engagement process. ■ The LSA was refined and edits to the text were made in Section 6.2. ■ Revised text to include springs in Section 7.2.1.1 and Section 8.2.2. Any spring water samples will be samples for the same parameters and at the same frequency as groundwater. ■ Sections 7.2.1.1 and 8.2.2 were updated to include water levels and hydrostratigraphic units. ■ Section 7.1 and 7.2.1.1 outline the approach used to identify all domestic, communal, or municipal water wells / springs within the local and regional project area.	■ Section 4 ■ Section6.2 ■ Section 7.1 ■ Section 7.2.1.1 ■ Section 8.2.2

Comment # / Ref #	Study Plan Section	TISG Section	Agency/Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
	infrastructure and/or local well supplies; • Areas within close proximity (two kilometres) to other existing groundwater users (e.g., registered and unregistered water supply wells); ■ **4.2.1.1 Water Well Locations** – "…A door-to-door water well survey will be completed within Marten Falls and any outpost camps within two kilometres of the proposed CAR, associated borrow source areas, associated roads and construction lay down areas to identify unregistered water supply wells and to verify the locations of registered wells."	ecological, technical, social, health, economic and cultural considerations…" ■ **Section 8.6** – "…The Impact Statement must:… • identify all springs and any other potable surface water resources within the local and regional project areas and describe their current use, potential for future use, and whether their consumption has Indigenous cultural importance; • describe the surface water quality baseline characterization program, including sampling site selection, monitoring duration and frequency, sampling protocol, and analytical protocol, including quality assurance and quality control measures;… • identify all domestic, communal, or municipal water wells within the local and regional project areas, including their screened hydrostratigraphic unit and piezometric level; describe their current use, potential for future use, and whether their consumption has any Indigenous cultural importance;…"		■ As per Section 6 of the Guidelines, the Agency expects the proponent to engage with, at a minimum, the Indigenous groups listed in the IEPP.	– comment on the list of valued components and indicators; – inform the effects assessment and review its conclusions; and – inform the development of mitigation measures and follow-up programs.		
GW-02	■ **Section 4.1 Desktop Assessment** – The desktop assessment will include the following tasks: • A review of previous studies pertaining to the Project or conducted within the RSA that may provide additional hydrogeological, geological, hydrological, geochemical or biological data relevant to the Project. • A desktop review of available reports and other pertinent information from within the RSA, if any; ■ **Section 7 Conformance with Federal and Provincial Guidance** – "The desktop assessment and/or the baseline groundwater report will	■ **Section 7.1** – "…Ensure baseline data are representative of project site conditions. If surrogate data from reference sites are used rather than site-specific surveys, the proponent should demonstrate that the data are representative of project site conditions." ■ **Section 7.2** – "…The Impact Statement must provide detailed descriptions of specific data sources, data collection, sampling, survey and research protocols and methods followed for each baseline environmental, health, social and economic condition that is described, in order to corroborate the validity and	The Agency	■ The study plan states that previous studies and reports relevant to the project area may be used to provide additional data and detailed descriptions of the specific data sources will be provided in the baseline report, as required in Section 7.2 of the Guidelines. Section 7.2 of the Guidelines also requires justification to show that the data sources are relevant in spatial and temporal coverage to the Project.	■ Provide details to demonstrate that existing data sources are relevant in spatial and temporal coverage to the Project.	■ Revised text in Section 7.1. Site Specific baseline data will be collected. Surrogate data from other sites will not be used in place of site-specific baseline data for the Project area, but may be used to supplement site specific data if the data are from nearby sites within the region.	■ Section 7.1 ■ Section 7.2

Comment # / Ref #	Study Plan Section	TISG Section	Agency/Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
