



FINAL

Physiography, Terrain and Soils Study Plan

May 2021





MARTEN FALLS FIRST NATION ALL SEASON COMMUNITY ACCESS ROAD

Physiography, Terrain and Soils Study Plan

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Revision History

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- Appendix A. Preliminary List of Data Sources
- Appendix B Agency Comments on the Draft Study Plan

Acronyms

- AP Acid-Generation Potential
- AECOM..... AECOM Canada Ltd.
- CALA Canadian Association for Laboratory Accreditation
- CAR Community Access Road
- EA Environmental Assessment
- IA Impact Assessment
- IAAC Impact Assessment Agency of Canada
- IS Impact Statement
- km Kilometre
- LSA Local Study Area
- MECP Ontario Ministry of the Environment, Conservation and Parks
- MFFN..... Marten Falls First Nation
- OGS..... Ontario Geological Survey
- PAG Potentially Acid Generating
- PDA Project Development Area
- PTTW..... Permit To Take Water
- ROW Right-of-way
- RSA Regional Study Area
- SARA Species at Risk
- TISG Tailored Impact Statement Guidelines
- ToR Terms of Reference
- VC..... Valued Component





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 Physiography Terrain and Soils 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

The Physiography, Geology, Terrain and Soils Study Plan focuses on valued components associated with physical geography, including the location, spatial extent and composition of surficial landforms. Studying these landforms will help the Project avoid sensitive landform features such as eskers, beach ridges, bedrock outcrops and wetlands, unfavourable soils due to poor quality or poor geotechnical properties and unfavourable slopes (i.e., areas prone to slope failure). This Study Plan will also provide insight on potential pit and quarry areas and ongoing geological modifying processes, such as permafrost degradation, landslides and slumps.

This Study Plan is one of a group of study plans created for the Project. **Table 1-2** includes the study plans for each environmental¹ 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	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Air Quality ■ Greenhouse Gas Emissions
Climate Change	■ Climate Adaptation and Resiliency Study Plan	<ul style="list-style-type: none"> ■ Climate Change
Acoustic and Vibration Environment	■ Acoustic and Vibration Environment Study Plan	<ul style="list-style-type: none"> ■ Noise ■ Vibration
Physiography, Geology, Terrain and Soils	■ Physiography, Terrain and Soils Study Plan	<ul style="list-style-type: none"> ■ Physiography, Terrain and Soils
Surface Water	■ Surface Water Study Plan	<ul style="list-style-type: none"> ■ Surface Water
Groundwater and Geochemistry	■ Groundwater and Geochemistry Study Plan	<ul style="list-style-type: none"> ■ Groundwater
Vegetation	■ Vegetation Study Plan	<ul style="list-style-type: none"> ■ Wetland and Riparian Ecosystems ■ Upland Ecosystems ■ Designated Areas (Areas of Natural and Scientific Interest, Environmentally Significant Areas, Significant Woodlands, Critical Landform / Vegetation Associations)

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.





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Environmental Discipline	Study Plan Name	Valued Component(s)
		<ul style="list-style-type: none"> Traditional Use Plants and SAR Plant Populations (including species with special conservation status or rarity in the province)
	<ul style="list-style-type: none"> Peatlands Study Plan 	<ul style="list-style-type: none"> Peatland Ecosystems (bogs and fens)
Wildlife	<ul style="list-style-type: none"> Wildlife Study Plan 	<ul style="list-style-type: none"> Bats (including SAR-bats such as: Little Brown Myotis [<i>Myotis lucifugus</i>], Northern Myotis [<i>Myotis septentrionalis</i>] and Tricolored Bat [<i>Perimyotis subflavus</i>]) Fur Bearers (proxy VC² American Marten [<i>Martes americana</i>], Beaver [<i>Castor canadensis</i>] and Wolverine [<i>Gulo gulo</i>]) Amphibians and Reptiles Pollinating Insects
	<ul style="list-style-type: none"> Ungulates (Moose and Caribou) Study Plan 	<ul style="list-style-type: none"> Moose (<i>Alces alces</i>) Caribou, boreal population (<i>Rangifer tarandus</i>)
	<ul style="list-style-type: none"> Bird Study Plan 	<ul style="list-style-type: none"> Forest Birds (proxy VC of Red-eyed Vireo [<i>Vireo olivaceus</i>] for deciduous forest, Ovenbird [<i>Seiurus aurocapilla</i>] for mixedwood forest, Dark-eyed Junco [<i>Junco hyemalis</i>] for coniferous forest and disturbed forest Raptors (proxy VC of Osprey [<i>Pandion haliaetus</i>] for diurnal raptors and Boreal Owl [<i>Aegolius funereus</i>] for nocturnal raptors Shorebirds (proxy VC of Wilson's Snipe [<i>Gallinago delicata</i>]) Waterfowl (proxy VC of Mallard [<i>Anas platyrhynchos</i>]) Bog / Fen Birds and Other Wetland Birds (proxy VC of Palm Warbler [<i>Setophaga palmarum</i>] for bogs, Common Yellowthroat [<i>Geothlypis trichas</i>] for fens; and Northern Waterthrush [<i>Parkesia noveboracensis</i>] for swamps . SAR birds: Canada Warbler (<i>Cardellina canadensis</i>), Chimney Swift (<i>Chaetura pelagica</i>), Common Nighthawk (<i>Chordeiles minor</i>), Eastern Whip-poor-will (<i>Antrostomus vociferous</i>), Eastern Wood-Pewee (<i>Contopus virens</i>), Evening Grosbeak (<i>Coccothraustes vespertinus</i>), Olive-sided Flycatcher (<i>Contopus cooperi</i>), Bald Eagle (<i>Haliaeetus leucocephalus</i>), Peregrine Falcon (<i>Falco peregrinus</i>), Short-eared Owl (<i>Asio flammeus</i>), Bank Swallow (<i>Riparia riparia</i>), Barn Swallow (<i>Hirundo rustica</i>), Black Tern (<i>Chidonias niger</i>), Rusty Blackbird (<i>Euphagus carolinus</i>), Yellow Rail (<i>Coturnicops noveboracensis</i>)

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





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Environmental Discipline	Study Plan Name	Valued Component(s)
Fish and Fish Habitat	<ul style="list-style-type: none"> ■ Fish and Fish Habitat Study Plan 	<ul style="list-style-type: none"> ■ Lake Sturgeon (<i>Acipenser fulvescens</i>) ■ Walleye (<i>Sander vitreus</i>) ■ Brook Trout (<i>Salvelinus fontinalis</i>) ■ Northern Pike (<i>Esox lucius</i>) ■ Lake Whitefish (<i>Coregonus clupeaformis</i>) ■ Chain Pickerel (<i>Esox niger</i>) ■ Yellow Perch (<i>Perca flavescens</i>) ■ Cisco (<i>Coregonus artedii</i>) ■ Burbot (<i>Lota lota</i>) ■ Longnose Sucker (<i>Catostomus catostomus</i>) ■ White Sucker (<i>Catostomus commersonii</i>) ■ Forage / Prey Species (including species such as Lake Chub [<i>Couesius plumbeus</i>]) ■ Lower Trophic Organisms (e.g., benthic invertebrates)
Social	<ul style="list-style-type: none"> ■ Social Study Plan 	<ul style="list-style-type: none"> ■ Housing and Accommodation ■ Community Service and Infrastructure ■ Transportation ■ Community Well-being ■ Populations and Demographics
Economy	<ul style="list-style-type: none"> ■ Economic Study Plan 	<ul style="list-style-type: none"> ■ Regional Economy ■ Labour Force and Employment ■ Government Finances
Land and Resource Use	<ul style="list-style-type: none"> ■ Land and Resource Use Study Plan 	<ul style="list-style-type: none"> ■ Land Use Compatibility ■ Parks and Protected Areas ■ Extractive Industry ■ Forestry Industry ■ Energy and Linear Infrastructure ■ Recreation and Tourism
Human Health and Community Safety	<ul style="list-style-type: none"> ■ Human Health and Community Safety Study Plan 	<ul style="list-style-type: none"> ■ Public Safety ■ Public Health ■ Diet ■ Environmental Factors Influencing Health
Visual Aesthetics	<ul style="list-style-type: none"> ■ Visual Aesthetics Study Plan 	<ul style="list-style-type: none"> ■ Visual Contrast / Character ■ Visibility ■ Visual Sensitivity
Archaeological and Cultural Heritage	<ul style="list-style-type: none"> ■ Cultural Heritage Study Plan 	<ul style="list-style-type: none"> ■ 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 throughout. The purpose of this Study Plan is to explain:

- A baseline³ 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 Physiography, Terrain and Soils 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 MECPC and applicable agencies. However, no discussions have occurred to date on the Physiography, Terrain and Soils Study Plan.





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 persons⁵ 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).





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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 <i>(Nishnawbe Aski Nation)</i>	<ul style="list-style-type: none"> ■ 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 Nation and the Union of Ontario Indians / Nishnawbe Aski Nation	<ul style="list-style-type: none"> ■ Long Lake #58 First Nation**
Mushkegowuk Council <i>(Nishnawbe Aski Nation)</i>	<ul style="list-style-type: none"> ■ Attawapiskat First Nation ■ Fort Albany First Nation ■ Kashechewan First Nation
Shibogama First Nations Council <i>(Nishnawbe Aski Nation)</i>	<ul style="list-style-type: none"> ■ Kasabonika Lake First Nation ■ Kingfisher Lake First Nation ■ Wapekeka First Nation ■ Wawakapewin First Nation ■ Wunnumin Lake First Nation
Independent First Nations Alliance <i>(Nishnawbe Aski Nation)</i>	<ul style="list-style-type: none"> ■ Kitchenuhmaykoosib Inninuwug First Nation
Independent First Nations <i>(Nishnawbe Aski Nation)</i>	<ul style="list-style-type: none"> ■ Mishkeegogamang First Nation ■ Weenusk First Nation
Nokiiwin Tribal Council	<ul style="list-style-type: none"> ■ Animbiigoo Zaagi'igan Anishinaabek First Nation (AZA)*
Métis Nation of Ontario	<ul style="list-style-type: none"> ■ Métis Nation of Ontario; Region 2*
Independent Métis Nation	<ul style="list-style-type: none"> ■ 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.