	provide detailed descriptions of specific data sources and data collection methods associated with groundwater." – "Upon completion of the two-year groundwater monitoring program, water quality and quantity data will be analyzed and the findings will be presented in a hydrogeology baseline report… The hydrogeology baseline report will include:… • Plan maps showing: ▪ The Project location and key features (i.e., the selected CAR, aggregate borrow source area, access roads, camp and laydown areas, the Marten Falls First Nation community and registered and unregister water wells); ▪ Project study areas, encompassing the spatial boundaries of the Project, including any associated project components and the anticipated boundaries of the Project effects that may potentially effected local communities, municipalities and Indigenous groups; ▪ Bedrock and surficial geology, including major structural features (e.g., faults); ▪ Groundwater monitoring locations and inferred groundwater flow directions" • Groundwater quality results will be compared to applicable guidelines and standards for aquatic life and drinking water uses, including the Canadian drinking water quality guidelines, Ontario drinking water quality guidelines and the Ontario Groundwater Standards;"	accuracy of the baseline information collected…. – If using existing data sources, the Impact Statement must provide justification to show that the data sources are relevant in spatial and temporal coverage to the Project…" ■ **Section 9** – "…To understand the community and Indigenous context and baseline health profile, the proponent must:… • describe drinking water sources which may be effected by the Project, including surface and/or groundwater (permanent, seasonal, periodic or temporary), their distance from project activities and approximate wellhead capture zones;…" ■ **Section 16.1** – "With respect to biophysical determinants of health, the Impact Statement must:… • identify predicted effects of the Project on the quality and quantity of ground or surface water used for domestic uses based on the most stringent guideline values of the following criteria; Canadian Drinking Water Quality Guidelines (CDWQG), Ontario Drinking Water Quality Standards (ODWQS), or Ontario Soil, Groundwater and Sediment Standards (SGSS);…"					
GW-03	■ **5.2.2 Data Analysis and Reporting** – "Upon completion of the two-year groundwater monitoring program, water quality and quantity data will be analyzed and the findings will be presented in a hydrogeology baseline report… The hydrogeology baseline report will include:… • Plan maps showing: ▪ The Project location and key features (i.e., the selected CAR, aggregate borrow source area, access roads, camp and laydown areas, the Marten Falls First Nation community and registered and unregister water wells); ▪ Project study areas, encompassing the spatial boundaries of the Project, including any associated project components and the anticipated boundaries of the Project effects that may potentially effected local communities, municipalities and Indigenous groups; ▪ Bedrock and surficial geology, including major structural features (e.g., faults); ▪ Groundwater monitoring locations and inferred groundwater flow directions" • Groundwater quality results will be compared to applicable guidelines and standards for aquatic life and drinking water uses, including the Canadian drinking water quality guidelines, Ontario drinking water quality guidelines and the Ontario Groundwater Standards;"	■ **Section 9** – "…To understand the community and Indigenous context and baseline health profile, the proponent must:… • describe drinking water sources which may be effected by the Project, including surface and/or groundwater (permanent, seasonal, periodic or temporary), their distance from project activities and approximate wellhead capture zones;…" ■ **Section 16.1** – "With respect to biophysical determinants of health, the Impact Statement must:… • identify predicted effects of the Project on the quality and quantity of ground or surface water used for domestic uses based on the most stringent guideline values of the following criteria; Canadian Drinking Water Quality Guidelines (CDWQG), Ontario Drinking Water Quality Standards (ODWQS), or Ontario Soil, Groundwater and Sediment Standards (SGSS);…"	The Agency	■ According to Section 5.2.2 of the study plan, baseline groundwater data, including geographic information of water wells, from the proposed monitoring program will be documented in a hydrogeology baseline report. It remains unclear if the report will specifically identify information related to water wells that may be used as drinking water sources. ■ All drinking water sources (both surface water and groundwater) within the areas of influence of the Project should be identified in the report and considered in the water quality and health effects assessments. ■ Health Canada recommends the use of the most stringent drinking water quality guideline values for an assessment of potential health effects. Note that the ODWQS include less stringent criteria than the most recent CDWQG for lead, manganese and strontium.	■ Clarify whether any water wells that may be used as drinking water sources will be identified as drinking water sources in the baseline study and how water quality data will be used for the health effects assessment. ■ Provide detail to demonstrate that the potable groundwater contaminant levels will be compared to the most stringent guideline values, as per Section 16.1 of the Guidelines.	■ The drinking water sources (groundwater or surface water) will be identified during the desktop assessment and / or the field water well /spring surveys. Any water wells that have potential to provide drinking water will be treated as drinking water sources. ■ Water quality results will be compared against all applicable criteria for all suitable uses (drinking water, aquatic life, wildlife, etc.). Exceedances from all criteria will be flagged in the baseline and future reports, which includes the most stringent criteria.	■ Section 7.2.1.1 ■ Section 8.2.2

Comment # / Ref #	Study Plan Section	TISG Section	Agency/Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
GW-04	■ **5.2.2 Data Analysis and Reporting** – "The hydrogeology baseline report will include: • Tables summarizing data such as: ○ Water well owners, water levels, reported yield and uses (domestic, communal, municipal, commercial/industrial);"	■ **Section 14.2** – "With respect to potential project effects on the physical hydrogeological system, the Impact Statement must: • provide a project-specific water use assessment identifying and describing the quantity and quality of water resources potentially affected by the Project, including: ▪ any withdrawal of groundwater or surface water; ▪ changes to the groundwater recharge/discharge areas; ▪ temporal and spatial changes in groundwater quantity, quality and flow (e.g., long-term changes in water levels), including how these changes may relate to domestic, communal or municipal water supply wells; ▪ the flow or volume of water available in the water bodies; and ▪ how any waste waters or dewatering water would be managed and where it would be discharged."	The Agency	■ It is not clear from the study plan if the tables will also include the actual or inferred available drawdown at the water wells. This information will inform whether the degree of drawdown associated with the Project would necessitate mitigation measures.	■ Update the study plan to ensure that measured or inferred available drawdown with water well information are included, as required in Section 14.2 of the Guidelines.	■ Revised updated section 8.2.2 to specifically include "inferred available drawdown".	■ Section 8.2.2
GW-05	■ **6.2 Methods for Predicting Future Conditions** – "No modelling is proposed as part of the study plan for groundwater. There will be some analytical calculations and analysis software packages (e.g., AQTESOLV) required for the estimation of K values."	■ Section 14.2 – "With respect to potential project effects on the physical hydrogeological system, the Impact Statement must: • provide a project-specific water use assessment identifying and describing the quantity and quality of water resources potentially affected by the Project, including: ▪ any withdrawal of groundwater or surface water; ▪ changes to the groundwater recharge/discharge areas; o temporal and spatial changes in groundwater quantity, quality and flow (e.g., long-term changes in water levels), including how these changes may relate to domestic,	The Agency	■ The study plan suggests that analytical solutions or models will not be used to assess the magnitude of changes to groundwater quantity. ■ It is unclear what methods will be used to quantify the magnitude of the effects to groundwater quantity given the magnitude definitions provided in Table 6-3.	■ Provide details about the methods that will be used to quantify the magnitude of the effects to groundwater quantity in a manner that meets the requirements of the Guidelines.	■ Analytical calculations and analysis software packages (e.g., AQTESOLVE) will be utilized for the estimation of hydraulic conductivity (K) values. Numerical models will use field derived aquifer properties to estimate CAR construction related zones of influence / drawdown cones to assess for potential interference for ecological systems or drinking water sources. In addition, a water balance model approach will be utilized to evaluate the impact of groundwater extraction on valued ecosystem components (receptors). The need for a	■ Section 9.4

Comment # / Ref #	Study Plan Section	TISG Section	Agency/Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
		communal or municipal water supply wells; ▪ the flow or volume of water available in the water bodies; ▪ how any waste waters or dewatering water would be managed and where it would be discharged."				more comprehensive groundwater model will be elevated following completion of project design.	