** 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, Indigenous land and resource use and cultural values and practices can be collected and / or shared;





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- 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





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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.

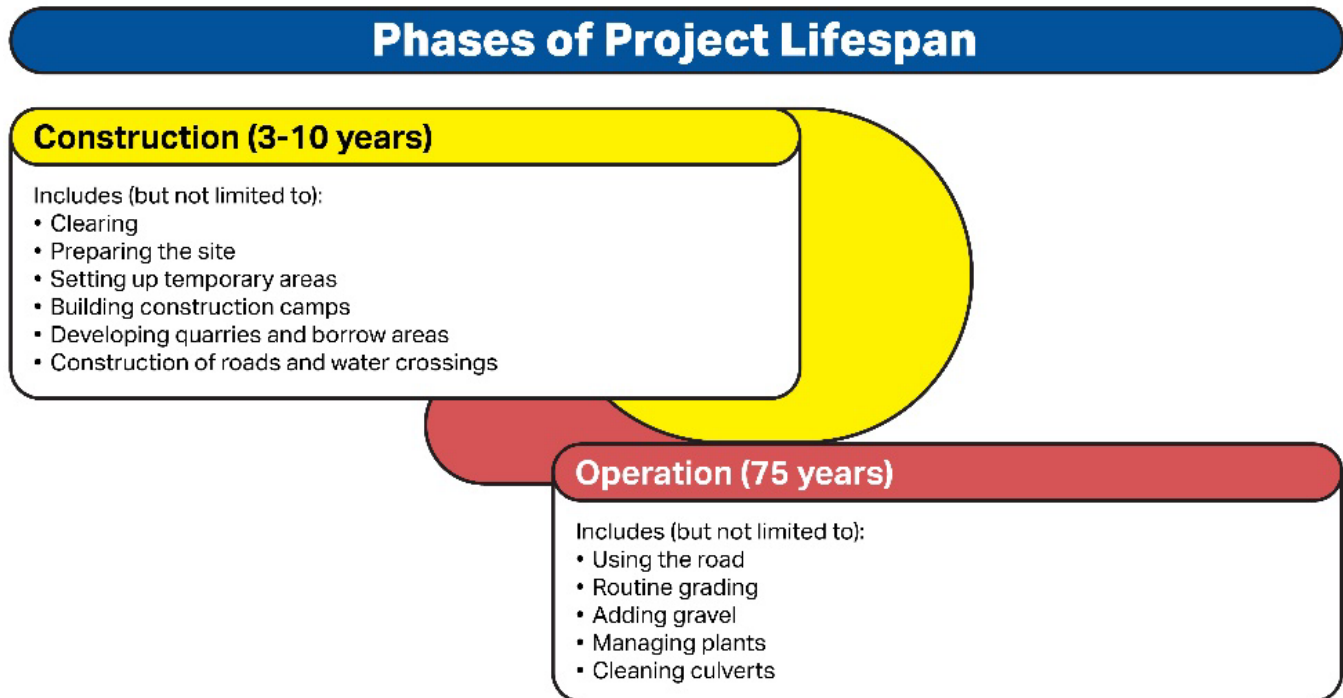
In determining the temporal boundaries, in particular the long operations and maintenance phase, consideration was given to the long-term effects on the well-being of present and future generations (Sustainability Principle #2⁶). The final temporal boundaries to be used in the IS / EA Report will be 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





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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.

6.2.1.1 Physiography, Terrain and Soils Study Areas

The LSA and RSA boundaries for Physiography, Terrain and Soils are detailed in **Table 6-1** with the LSA and RSA boundaries being shown on **Figure 6-2**.

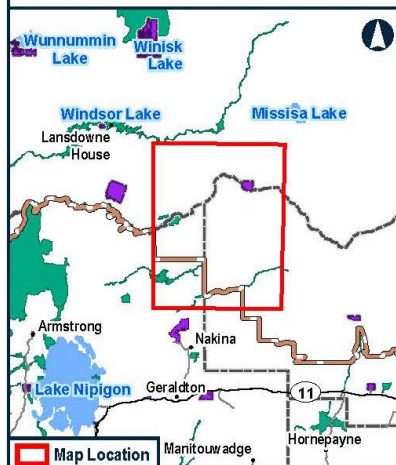
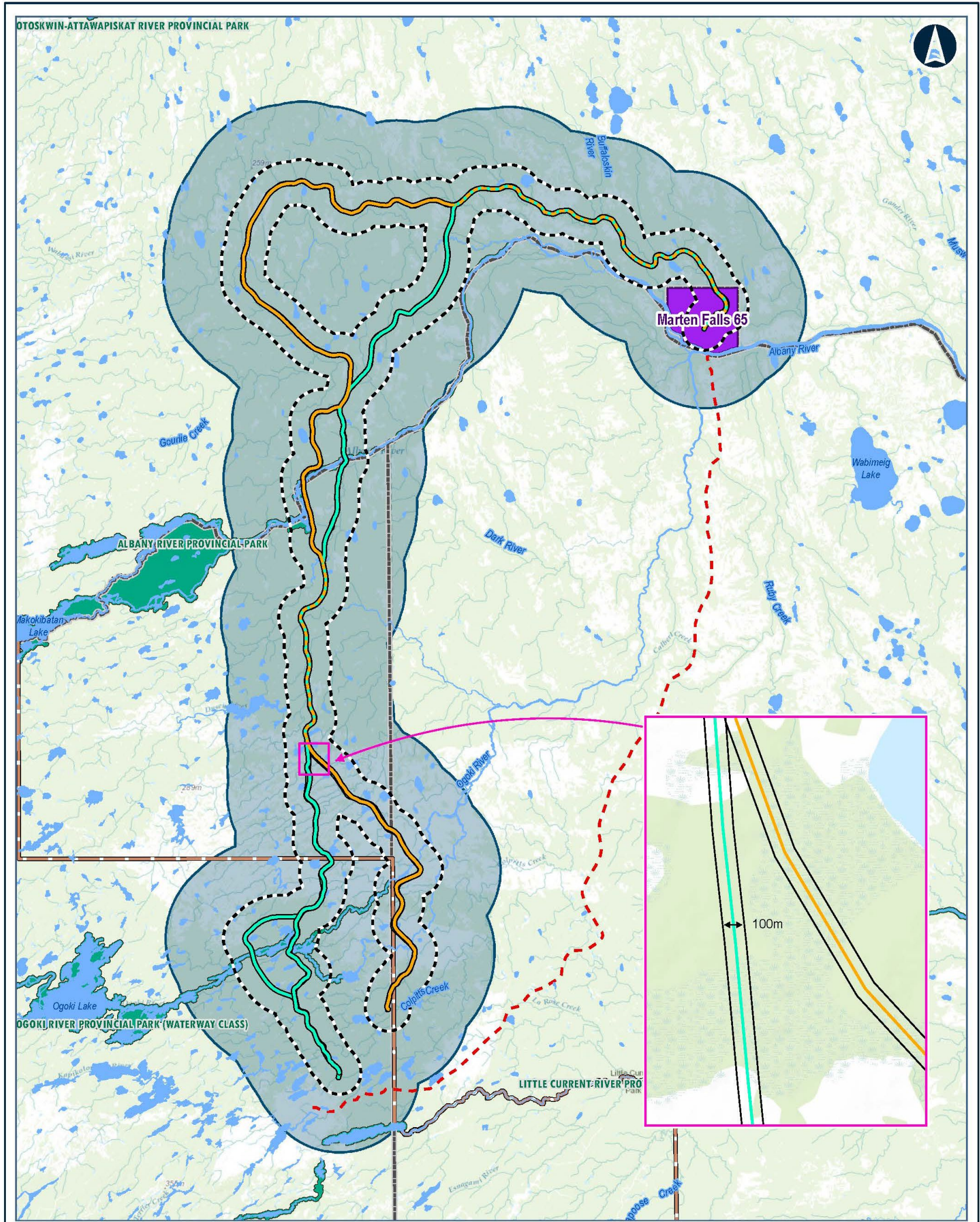
Table 6-1: Physiography, Terrain and Soils Study Areas

Study Area	Geographic Extent	Rationale
Local Study Area	<ul style="list-style-type: none"> 3 km buffer on either side of the centreline of Alternative 1 and Alternative 4. 	<ul style="list-style-type: none"> Designed to address the area where direct effects of the Project are likely to occur beyond the Project Development Area.
Regional Study Area	<ul style="list-style-type: none"> 11 km buffer on either side of the centreline of Alternative 1 and Alternative 4 	<ul style="list-style-type: none"> Using a boundary of 11 km on either side of the Project centreline will allow for assessment of cumulative and indirect effects of the Project on the broader landscape, while remaining representative of the types of physiography, terrain and soils found within the RSA.

The LSA and the RSA align with the Vegetation Study Plan because changes to physiography, terrain and soils are expected to have a strong measurable effect on vegetation composition and forest productivity.



Figure 6-2: Physiography, Terrain and Soils Local and Regional Study Areas



Legend

Route Label

- Alternative 1 (Orange line)
- Alternative 4 (Green line)
- Project Study Area (PSA) - 100m (White box)
- Local Study Area Buffer (LSA) - 3km (Dashed black line)
- Regional Study Area (RSA) - 11km (Blue shaded area)

Notes:
None

Data Source:
Base Data: Provided by MNR 2019; Route Infrastructure - Provided by AECOM 2019. Contains information licensed under the Open Government Licence Ontario.
Aerial photography provided by:
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase,

- Existing Winter Access Roads (Red dashed line)
- Railway (Black line with cross-ticks)
- Waterbody (Blue area)
- First Nation Reserve (Purple area)
- Far North Boundary (Brown dashed line)
- District Municipal Boundary (Grey dashed line)
- Provincial Park (Green area)

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Physiography, Terrain, and Soils Study Areas

0 5 10 20
 Kilometres
 Datum: NAD 1983 UTM Zone 16N

Dec, 2020	1:500,000 *when printed 11"x17"
Rev 00	

Figure 3-1

Contains information provided by Ontario Ministry of the Environment, Conservation and Parks or by Ontario Ministry of Natural Resources and Forestry (OMNR). Queen's Printer of Ontario 2020. Through a Sanitization Data License Agreement. This drawing has been prepared for use of AECOM client and may not be reproduced or relied upon by third parties, except as agreed by AECOM and its client, as required by law or for use by government's emergency agencies. AECOM accepts no responsibility, and does not warrant, endorse or accept any liability for this drawing without AECOM's express written consent. The use of Service Data in this drawing does not constitute an endorsement by the Ministry for this drawing or by AECOM of the Service Data.