GW-06	■ **6.3 Magnitude of Effect** **Table 6-2: Groundwater Quality Magnitude Definition** – **"Negligible** Definition: There is little to no variation predicted in measurable parameters and is within the range of natural variation. Rationale: Monitoring wells show no discernable change to water quality, therefore no effect on ecological life or potable use. – **Low** Definition: There is a small variation predicted in measurable parameters, that are outside the range of natural variation and below the applicable water quality criteria or within 20% of existing condition values. Rationale: Temporary effect or permanent change to water quality is discernable but remains protective of ecological life and potable water sources. – **Medium** Definition: There is a modest variation predicted in measurable parameters, that is significantly different from existing conditions and is below the applicable water quality criteria or is between 20% to 50% of existing condition values. Rationale: Temporary effect or permanent change to water quality is significant but remains protective of ecological life and potable water sources.	■ **Section 21** – "…Proponents must describe the extent to which residual effects are adverse. Where relevant, or where best practice or evidence-based thresholds exist, effects should be described using criteria to quantify adverse effects. This includes criteria such as whether the effects are high or low in magnitude, the geographical extent, timing, frequency, duration and reversibility of the effects, taking into account any important contextual factors. Where the potential for human health effects exist due to exposure to a particular contaminant at any level (e.g., non-threshold air pollutants, including particulate matter and nitrogen dioxide, and water pollutants, such as but not limited to arsenic and lead) mitigation measures should aim to reduce the residual effects to as low as reasonably achievable. In addition, effects should be characterized using language most appropriate for the effect (for example, impacts on the exercise of Aboriginal and Treaty rights and social effects may be described differently from biophysical effects)…" – "…The Impact Statement must: • characterize the residual effects using criteria most appropriate for the effect; • characterize residual effects for human health using human health-related criteria most appropriate for the carcinogenic and non-	The Agency	■ The magnitude of residual effects will be determined partly based on the percentage deviation (e.g., between 20% and 50%) from the baseline condition. No explanation is provided on how the proposed judgement criteria are developed or whether they are adequate to protect human health. ■ Furthermore, the study plan assumes that groundwater quality remains protective of human health as long as contaminant levels are below the water quality criteria. However, there is no evidence of a health effect threshold at the population level upon exposure to certain water contaminants, such as arsenic and lead. The characterization of potential health impacts should acknowledge that health risks exist below criteria levels along the continuum of concentrations for these non-threshold pollutants/contaminants. ■ Health Canada encourages the proponent to use all available technologies to reduce their emissions as low as reasonably achievable (ALARA) and beyond those required to achieve applicable criteria (i.e., CDWQG) in order to reduce the health burden of groundwater pollution on the population.	■ Update the study plan to include, in the definitions for magnitude, criteria that are relevant to the protection of human health. ■ Describe the approach that will be used to ensure that these criteria are appropriate for the human health impact assessment.	■ The percentage division values for water quality and quantity were selected using professional judgement. Water quality and quantity undergo natural seasonal fluctuations, therefore it is extremely challenging to state whether changes are natural or Project induced at less than 20% change. Once baseline data are collected, we will have a better idea of the range of natural seasonal variation and can adjust the approach as needed. ■ The CDWQG's do state concentrations for a few parameters (arsenic, lead, haloaceteic acids, and vinyl chloride) should be ALARA (as low as reasonably achievable). That being said, they still undergo natural seasonal variation and it is extremely challenging to state whether changes are natural or Project induced at less than 20% change.	■ Section 9.6

Comment # / Ref #	Study Plan Section	TISG Section	Agency/Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
	– **High** Definition: There is a large variation predicted in measurable parameters, exceeds applicable water quality criteria, or is greater than 50% of existing condition values. Rationale: Temporary effect or permanent change to water quality is discernable and can potentially impair ecological or potable uses of water."	carcinogenic health effects of non-threshold contaminants;" • provide the rationale for the choice of criteria used to determine the extent to which the predicted effects are adverse. The information provided must be clear and sufficient to enable the Agency, review panel, technical and regulatory agencies, Indigenous groups, and the public to review the proponent's analysis of effects;…"					
GW-07	■ **Section 7 Conformance with Federal and Provincial Guidance** – "…. will be included in future reporting (effects assessment), but will not be included as part of the baseline works."	■ **Section 14.2**	The Agency	■ It is unclear how many of the requirements in Section 14.2 of the Guidelines will be met. ■ The effects assessment must consider the effects of each of the project components and physical activities, in all phases, and be based on a comparison to the proposed baseline work.	■ Provide more detail on the methodology of the effects assessment, and how the requirements described in Section 14.2 of the Guidelines will be met. ■ Provide detail on how engagement with Indigenous groups and the public will inform the effects assessment, as well as the selection of mitigation and follow-up program measures.	■ Additional wording added.	■ Section 4 ■ Section 9