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 physiography, terrain and soils. This section outlines the proposed desktop assessment, detailed terrain mapping and field data collection proposed to complete a comprehensive Physiography, Terrain and Soils baseline study designed in support of the IA / EA for the Project.

In addition to the Physiography, Terrain and Soils baseline study, the TISG (The Agency, 2020c) for the Project also requires the identification of any geological hazards that exist in areas planned for Project facilities and infrastructure. Therefore, this section also outlines the desktop analysis and field survey proposed to complete a geological hazard assessment. The geological hazard assessment will characterize the geological conditions within the Physiography, Terrain and Soils RSA and identify potential geological hazards. The results of the geological hazard assessment will support the assessment of effects of the environment on the Project and will provide critical information to support selection and design the preferred CAR alignment, minimizing road alignment through areas with known or suspect geological hazards (e.g., permafrost degradation, landslides and slumps). Due to the association between the geological hazard assessment and the Physiography, Terrain and Soils Baseline study, the geological hazard assessment is captured as part of this Study Plan.

7.1 Desktop Assessment

7.1.1 Physiography, Terrain and Soils

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 for Route Alternatives 1 and 4. The 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)





and the Geological Survey of Canada (GSC) to develop a conceptual understanding of the local physiography, terrain and soil conditions. The desktop assessment will include the following tasks:

- A review of available high-resolution imagery, including digital stereo aerial photography, satellite imagery and Google Earth imagery, and previous studies pertaining to the Project or conducted within the RSA that may provide additional physiography, terrain and soil data relevant to the Project. If any data are referenced, justification for utilizing these data (i.e., spatial and temporal relevance), detailed descriptions, and specific data sources will be provided in the baseline report.
- Conducting a review of relevant mining claims in Canada Chrome Corporation (Ontario Assessment File Database, #20000007482, Ministry of Energy, Northern Development and Mines).
- A review of documents pertaining to mineral aggregate deposits in Ontario, including, but not limited to, the Mineral aggregates in Ontario Report, prepared by the Ontario Aggregate Resources Corporation in 2002
- Conducting an online search for regional terrain polygon mapping and soil quality studies.
- Conducting a search for regional permafrost mapping.
- Discussion with other discipline leads to identify locations along the proposed CAR that may have ecological receptors that are sensitive or vulnerable to acidification.
- Preparation of a report summarizing the findings and data gaps noted during the desktop review.

If any surrogate data are referenced, justification for utilizing these data (i.e., spatial and temporal relevance), 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.

7.1.2 Geology and Geological Hazards

A desktop review of existing information sources will be completed to characterize the geological environment and identify geological hazards within the RSA. A preliminary list of applicable information sources has been included in Appendix A. The geology desktop assessment will be focused on lands within the Terrain, Soils and Physiography RSA for Route Alternatives 1 and 4, as the geological characterization will be used to support the assessment of effects to the Terrain, Soils and Physiography VC. The desktop review will focus on published information obtained from Ontario Geological Survey (OGS) and the





Geological Survey of Canada (GSC) to develop a conceptual understanding of the local geological conditions. The desktop assessment will include the following tasks:

- Conducting a search for and review of 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.
- Conducting an online search of federal websites for information regarding the earthquake and seismic history for the Project area. This information will be used to identify potential geological hazards that exist in the areas planned for the Project facilities and infrastructure.
- Conducting a search for known or potential areas within the RSA where karst related natural hazards may be present.

7.2 Summary of Previous Field Studies

Previous geotechnical investigations were completed in 2009-2010 for a proposed Infrastructure Corridor that was commissioned by Canada Chrome Corporation (Golder 2010). The extensive auger hole and borehole subsurface investigations along the Canada Chrome alignment mostly overlap Alternative 1 and portions of the Alternative 4 routes, as shown on **Figure 6-2**. The investigations included auger holes up to 6 m total depth, boreholes with a total depth of up to about 8 m and water crossing boreholes extending 3 m into bedrock. The auger holes and borehole logs confirmed the regional surficial geology mapping of the area penetrating peat, silt, clay and sand mixtures at surface to depth. At the two (2) river crossings near the southern end of the Alternative 1 route, the boreholes penetrated granitic bedrock at an elevation of between approximately 233.2 and 233.3 meters above sea level (0.6 m to 4.2 m below ground surface). These investigations provide valuable information on sub-surface conditions in the area.

In 2019, KGS completed a preliminary geotechnical investigation along Alternatives 1 and 4. The field investigations were focused on geological features which could be potential pits and quarries along the CAR. Field activities included:

- Developing helicopter access;
- Peat probing;
- Hand auguring;
- Test hole drilling; and
- Visual assessment of select major water crossings (crossings of >10 m +/- in width).
- Site walkover of potential bedrock quarry sites





Results from these field investigations will be used to inform the development of the desktop portion of the assessment and the planning of the field studies proposed in **Section 7.3**.

7.3 Terrain Mapping

Because much of the existing published surficial geology and terrain mapping available from government agencies such as the OGS and GSC is at small scales ranging from 1:50,000 to 1:250,000, detailed terrain mapping will be completed at a scale of between 1:2,000 and 1:5,000 for the PDA and LSA. The value of this detailed mapping is that it provides information on the following:

- Location and spatial extent of soil parent materials (e.g., till, bedrock, glaciofluvial and organic) within the PDA and LSA;
- Location and spatial extent of sensitive landform features such as eskers, beach ridges, bedrock outcrops and wetlands;
- Location and spatial extent of potential pit and quarry materials;
- Location and spatial extent of soils (from a soil quality perspective);
- Location and spatial extent of unfavourable slopes;
- Location of unfavourable soils (e.g., muskeg);
- Thickness of overburden materials / depth to bedrock, including thickness of organic materials and underlying soil parent material;
- Drainage of soil materials (e.g., are the materials well drained or poorly drained mineral materials, or are they very poorly drained organic accumulations); and
- Ongoing geological modifying processes such as permafrost degradation, landslides and slumps.

This mapping will allow for the proper establishment of sampling plots for a variety of disciplines, including soils and vegetation.

The requirements outlined in the TISG suggest the need for historical analysis in relation to both permafrost and landsliding. As a result, digital aerial photography from the early 1950s and the most recent publicly available imagery will be obtained for selected areas for historical analysis and mapping purposes. The mapping of terrain units will be completed on the most recent stereo imagery while the imagery from the





early 1950s and Google Earth imagery will be used to look for historical trends. Relatively homogeneous terrain units will be delineated on the basis of:

- Soil parent materials (e.g., till, outwash, organic and bedrock)
- Overburden thickness / depth to bedrock
- Topography / landforms (e.g., undulating, planar, depressional and ridged (eskers, beach ridges)
- Slope
- Drainage (e.g., well, imperfect and poor) and
- Geological modifying processes (e.g., permafrost degradation, landsliding, groundwater seepage)

The detailed mapping will be completed by a group of experienced terrain scientists with experience in northern Ontario. The mapping will be completed in a digital mapping environment known as “*Softcopy*”, the same mapping software tools being used to complete the vegetation mapping. Softcopy combines ArcGIS and PurVIEW software to allow mappers the ability to zoom into the digital stereo imagery in 3D at scales ranging from 1:5,000 to 1:1,000 and to incorporate any previously collected field data, including hand auger, peat probe and test hole drilling data, surficial geology and bedrock geology mapping. This then allows for the better delineation of critical landscape features such as areas of permafrost degradation, landslides, areas of peat deposits in excess of 2 m, or areas of poorly drained mineral soils. This approach has been used for other projects in northern Ontario, including De Beers Victor diamond mine west of Attawapiskat, Ontario.

This mapping will be supported by a reconnaissance field program where soils and terrain data will be collected to address the requirements of the IS / EA Report, especially to meet soil requirements for soil quality, erosion and reclamation planning.

A series of final 1:5,000 scale map figures will be produced for the PDA while map figures at 1:10,000 scale will be produced from the new mapping for the LSA and from existing mapping for the RSA. These figures will adhere to GIS and map production standards.





7.4 Field Study Methods

7.4.1 Physiography, Terrain and Soils

Information on the regional physiography, terrain and soil components of the PDA and LSA will be primarily obtained through the desktop assessment and previous studies (KGS 2019). However, as identified in **Section 7.3**, detailed terrain mapping will be completed and will be supported by a reconnaissance field program specifically aimed at collecting data to address the soils component of the IS / EA Report and to verify the initial terrain mapping. Additional site-specific data obtained from field programs from other disciplines, such as geotechnical, hydrogeological and vegetation, will also be incorporated and used to refine the preliminary mapping and existing knowledge.

The Physiography, Terrain and Soils field program will be completed in conjunction with the Vegetation field program. This will allow for the consistent collection of field data to establish correlations between soil / terrain conditions and vegetation communities (e.g., ecosites⁷) in the field. The soil / terrain plot will be established within the larger vegetation plot with the overall plot location being agreed to by both the soil / terrain specialist and the vegetation ecologist. The soil / terrain specialist and the vegetation ecologist will work co-operatively to determine critical ecological parameters including soil moisture and soil nutrient regime which are two key drivers in classifying ecosites.

The field program will use a combination of plot types, including both ground plots and visual plots. The ground plots are more detailed with full soil pits being completed and data collected to address both soils and vegetation needs. The visual plots are less intensive but will also collect sufficient data to help in the final mapping process. It is anticipated that the visual plots will be completed both on the ground (e.g., while walking from one ground plot to another) and in the air from the helicopter. The ground plots and some visuals will be established along transects running out from pre-cut helicopter landing pads. Based on access, it is anticipated that there will be between 50 and 60 ground plots and between 150 to 180 visuals.

Field plot locations will be identified during the initial terrain mapping by both the soil / terrain specialist and vegetation ecologist. The purpose of these field sites for soils and terrain will be to verify / confirm the soil parent materials, depth to bedrock, topography, slope, drainage and presence / absence of ongoing geological modifying processes such as permafrost degradation, landsliding, seepage and high water

7. An ecosite is defined as a distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances.





tables. And as part of the program, soil pits will be dug to a depth of approximately 0.75 m cm and augured to a depth of approximately 2 m or until bedrock is encountered. Individual soil profiles will be described to the subgroup level according to the Canadian System of Soil Classification, Third Edition (Soil Classification Working Group. 1998), Field Manual for Describing Soils in Ontario (University of Guelph 2003) and The Canada Soil Information System (CanSIS) (Expert Committee on Soil Survey 1982). No provincial standards or guidelines are available for soil sampling protocols in non-productive or non-agricultural areas of Ontario.

7.4.2 Soil Quality Sampling

As part of the sampling program, baseline soil quality data will be collected from proposed pit and quarry areas and disturbed areas along the CAR. Sampling locations will be focused on landforms of interest and areas undergoing terrain investigations, including areas near watercourses. Soil samples will be placed in laboratory-supplied sample jars prepared in advance with the appropriate preservatives, sealed, labelled and stored prior to being transported to a CALA certified laboratory. Soil samples will be submitted for analysis of the following parameters:

- Total metals, including:
 - 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;
- pH;
- Total organic carbon;
- Anions (chloride, bromide, fluoride and sulphate);
- Nutrients (nitrate, nitrite);
- Volatile organic compounds (VOCs);
- Poly-aromatic hydrocarbons (PAHs); and / or
- Radionuclide parameters.

The above suite of analytical parameters will be used to establish baseline soil quality and identify contaminants of potential concern associated with Project work, including placement of fill material (general





parameters, anions, metals and radionuclides), blasting residual (nutrients), 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 surficial geological unit.

For the purposes of this study, it is assumed that two samples from 30 individual locations (60 samples total) will be sufficient to assess baseline soil conditions within the PDA, but outside the CAR ROW. Multiple samples will be collected from each lithology at spatially separated locations to allow for a more robust and representative dataset. Samples will typically be collected on the downgradient side of the ROW within the upper 1 m using a shovel or hand auger. The scope of the analytical program will be refined following completion of the desktop study. Prior to field work, a plan map showing the regionally mapped surficial geology units and the proposed sampling locations will be created to help ensure that samples are collected from all surficial geological units and proposed key areas, such as quarries and camps.

7.4.3 Geological Hazard Assessment

Geological hazards in the RSA will be identified during the desktop assessment through discussions with Indigenous communities, or from the detailed terrain mapping within the LSA and PDA. Further assessment and field truthing will be conducted under the terrain / soils field program (**Section 7.4.1.1**) and in other discipline work plans, as required, based on the professional judgement of MFFN CAR Project Consultants. This information will be used when selecting and designing the preferred CAR alignment with the overall goal of minimizing road alignment through areas with known or suspected geological hazards. Geological hazards will include but not limited to:

- Seismic (e.g., earthquakes)
- Liquefaction
- Landsliding / Slumping
- Permafrost degradation (e.g., thermokarst subsidence)
- Isostatic rise
- Inundation / flooding
- Karst
- Soil erosion





8. Data Management

8.1 Data Management

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. 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 Analysis and Reporting

Upon completion of the Physiography, Terrain and Soils desktop study, a report will be produced that outlines the results initial data review, including the identification of data gaps that will need to be addressed in the mapping and field reconnaissance programs. This summary will be used to guide the mapping and subsequent field investigations, as required.

The results from detailed mapping and field investigation programs will be summarized in a baseline report in support of the IS / EA Report for the Project. The baseline report will include:

- A detailed summary of previous relevant investigations including, but not limited to, the studies referenced in **Section 7.2**.
- A series of map figures depicting the bedrock geology accompanied by detailed description of the bedrock geology, including lithologic descriptions for mapped geologic units within the RSA.
- A series of map figures depicting the surficial geology within the LSA accompanied by detailed description of each surficial material type, including texture (e.g., sand, silt, clay), type (rounded, subrounded, subangular, angular) and percent coarse fragment, thickness and associated topographic conditions. Maps will show the location of field sampling sites. A smaller scale map will be provided that shows the surficial geology within the RSA based on published data.
- A discussion of geological hazards including permafrost degradation, and isostatic rebound. This discussion will include a series of smaller-scale maps that depict particular features such as fault lines, karst, etc.





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- A series of map figures depicting “special” geologic and geomorphic features within the LSA that may affect construction and maintenance activities. These include features such as eskers, potential pits and quarries, areas of organic soils, areas of permafrost, areas showing evidence of active permafrost degradation (e.g., thermokarst), areas of steep slopes and other potential hazards.
- A series of map figures depicting soil units within the LSA accompanied by detailed descriptions of each soil group (e.g., data on soil texture, consistency, presence/absence of mottling, depth to water table) and associated topographic conditions. Maps will show the location of soil sampling sites. No soils mapping will be completed for the RSA.
- A series of map figures depicting soil drainage within the LSA accompanied by a detailed description of each soil drainage class and implications for construction and maintenance activities. Maps will show the location of soil sampling sites.
- A series of map figures depicting soil erosion within the LSA accompanied by a discussion of soil erosion and mitigation techniques.

Soil quality results will be compared against applicable federal (Canadian Council of Ministers of the Environment [CCME]) and Ontario Soil Quality Guidelines. All map figures will show spatial boundaries of the Project and will illustrate the CAR, access roads, camp and laydown areas, MFFN community, and other features where appropriate.





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 Physiography, Terrain and Soils is provided in **Table 9-1** and will be confirmed during the IS / 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	Physiography, Terrain and Soils
Construction Phase	<i>Mobilization of Equipment and Supplies</i>	
	<i>Temporary Construction Staging Areas¹</i>	X
	<i>Temporary Access Roads and Trails¹</i>	X
	<i>Temporary Construction Camps¹</i>	X
	<i>ROW Clearing and Grubbing</i>	X
	<i>Brush and Timber Disposal</i>	
	<i>Quarries and Pits¹</i>	X
	<i>Drilling / Blasting / Aggregate Production</i>	X
	<i>Road Construction (stripping, subgrade excavation, embankment fill placement, grading, ditching)</i>	X
	<i>Bridge and Culvert Installation (approach embankments, foundations, substructures, superstructures, traffic protection, erosion controls)</i>	X
	<i>Construction Site Restoration</i>	X





Project Phases	Project Activities	Physiography, Terrain and Soils
Construction Phase: Decommissioning	<i>Quarries and Pits</i>	X
	<i>Temporary Camps, Roads / Trails and Staging Areas</i>	X
Operations Phase	<i>Road Usage</i>	
	<i>Maintenance²</i>	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.

Table 9-2: Physiography, Terrain and Soils Indicators

Valued Component	Indicator	Rationale for Selection
Physiography, Terrain and Soils	<ul style="list-style-type: none"> Degradation of physical or chemical characteristics of terrain, and soils, including permafrost. 	<ul style="list-style-type: none"> Important for geotechnical stability of civil infrastructure (e.g., roads), protection of human health, and protection of aquatic and terrestrial habitat associated with natural hazards (e.g., slope failures).

The Physiography, Terrain and Soil VC has been determined through consideration of the following factors listed in the TISG⁸:

- VC presence in the study area;

8. 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 relationship of the Physiography, Terrain and Soil VC to other disciplines (e.g., vegetation, climate change, etc.);
- 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);
- 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.

The indicators have been determined for VCs of the Physiography, Terrain and Soils through additional consideration of the following:

- any other relevant and credible source, such as scientific or academic publications or input from the public; and
- review of existing available mapping, reports and other information.

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 Physiography, Terrain and Soils.

Geology is not considered a stand-alone VC in the IS / EA, but rather a supporting technical discipline to other VCs. This considers that the characterization of the geological environment will be used to support the assessment of Project-related effects to other identified VCs and their indicators, including Physiography, Terrain and Soils. The identification of geological hazards will also support the assessment of effects of the environment on the Project.





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 Physiography, Terrain and Soils discipline have been identified in **Table 9.1**. The potential direct effects resulting from the Project-environment interactions will be confirmed during the IS / 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 physiography, terrain and soils may result in indirect effects to other environmental disciplines.

9.4 Methods for Predicting Future Conditions

Modelling is a common approach to predicting future conditions for many disciplines / components of an IA / EA. However, modelling is not planned for the Physiography, Terrain and Soils baseline report or 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.





Table 9-3: Potential Discipline Interactions

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





9.6 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 irreversible⁹. 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 identify factors to identify disproportionate residual effects for diverse subgroups.

9.6.1 Magnitude

For magnitude, environmental discipline-specific definitions are required and are proposed below in **Tables 9-4 and 9-5** for Physiography and Terrain, and Soils, respectively.

Table 9-4: Physiography and Terrain Magnitude Definition

Magnitude Level	Definition	Rationale
Negligible	<ul style="list-style-type: none"> There is little to no variation in predicted topographical changes (<1 m), all changes are above the seasonal water table, topographical changes are more than 10 m away from water crossings. (i.e., similar to existing conditions). 	<ul style="list-style-type: none"> Topographical changes are minor and largely indiscernible, therefore no effect on existing drainage surface water flow, and remains protective of ecological and human life (i.e., migration barriers and slope failures).
Low	<ul style="list-style-type: none"> There is a small topographical variation predicted (between 1 and 10 m), all changes are above the seasonal water table, topographical changes are more than 10 m away from water crossings. 	<ul style="list-style-type: none"> Temporary effect or permanent change to topography is discernible but doesn't alter existing surface water flow and remains protective of ecological and human life (i.e., migration barriers and slope failures).