Draft Study Plan Comments – Provincial

Comment ID	Study Plan Section	Agency/Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
1	■ N/A	■ MECP, Environmental Assessment Branch	■ Please review EAB comments on the Wildlife, Ungulates and Vegetation work plans that may apply to this work plan.	■ Please review EAB comments on the Wildlife, Ungulates and Vegetation work plans that may apply to this work plan.	■ No additional wording added.	■ N/A
2	■ p. viii - List of Acronyms	■ MECP, Environmental Assessment Branch	■ Minor typo in MFFN - **Martin** Falls First Nation	■ Correct typo	■ Corrected	■ Abbreviations
3	■ p. 4, s. 4. 1	■ MECP, Environmental Assessment Branch	■ Page 4 indicates that the desktop assessment will focus on Alternative #1 and Alternative #4 RSAs. There may be additional alternatives brought forward in the ToR or EA process, and it is not clear how this work plan may include consideration and study of additional alternatives if they are brought forward.	■ Please ensure that the work plan reflects all alternatives (including route alternatives and supporting infrastructure) that are presented in the proposed ToR, and if appropriate include clear flexibility provisions explaining how the work plan would be adapted to consider and study any additional alternatives.	■ Reworded entire Study Plan to include "all proposed routes".	■ Various
4	■ p. 5, s. 4.2.1	■ MECP, Environmental Assessment Branch	■ Page 5 states that "The groundwater baseline study will include installation of hydrogeological stations in areas along the successful CAR." It is not clear what "successful CAR" means. This should be explained, particularly in the context of how this part of the baseline study fits into the alternatives assessment - i.e. is the groundwater field study done on all alternatives or just the preferred alternatives?	■ Please clarify what the term "successful CAR" means and how the groundwater field study fits into the alternatives assessment for routes and supporting infrastructure. Please clarify if the desktop assessment (s. 4.1) is being done for all alternatives and the field study (s. 4.2) is being done for the preferred alternatives. If not, clarify if both desktop and field work is being done for all alternatives. Please ensure this is clear in the ToR and work plan.	■ Reworded entire Study Plan to include "all proposed routes".	■ Various Sections throughout the work plan.
1	■ p. 6/Section 4.2.2 Proposed Groundwater Monitoring Well Installation Regime for Each at Key Monitoring Locations	■ MECP, Hydrogeologist	■ The consultant indicated that typical groundwater monitoring stations will involve two wells at one location (nested shallow and deep). In order to collect comprehensive baseline groundwater data, overburden monitoring wells or drive-point piezometers must be screened/installed to allow characterization of representative units (e.g., peat, silt/clay, till/ shallow fractured bedrock). Additional monitoring wells/piezometers may be required for adequate baseline characterization.	■ Overburden groundwater monitoring wells or drive-point piezometers must be screened/ installed to allow characterization of representative units (e.g., peat, silt/clay, till, shallow fractured bedrock). Additional monitoring wells/piezometers may be required for adequate baseline characterization.	■ Added "Addition monitoring wells or drive-point piezometers may also be required to allow for adequate baseline characterization of all hydrostratigraphic units that are encountered (e.g., peat, silt/clay, till, shallow fractured bedrock)." to the end of paragraph two of Section 7.2.2	■ Section 7.2.2
2	■ p. 10-11/Section 4.2.6.2 Groundwater Quality Sampling	■ MECP, Hydrogeologist	■ It is recommended that the following additional analytical parameters are included for groundwater quality samples and water supply well samples within 2 km of Project activities: general parameters (pH, conductivity, hardness), total suspended solids, and total dissolved solids.	■ Include the following additional analytical parameters for groundwater quality samples and water supply well samples within 2 km of Project activities: general parameters (pH, conductivity, hardness), total suspended solids, and total dissolved solids.	■ The additional requested parameters have been added to the list of parameters that groundwater and drinking water samples will be analyzed for.	■ Section 7.2.6.2
3	■ p. 12/Section 5.2.2 Data Analysis and Reporting	■ MECP, Hydrogeologist	■ The consultant has not indicated if groundwater quality results, from identified water supply wells within 2 km of Project activities, will be provided to the well owners. It is recommended that groundwater quality sample results from existing registered and unregistered water supply wells should be provided to the well owner within 30 days of receipt from the laboratory, with appropriate follow-up support by the consultant for results interpretation.	■ Groundwater quality sample results from existing registered and unregistered water supply wells shall be provided to the well owner within 30 days of receipt from the laboratory, with appropriate follow-up support by the consultant for results interpretation.	■ Added "Water quality sample results from existing registered and unregistered water supply wells shall be provided to the well owner within 30 days of receipt from the laboratory, with appropriate follow-up support by the consultant for results interpretation." at the end of Section 7.2.6.2.	■ Section 7.2.6.2

Phone: 1-800-764-9114 **Email:** info@martenfallsaccessroad.ca **Web:** http://www.martenfallsaccessroad.ca