9. 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.





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Magnitude Level	Definition	Rationale
Medium	<ul style="list-style-type: none"> There is modest topographical variation predicted (between 10 and 20 m), changes occur below the seasonal water table, topographical changes are between 3 and 10 m away from water crossings. 	<ul style="list-style-type: none"> Temporary effect or permanent change to topography is discernable, alters existing surface water drainage, acts as a modest barrier to ecological migration, and increases the likelihood of slope failure. However, ecological and human health impacts can be mitigated through planning and implementation of engineering controls.
High	<ul style="list-style-type: none"> There is a large topographical variation predicted (>20 m), changes occur below the seasonal water table, changes are less than 3 m from water crossings. 	<ul style="list-style-type: none"> Temporary effect or permanent change to topography is discernable, and can potentially impair surface water drainage, ecological and human health. Effects can be limited, but not completely removed, through mitigation planning and implementation of engineering controls.

Table 9-5: Soils Magnitude Definition

Magnitude Level	Definition	Rationale
Negligible	<ul style="list-style-type: none"> There is little to no variation predicted in soil concentrations which remain within the range of natural variability. 	<ul style="list-style-type: none"> Soil quality shows no discernable change, therefore no effect on ecological life or human health (e.g., potable water use, physical contact).
Low	<ul style="list-style-type: none"> There is a small variation predicted in soil concentrations that is less than double current concentrations, but concentrations remain below applicable provincial / federal soil quality criteria. 	<ul style="list-style-type: none"> Temporary effect or permanent change to soil quality is minor and is inferred to remain protective of ecological life and human health.
Medium	<ul style="list-style-type: none"> There is a moderate variation predicted in measurable parameters, concentrations are less than five (5) times current concentrations and are below the applicable provincial/federal soil quality criteria, or predicted concentrations are less than 10 times current concentrations. 	<ul style="list-style-type: none"> Temporary effect or permanent change to soil quality is moderate but is inferred to remain protective of ecological life and human health.
High	<ul style="list-style-type: none"> There is a large variation predicted in measurable parameters, concentrations exceed applicable provincial / federal soil quality criteria and are greater than 10 times current concentrations. 	<ul style="list-style-type: none"> Temporary effect or permanent change to soil quality can potentially impair ecological life or human health.

Professional judgement and / or risk assessment may be required to assess impacts where no provincial or federal soil standard exists or when non-threshold parameters such as arsenic, chromium and lead are involved.





9.7 Consideration of Sustainability Principles

The following provides a generic description of how sustainability principles will be considered in the preparation of the IS / EA Report. 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 sustainability assessment for the Project will be undertaken on the preferred alternative and will characterize the Project's contribution to sustainability incorporating the requirements set out in Section 25 of the TISG.

One aspect of the sustainability assessment is describing the process in selecting the preferred alternative to the Project and how the sustainability principles were considered. 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 and 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

Existing condition values for soil quality will be based on one soil sampling program because soil quality is not subject to seasonal or inter-annual variability. It is assumed that two samples from 30 individual locations (60 samples total) is sufficient to assess baseline soil conditions within the PDA, but outside the CAR ROW. If additional landforms / surface soils are encountered, additional soil samples will be required to characterize all soil types.





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	Federal TISG Reference	Requirement / Comment / Concern	Response	Study Plan Reference
1	TISG Section 1.1, page 4	<ul style="list-style-type: none"> 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; 	<ul style="list-style-type: none"> The potential effects of the project on the environment will be assessed in accordance with applicable standards and guidance. 	<ul style="list-style-type: none"> No reference
2	TISG Section 2.3, pages 6-7	<ul style="list-style-type: none"> 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): <ul style="list-style-type: none"> 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; 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. 	<ul style="list-style-type: none"> The information related to landscape features, sensitive or protected areas and select others listed in the TISG will be illustrated on maps and / or described within the IS / EA Report, where appropriate. Land use will be assessed so that appropriate soil quality standards are applied to the soil quality data collected. 	<ul style="list-style-type: none"> Section 6 Section 7 Section 8
3	TISG Section 3.1, page 11	<ul style="list-style-type: none"> The Impact Statement must describe all project components including but not limited to: <ul style="list-style-type: none"> borrow pits, gravel or aggregate pits and quarries (footprint, geographic location, ownership, and development plans including pit phases and lifespan), including their location in relation to upland habitats and the presence of rare, limited and/or significant habitat (e.g., federal, provincial, or Indigenous protected and conserved areas, ANSIs (Areas of Natural and Scientific Interest), Ramsar sites critical habitat identified under the Species at Risk Act, etc.; 	<ul style="list-style-type: none"> Potential quarry and pit areas will be identified on a map in the baseline report. Areas of ecological sensitivity will be identified in other discipline Study Plans 	<ul style="list-style-type: none"> Section 8.2
4	TISG Section 5.1, page 22	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Mitigation measures will be included in the IS / EA Report. 	<ul style="list-style-type: none"> No reference
5	TISG Section 7.1, page 30	<ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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; 	<ul style="list-style-type: none"> The Study Areas are defined and described in this Study Plan. 	<ul style="list-style-type: none"> Section 6.2





ID	Federal TISG Reference	Requirement / Comment / Concern	Response	Study Plan Reference
		<ul style="list-style-type: none"> – 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. 		
6	TISG Section 7.1, page 30	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ A limited amount of modelling may be required during the effects assessment; however, modelling is not planned for the baseline report. ■ If any surrogate data are used to supplement the data collected as part of the field studies (Section 7.3), it will be demonstrated that those data are representative of project site conditions. 	<ul style="list-style-type: none"> ■ Section 7.3 ■ Section 9.4
7	TISG Section 7.1, page 31	<ul style="list-style-type: none"> ■ 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 standard. 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. 	<ul style="list-style-type: none"> ■ Complete data sets from all field sites will be provided. They will be in the form of complete and quality assured relational databases, with precisely georeferenced site information, precise observation / visit information and with observations and measurements in un-summarized form. Databases and GIS files will be accompanied by detailed metadata that meets ISO 19115 standards (or equivalent). Documentation and digital files will be provided for all results of analyses that allow for a clear understanding of the methods and a replication of the results. 	<ul style="list-style-type: none"> ■ No reference
8	TISG Section 7.2, page 32	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Section 7
9	TISG Section 7.2, page 33	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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. ■ A limited amount of modelling may be required during the effects assessment; however, modelling is not planned for the baseline report. 	<ul style="list-style-type: none"> ■ Section 7
10	TISG Section 7.2, page 33	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Section 7





ID	Federal TISG Reference	Requirement / Comment / Concern	Response	Study Plan Reference
11	TISG Section 7.2, pages 31-33	<ul style="list-style-type: none"> ■ 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. <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> • terrestrial ecosystem mapping products; • forest cover maps; • remote sensing resources; • important habitats and features to include: <ul style="list-style-type: none"> ▪ 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; ▪ 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 ▪ 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. 	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Section 7





ID	Federal TISG Reference	Requirement / Comment / Concern	Response	Study Plan Reference
12	TISG Section 7.3, page 34	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Information on the VCs will be collected from the public and indigenous communities as outlined in the Consultation and Engagement Plan and the Aboriginal and Treaty Rights and Interests Study Plan. The IS / EA Report will include an assessment of the effects of the project on the VC. 	<ul style="list-style-type: none"> Section 4 Section 5
13	TISG Section 7.3, page 35	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The baseline report describes the valued components. The IS / EA Report will include further details and descriptions of the VCs, their importance and predicted effects (adverse and positive) as a result of the project. 	<ul style="list-style-type: none"> Section 8.1
14	TISG Section 7.3, page 35	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> This Study Plan will be reviewed by relevant federal and provincial agencies. A work plan will be developed for the valued components and validated by the Agency as required. 	<ul style="list-style-type: none"> Section 7
15	TISG Section 7.3, pages 34-35	<ul style="list-style-type: none"> In selecting a valued component to be included, the following factors should be considered: <ul style="list-style-type: none"> 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 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. 	<ul style="list-style-type: none"> The valued components were selected in consideration of the factors listed in this comment. 	<ul style="list-style-type: none"> Section 9.2
16	TISG Section 7.4.1, page 36	<ul style="list-style-type: none"> For valued components establish three study area spatial boundaries to assess impacts to each valued component: <ol style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Geographic extent, and the extent rationale, of the Project, Local, and Regional Study Areas for this VC is provided in this Study Plan. 	<ul style="list-style-type: none"> Section 6.2
17	TISG Section 7.4.1, pages 35-36	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Geographic extent, and the extent rationale, of the Project, Local, and Regional Study Areas for this VC is provided in this Study Plan. 	<ul style="list-style-type: none"> Section 6.2
18	TISG Section 7.4.2, page 37	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The effects assessment will be conducted across all phases of the project. 	<ul style="list-style-type: none"> Section 6.1





ID	Federal TISG Reference	Requirement / Comment / Concern	Response	Study Plan Reference
19	TISG Section 8.3, pages 40-41	<ul style="list-style-type: none"> ■ The Impact Statement must: <ul style="list-style-type: none"> – describe the bedrock geology and lithological units, including a summary table of geologic descriptions, mineralization styles (if applicable) supported by geological maps and cross-sections at appropriate scale (normally 1:50 000). Provide in the table an inferred risk rating (i.e., low, medium, high) for acid rock drainage and metal leaching potential based on the desk-top review of bedrock geology and mineralization; – provide written description and maps of the current location of eskers and other post-glacial deposits on a map; – identify any geological hazards that exist in the areas planned for the project facilities and infrastructure, including: <ul style="list-style-type: none"> • history of seismic activity in the area, including induced earthquakes, and secondary effects such as the risk of, landslides and liquefaction; • evidence of active faults; • isostatic rise or subsidence; and • history of landslides, slope erosion and the potential for ground and rock instability/landslides, and subsidence during and following project activities. – provide a characterization of the geochemical composition of all expected construction materials (i.e., eskers, quarries, etc.), in order to predict metal leaching and acid rock drainage including oxidation of primary sulphides and secondary soluble sulphate minerals. 	<ul style="list-style-type: none"> ■ The Physiography, Terrain and Soils baseline report will include a geological characterization and geological hazard assessment that meets the requirements of the TISG. A geochemical characterization of construction materials will be completed and is discussed in greater detail in the Groundwater and Geochemistry Study Plan. 	<ul style="list-style-type: none"> ■ Section 7.1 ■ Section 7.2 ■ Section 8.1 ■ Section 9.6
20	TISG Section 8.4, pages 41-42	<ul style="list-style-type: none"> ■ "The Impact Statement must: <ul style="list-style-type: none"> – describe the landforms, soils and sediments within the local and regional project areas, including sediment stratigraphy; surficial geology maps and cross-sections of appropriate scale; – describe the soils and sediment within the local and regional project areas and their suitability for sourcing construction material; – describe the geomorphology, topography and geotechnical characteristics of areas proposed for construction of major project components, including the presence and distribution of eskers and permafrost, if applicable; – identify any areas of ground instability; – provide maps depicting soil depth by horizon and soil order within the project site area to support soil salvage and reclamation efforts, and to outline potential for soil erosion; – describe the suitability of topsoil and overburden for use in the reclamation of disturbed areas including an assessment of the acid generating potential of overburden to be use – describe the historical land use and the potential for contamination of soils and sediments and describe any known or suspected soil contamination with the study area that could be re-suspended, released or otherwise disturbed as a result of the Project; and – identify ecosystems that are sensitive or vulnerable to acidification resulting from the deposition of atmospheric contaminants – provide written description and maps of ecozones, ecoregions, and ecodistricts as per Ontario or Canada's Ecological Landscape Classification; – provide written description and maps of the current location of eskers and other post-glacial deposits on a map; – describe permafrost conditions including distribution of frozen and unfrozen ground, if applicable; and – describe the potential for thaw settlement and terrain instability associated with ground thawing in permafrost areas, if applicable. 	<ul style="list-style-type: none"> ■ The desktop and field studies will incorporate all of the comments and summarize the results as part of the baseline works and the IS / EA Report. 	<ul style="list-style-type: none"> ■ Section 7 ■ Section 8
21	TISG Section 8.6, page 46	<ul style="list-style-type: none"> ■ 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; 	<ul style="list-style-type: none"> ■ Publicly available geological data obtained through the desktop study will be included on relevant Project Plan maps. 	<ul style="list-style-type: none"> ■ Section 7.1
22	TISG Section 8.9, page 54	<ul style="list-style-type: none"> – use the Ontario Ministry of Natural Resources and Forestry's Far North Land cover (version 1.4 or later, as available) and augmentation with fire history, digital elevation models, surficial geology and other data sources 	<ul style="list-style-type: none"> ■ This source will be used in the IS / EA Report where applicable. 	<ul style="list-style-type: none"> ■ Appendix A
23	TISG Section 13, pages 80-83	<ul style="list-style-type: none"> ■ This section of the TISG describes the methodology for the effects assessment, including definitions of scope, severity, and irreversibility. 	<ul style="list-style-type: none"> ■ The IS / EA Report will include a description of the methodology of the effects assessment, some of which is also summarized in this Study Plan. 	<ul style="list-style-type: none"> ■ Section 9
24	TISG Section 14.3, page 88	<ul style="list-style-type: none"> ■ The Impact statement must describe any changes to eskers and similar geological features as a result of the Project; 	<ul style="list-style-type: none"> ■ Changes in topography will be assessed as part of the IA / EA. The locations of key geological features will be identified during the desktop review and ground-truthed during the field studies. 	<ul style="list-style-type: none"> ■ Section 7.1 ■ Section 7.3





ID	Federal TISG Reference	Requirement / Comment / Concern	Response	Study Plan Reference
25	TISG Section 14.3, page 88	<ul style="list-style-type: none"> The Impact statement must describe any changes to permafrost conditions as a result of the Project; 	<ul style="list-style-type: none"> Permafrost will be considered in the assessment as part of the IA / EA. The presence of frozen and unfrozen ground will be identified during the desktop review and ground-truthed during the field studies. 	<ul style="list-style-type: none"> Section 7.1 Section 7.3
26	TISG Section 14.3, Page 88	<ul style="list-style-type: none"> The Impact Statement must provide an overall description of changes related to landscape disturbance including fragmentation of habitats and project effects on areas of ground instability; 	<ul style="list-style-type: none"> Changes in topography will be assessed as part of the IA / EA, including subsequent effects on habitat fragmentation and geohazards. 	<ul style="list-style-type: none"> No reference
27	TISG Section 14.3, page 88	<ul style="list-style-type: none"> 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); 	<ul style="list-style-type: none"> The contaminants of concern for soil will be presented in IS / EA Report and soil samples will be analyzed for contaminant of concern parameters (including arsenic, chromium, mercury and methylmercury) as part of the baseline studies. The contaminants of concern for water will be described in the Groundwater and Geochemistry and Surface Water Study Plans. Accidents and malfunctions will be assessed in the IS / EA Report. Potential changes to surface and groundwater (quality and quantity), including effects on other VCs, will be assessed as part of the IA / EA. 	<ul style="list-style-type: none"> Section 7.4 Groundwater and Geochemistry Study Plan Surface Water Study Plan
28	TISG Section 14.3, page 88	<ul style="list-style-type: none"> 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; 	<ul style="list-style-type: none"> Changes in topography will be assessed as part of the IA / EA, including changes in surface water drainage and the subsequent effects on other VCs will be assessed in the IA / EA. Mercury and methylmercury soil sampling will also be completed to determine the presence of mercury within the LSA and allow for risk assessment and mitigation planning, as required. In addition, the Surface Water and Groundwater and Geochemistry Study Plans include water quality sampling for mercury and methylmercury parameters. 	<ul style="list-style-type: none"> Section 7.4 Surface Water Study Plan Groundwater and Geochemistry Study Plan
29	TISG Section 14.3, page 89	<ul style="list-style-type: none"> describe the historical land use and the potential for contamination of soils and sediments and potential for loss of soil fertility. Describe any known or suspected soil contamination within the study area that could be re-suspended, released or otherwise disturbed as a result of the Project; 	<ul style="list-style-type: none"> Soil quality data will be collected at any known or potential areas of contamination as part of the baseline soil sampling program. 	<ul style="list-style-type: none"> Section 7.4
30	TISG Section 20, page 119-128	<ul style="list-style-type: none"> Section 20 of the TISG describes the requirements around mitigation and enhancement measures that must be considered in the Impact Statement. 	<ul style="list-style-type: none"> Mitigation measures will be informed by best management practices, applicable resource management and / or recovery plan, Indigenous input, and industry standards. 	<ul style="list-style-type: none"> Section 9.5
31	TISG Section 21, pages 129-130	<ul style="list-style-type: none"> Section 21 of the TISG describes the requirements and guidance associated with determining residual effects. 	<ul style="list-style-type: none"> Residual effects will be assessed in the IA / EA. 	<ul style="list-style-type: none"> Section 9.6
32	TISG Section 22, pages 131-133	<ul style="list-style-type: none"> Section 22 of the TISG describes the guidance around conducting cumulative effects assessment for the project. 	<ul style="list-style-type: none"> Cumulative effects assessment will be conducted as part of the IA / EA. 	<ul style="list-style-type: none"> Effects Assessment Methodologies
33	TISG Section 23.2, page 136	<ul style="list-style-type: none"> Identify any areas of potential wind or water erosion, slumps and slope instability, geologic hazards, including but not limited to those caused by geologic movements; 	<ul style="list-style-type: none"> These areas will be identified during the desktop study. If geological hazards in the RSA are identified during the desktop assessment the areas will be flagged to the Geotechnical and Project design teams. Further assessment and field truthing will be conducted under other discipline work plans, as required, based on the professional judgement of the geotechnical team. The Project design team will use this information when selecting and designing the preferred CAR alignment with the overall goal of minimizing road alignment through areas with known or suspect geological hazards. 	<ul style="list-style-type: none"> Section 7.1 Section 7.4.3
34	TISG Section 25, pages 139-140	<ul style="list-style-type: none"> Section 25 of the TISG provides guidance on how to demonstrate the Project's contributions to sustainability. 	<ul style="list-style-type: none"> The IS / EA Report will include discussion on how the project contributes to sustainability. 	<ul style="list-style-type: none"> Section 9.7
35	TISG Section 26, Page 141	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The IS / EA Report will include descriptions of follow-up programs, as required by VC. 	<ul style="list-style-type: none"> Section 9.9





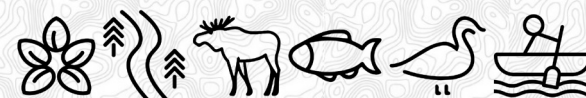
Table 11-2: Study Plan Provincial Concordance – Conformance with Requirements

ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
1	MECP	<ul style="list-style-type: none"> Completeness Review Memorandum compiled from MECP emails and August 2019 meetings with MECP and ENDM 	<ul style="list-style-type: none"> 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.). 	<ul style="list-style-type: none"> The Study Areas are defined and described in the Study Plan. 	<ul style="list-style-type: none"> Section 6
2	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> #17 Section 8 Page 54 <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The Study Plan meets this requirement. As identified in Section 4.2 of the Study Plan, the Proponent will provide 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 (IAAC 2020a). Further information on how Indigenous Knowledge will be considered in the IS / EA Report has been included in Section 5 of the Study Plan. Section 5 of the Study Plan provides further details on the 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. 	<ul style="list-style-type: none"> Section 4 Section 5
3	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> #21 Section 10.2.4 Page 73 Technical Work Plans – <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The Study Plan meets this requirement. 	<ul style="list-style-type: none"> No reference
4	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Assessment Methods – <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The Study Plan meets this requirement. 	<ul style="list-style-type: none"> Section 7 Section 8





ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
5	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> #16 Section 8 Page 54, Work Plans <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The Study Plan meets this requirement. 	<ul style="list-style-type: none"> Section 9
6	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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])." 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Section 7.4.2
7	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> #2 Draft Terms of Reference (Nov. 2019), Section 7.1 Description of the Environment; Table 7-1: Environmental Disciplines to be Considered during the Environmental Assessment, p. 22. Table 7-1 includes a list of environmental disciplines that will be considered during the EA. 'Geochemistry' was not included in the list for the Natural (Physical and Biophysical Environment. The consultant has committed to classification of bedrock quarry source materials, where "Samples of the bedrock will be obtained, and photographs of the feature will be taken in an effort to assess the suitability for quarry development." (p. 26). 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. 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. Baseline geochemistry investigations must be completed during the EA, with results and interpretation provided in the EA and applicable MECP Permit To Take Water (PTTW) and Environmental Compliance Approval (ECA) applications. These geochemistry investigations must include Acid Rock Drainage and Metal Leaching (ARD/ML) testing of representative samples from proposed aggregate rock source (i.e., quarry) material locations. The sample selection, collection, analytical testing and interpretation of results should be undertaken according to the following international guidelines: Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, MEND (Mine Environment Neutral Drainage Program) Report 1.20.1, December 2009 [http://mend-nedem.org/wp-content/uploads/1.20.1_PredictionManual.pdf] Rock Drainage at Mine sites in British Columbia, British Columbia Ministry of Energy and Mines, August 1998 [https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/mineral-exploration-mining/documents/permitting/ml-ard_guidelines.pdf] 	<ul style="list-style-type: none"> The Study Plan meets this requirement. 	<ul style="list-style-type: none"> Section 7.4.2





ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
8	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Subsection 7.1.4.3 pg 25-26 <ul style="list-style-type: none"> Provides an overview of soils and overburden stratigraphy along the proposed road corridor route. It is noted that the central portion of the proposed route follows the general path of a series of mining claims by Canada Chrome Corporation, that include extensive (~400 m spacing) overburden exploration boreholes drilled in 2010 (refer to the Ontario Assessment File Database, #20000007482, Ministry of Energy, Northern Development and Mines). The proponent is encouraged to access the associated borehole logs and geotechnical studies to provide additional baseline information on soil stratigraphy for the EA and supporting documents for MECP Permit to Take Water (PTTW) and ECA applications [http://www.geologyontario.mndm.gov.on.ca/mn_dmfiles/afri/data/records/20000007482.html]. Additional baseline data for soil stratigraphy in support of the EA and applicable MECP PTTW and ECA applications may be obtained from Ontario Assessment File #20000007482, Ministry of Energy, Northern Development and Mines [http://www.geologyontario.mndm.gov.on.ca/mndmfiles/afri/data/records/20000007482.html]." 	<ul style="list-style-type: none"> Publicly available online databases will be reviewed as part of this desktop assessment and results will be included in the baseline report. 	<ul style="list-style-type: none"> Section 7.1
9	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Section 7.4.2 Groundwater and Geochemistry Study Plan
10	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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). 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Section 7.4.2 Groundwater and Geochemistry Study Plan
11	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> #7 Draft Terms of Reference (Nov. 2019), Section 7.2 Potential Environmental Effects; Subsection 7.2.5 Groundwater, p. 50. Subsection 7.2.5 <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Section 7.4.2 Groundwater and Geochemistry Study Plan





ID	Comment from Regulatory Agency	Comment Type	Requirement / Comment / Concern	Response	Study Plan Reference
12	MECP	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> #15 Draft Terms of Reference (Nov. 2019), Appendix A – Draft Criteria & Indicators for Alternatives Evaluation, p. A- 1. <ul style="list-style-type: none"> In Appendix A, it is recommended that the following data source is used for additional baseline soil and overburden stratigraphy data along the proposed road corridor route: Ontario Assessment File Database, #20000007482, Ministry of Energy, Northern Development and Mines, [http://www.geologyontario.mndm.gov.on.ca/mn dmfiles /afri/data/records/20000007482.html]. Include the following source of information in Appendix A – Draft Criteria & Indicators for Alternatives Evaluation of the Terms of Reference: Ontario Assessment File Database, #20000007482, Ministry of Energy, Northern Development and Mines, [http://www.geologyontario.mndm.gov.on.ca/m ndmfiles/afri/data/records/20000007482.html]. 	<ul style="list-style-type: none"> Conducting a review of relevant mining claims in Canada Chrome Corporation (Ontario Assessment File Database, #20000007482, Ministry of Energy, Northern Development and Mines). 	<ul style="list-style-type: none"> Section 7.1
13	MNRF	<ul style="list-style-type: none"> Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference 	<ul style="list-style-type: none"> Sec 7.1.4.3 pg. 25 <ul style="list-style-type: none"> There doesn't appear to be soil sampling planned to identify baseline metals information. Having baseline information will provide data in the event of accidental release of contaminants during construction from the use of equipment and machinery (as noted in section 7.2.3). When conducting the geotechnical analysis on mineral and peat material, collect samples for analysis to be done. Soil samples could also be collected as part of the ELC/vegetation surveys (7.1.4.6). 	<ul style="list-style-type: none"> The soil sampling program is outlined in Section in 7.3.3 and includes analysis of metals, as well as numerous other parameters. 	<ul style="list-style-type: none"> Section 7.3.3
14	MNRF	<ul style="list-style-type: none"> Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference 	<ul style="list-style-type: none"> Sec. 7.2.3 – Physiology, Geology, Terrain and Soils pg. 42 Appendix A <ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> The Groundwater and Geochemistry Study will identify potential quarry and pit areas and conduct sampling activities to develop a baseline for existing conditions and to assess the potential for ML / ARD or elevated soil concentration issues. This information will be using in conjunction with data from other disciplines to assess the risk on ecological habitats in the quarry and pit areas and construction areas. 	<ul style="list-style-type: none"> Section 7 Section 9 Groundwater and Geochemistry Study Plan
15	MNRF	<ul style="list-style-type: none"> Letter received from Dave Barker, Resources Management Supervisor, Nipigon District, MNRF on the Draft Terms of Reference 	<ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> 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-publications While 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. 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Section 7 Appendix A





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.

Expert Committee on Soil Survey, 1982:

The Canada Soil Information System (CanSIS): Manual for Describing Soils in the Field, 1982 Revised. Land Resource Research Institute, Research Branch, Agriculture Canada, Ottawa. LRRR Contribution no 82-52. 166 pp.

Impact Assessment Agency of Canada, 2019:

Impact Assessment Act. <https://laws-lois.justice.gc.ca/eng/acts/I-2.75/>

Golder Associates Inc., 2010:

2010 Geology and Terrain Unit Geotechnical Data Report, Canada Chrome Proposed Infrastructure Corridor, 093-81042, December 27, 2010.

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>





MARTEN FALLS FIRST NATION ALL SEASON COMMUNITY ACCESS ROAD

Physiography, Terrain and Soils Study Plan

KGS Group Inc., 2019:

Environmental Assessment and Preliminary Design Services for Marten Falls Community Access Road 3-Day Helicopter Reconnaissance – Phase 1 – Final, December 11, 2019.

Ontario Geological Survey, 1984:

Aggregate Resources Inventory of the Hearst Area, Cochrane District; Ontario, Geological Survey, Aggregate Resources Inventory Paper 71, 51 p., 6 tables, 6 maps, scale 1:50 000.

Ontario Government, 1990a:

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

Ministry of Energy, Northern Development and Mines, 2017a:

Quaternary Geology. <https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/quaternary-geology>

Ministry of Energy, Northern Development and Mines, 2017b:

Bedrock Geology. <https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/bedrock-geology>

Price, W.A., 1997:

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

Price, W.A., 2009:

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

Soil Classification Working Group, 1998:

The Canadian System of Soil Classification, 3rd ed. Agriculture and Agri-Food Canada Publication 1646, 187 pp.

University of Guelph, 2003:

Field Manual for Describing Soils in Ontario. ASIN : B00JGZIH4 1.20.1. Version CANMET – Mining and Mineral Sciences Laboratories, Smithers, BC.



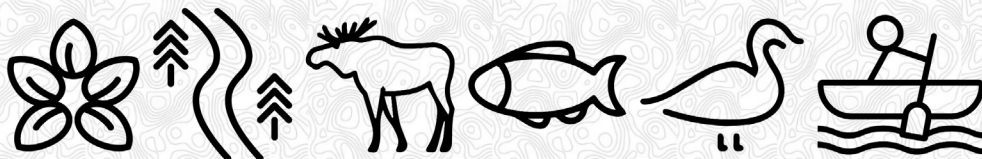


MARTEN FALLS FIRST NATION
ALL SEASON COMMUNITY ACCESS ROAD

Physiography, Terrain and Soils Study Plan

Appendix A

Preliminary List of Data Sources





MARTEN FALLS FIRST NATION ALL SEASON COMMUNITY ACCESS ROAD

Physiography, Terrain and Soils Study Plan

Golder Associates Inc., 2010:

2010 Geology and Terrain Unit Geotechnical Data Report, Canada Chrome Proposed Infrastructure Corridor, 093-81042, December 27, 2010.

KGS Group Inc., 2019:

Environmental Assessment and Preliminary Design Services for Marten Falls Community Access Road 3-Day Helicopter Reconnaissance – Phase 1 – Final, December 11, 2019.

Ministry of Energy, Northern Development and Mines, 2017:

Bedrock Geology. <https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/bedrock-geology>

Ministry of Energy, Northern Development and Mines, 2017:

Quaternary Geology. <https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/quaternary-geology>

Ministry of Energy, Northern Development and Mines:

Canada Chrome Corporation mining claims (Ontario Assessment File Database, #20000007482).

Ontario Aggregate Resources Corporation, 2002:

The Mineral aggregates in Ontario Report.

Ontario Geological Survey, 1984:

Aggregate Resources Inventory of the Hearst Area, Cochrane District; Ontario, Geological Survey, Aggregate Resources Inventory Paper 71, 51 p., 6 tables, 6 maps, scale 1:50 000.

Price, W.A., 1997:

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

Price, W.A., 2009:

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





MARTEN FALLS FIRST NATION
ALL SEASON COMMUNITY ACCESS ROAD

Physiography, Terrain and Soils Study Plan

Appendix B

Agency Comments on the Draft Study Plan





MARTEN FALLS FIRST NATION
ALL SEASON COMMUNITY ACCESS ROAD

Physiography, Terrain and Soils Study Plan

Draft Study Plan Comments – Federal





Comment # / Ref #	Study Plan Section	TISG Section	Agency / Regulatory Body Comments Received From	Comment / Context	Action Item	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 (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.		■ 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
GE-01	■ Section 3: Spatial Boundaries: Study Areas – "The PSA encompasses the 100 m wide CAR right-of-way (ROW), temporary construction access roads, work areas, worker camps, and long-term aggregate sources and associated access roads. The LSA currently being considered within the scope of the ongoing regulatory review process generally includes the area within 2.5 km of the centreline of Alternative 1 and Alternative 4."	■ Section 7.4.1 – "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... – 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; ..."	■ The Agency	■ The description of the study areas is unclear, in particular the description of the Project Study Area. ■ From the description provided in the study plan, it seems that only the Local Study Area and the Regional Study Area will encompass the route alternatives under consideration. ■ The study plan does not clearly describe how baseline data will be collected for the route alternatives under consideration.	■ Update the study plan to clarify the spatial boundaries of the study areas, in particular of the Project Study Area, for all route alternatives under consideration. ■ Update the study plan to provide a map showing the study areas for all route alternatives under consideration.	■ A map of the study areas is included.	■ Table 6-1 in Section 6.2.
GE-02	■ Figure 3-1	■ Editorial	■ The Agency	■ The legend of the map provided in Figure 3-1 is incomplete, as several colors used in the map are not featured in the legend. ■ A clear understanding of the map is important for validation of appropriateness of the sampling locations.	■ Update the legend of the map provided in Figure 3-1 to indicate what all various coloured areas represent. Several colors used in the map are not featured in the legend.	■ The study area plan map is updated.	■ Figure 6-2 in Section 6.2





Comment # / Ref #	Study Plan Section	TISG Section	Agency / Regulatory Body Comments Received From	Comment / Context	Action Item	Response	Study Plan Reference
GE-03	<ul style="list-style-type: none"> ■ Section 4: Baseline Study Design – “This study plan focuses on the additional studies that are anticipated to be required to gather information beyond what is currently available through existing information sources, including those as described in Section 7.2 ‘Sources of baseline information’ in IAAC’s Tailored Impact Statement (TISG) for this Project” 	<ul style="list-style-type: none"> ■ Section 8.4 – “The Impact Statement must: ... <ul style="list-style-type: none"> • describe the geomorphology, topography and geotechnical characteristics of areas proposed for construction of major project components, including the presence and distribution of eskers and permafrost, if applicable; ... • provide maps depicting soil depth by horizon and soil order within the project site area to support soil salvage and reclamation efforts, and to outline potential for soil erosion; ... • describe the historical land use and the potential for contamination of soils and sediments and describe any known or suspected soil contamination with the study area that could be re-suspended, released or otherwise disturbed as a result of the Project; and • identify ecosystems that are sensitive or vulnerable to acidification resulting from the deposition of atmospheric contaminants; ... • provide written description and maps of the current location of eskers and other post-glacial deposits on a map; • describe permafrost conditions including distribution of frozen and unfrozen ground, if applicable; and • describe the potential for thaw settlement and terrain instability associated with ground thawing in permafrost areas, if applicable.” 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ It is unclear if the requirements in Section 8.4 of the Guidelines will be met. Proposed methodologies for many of the relevant requirements in Section 8.4 of the Guidelines are not included in the study plan 	<ul style="list-style-type: none"> ■ Update the study plan to provide information to demonstrate the proposed approaches and methods to be used to meet the requirements of Section 8.4 of the Guidelines. 	<ul style="list-style-type: none"> ■ The Study Plan is updated to include the relevant requirements of Section 8.4 of the Guidelines. 	<ul style="list-style-type: none"> ■ Section 7.1 ■ Section 8.1





Comment # / Ref #	Study Plan Section	TISG Section	Agency / Regulatory Body Comments Received From	Comment / Context	Action Item	Response	Study Plan Reference
GE-04	<ul style="list-style-type: none"> ■ Section 4.1: Desktop Assessment <ul style="list-style-type: none"> – “Due to the large Project area, the study will be largely based on previous investigations and published existing data / information in the area.” ■ Section 7: Conformance with Federal and Provincial Guidance <ul style="list-style-type: none"> – “The summary report will provide detailed descriptions of specific data sources and data collection methods associated with physiology, geology, geochemistry, terrain and soils.” 	<ul style="list-style-type: none"> ■ Section 7.1 <ul style="list-style-type: none"> – “...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 <ul style="list-style-type: none"> – “...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..” 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ It is assumed that the previous investigations referenced in Section 4.1 of the study plan are the 2009-2010 geotechnical investigations commissioned by Canada Chrome Corporation and the 2019 KGS geotechnical investigations. ■ It is unclear what published existing data and information in the area will be used. 	<ul style="list-style-type: none"> ■ Demonstrate that the reports are representative of all of the terrain units and settings encountered by the Project. ■ Provide details about the published existing data and information that will be used to characterize the baseline conditions, as required in Section 7.2 of the Guidelines. ■ If surrogate data sources from reference sites are used rather than site-specific surveys, provide detail to demonstrate that the data are representative of project site conditions and clarify how potential gaps in the spatial coverage of the data will be addressed. ■ Ensure that a clear map showing all proposed route alternatives, along with the borehole and auger data used for each alternative, is provided in the Impact Statement. Ensure that in composite the existing and new data meet the requirements of the Guidelines 	<ul style="list-style-type: none"> ■ The Study Plan is updated to indicate if any surrogate 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. ■ The map showing the proposed routes is included (Figure 6-2). 	<ul style="list-style-type: none"> ■ Section 7.1 ■ Figure 6-2
GE-05	<ul style="list-style-type: none"> ■ Section 4.3.1: Geochemistry (ML/ARD) <ul style="list-style-type: none"> – “We have assumed that half of the samples will be collected at surface (bedrock outcrop hand samples) and the remainder will be collected from geotechnical drill core. The depth of the drill core samples will be shallower than the proposed depths of quarry / blasting operations to make certain that samples are representative of blast / fill material” 	<ul style="list-style-type: none"> ■ Section 3.2.2 <ul style="list-style-type: none"> – The Impact Statement must describe the anticipated activities during the operation phase of the Project, including: ... <ul style="list-style-type: none"> • characterization and management of borrow material, including overburden, and aggregate (storage, handling and transport of the volumes generated, mineralogical characterization, potential for metal leaching and acid rock drainage);...” ■ Section 8.3 <ul style="list-style-type: none"> – “The Impact Statement must: ... <ul style="list-style-type: none"> • provide a characterization of the geochemical composition of all 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ Caution is recommended when sampling surface outcrop samples as they can be weathered and not indicative of the actual reactivity of the rock. It is recommended that the depth distribution of samples (including those at surface) reflect the approximate distribution of the main volume of material to be quarried at depth. 	<ul style="list-style-type: none"> ■ Provide details to demonstrate that the samples collected at each location will be compositionally and spatially representative of material to be disturbed. 	<ul style="list-style-type: none"> ■ The Study Plan is updated to describe that approximately 25% of the samples will be collected near surface (<0.4 m below grade) and bedrock outcrop hand samples. Care will be taken to collect fresh outcrop samples and not exposed/weathered bedrock samples. The remainder of the samples will be collected from geotechnical drill core. The depth of the drill core samples will be shallower than the proposed depths of quarry / blasting operations to make certain that samples are representative of blast / fill material. 	<ul style="list-style-type: none"> ■ Section 7.4.2





Comment # / Ref #	Study Plan Section	TISG Section	Agency / Regulatory Body Comments Received From	Comment / Context	Action Item	Response	Study Plan Reference
		expected construction materials (i.e., eskers, quarries, etc.), in order to predict metal leaching and acid rock drainage including oxidation of primary sulphides and secondary soluble sulphate minerals..”					
GE-06	<ul style="list-style-type: none"> ■ Section 4.3.1: Geochemistry (ML/ARD) <ul style="list-style-type: none"> – “Mineralogy and Rietveld X-ray Diffraction: To determine the mineralogical composition of the rock samples.” 	<ul style="list-style-type: none"> ■ Section 8.3 <ul style="list-style-type: none"> – “The Impact Statement must: ... <ul style="list-style-type: none"> • provide a characterization of the geochemical composition of all expected construction materials (i.e., eskers, quarries, etc.), in order to predict metal leaching and acid rock drainage including oxidation of primary sulphides and secondary soluble sulphate minerals..” ■ Section 14.2 <ul style="list-style-type: none"> – “...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: ... <ul style="list-style-type: none"> • describe the methods used to predict acid rock drainage and/or metal leaching for construction materials, including sample collection and laboratory testing;...” 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ As the material to be sampled and tested likely contains low sulphide mineral concentrations, it is recommended that the proponent utilizes QEMSCAN rather than Rietveld XRD, as it has a much lower detection limit. It is possible that Rietveld XRD will not detect any sulphide minerals and is thus not of value for this project. 	<ul style="list-style-type: none"> ■ Revise the study plan to provide details to demonstrate that using QEMSCAN rather than Rietveld XRD will be considered, as it has a much lower detection limit for sulphide minerals. 	<ul style="list-style-type: none"> ■ Based on the level of this study at this time, XRD is considered sufficient and will allow for more samples to be collected due to the relative cost per analysis (~\$250 for XRD and ~\$1000 for QEMSCAN). In the future, we can use QEMSCAN for targeted locations as specified/requested by the professional geochemist. ■ No changes to the text were made. 	<ul style="list-style-type: none"> ■ N/A
GE-07	<ul style="list-style-type: none"> ■ 4.3.2 Soil Sampling <ul style="list-style-type: none"> – (...) Soil samples will be submitted for analysis of the following parameters: <ul style="list-style-type: none"> • Total metals (including mercury, arsenic and chromium); • Alkalinity; • pH; • Total organic carbon; • Anions (chloride, bromide, fluoride and sulphate); 	<ul style="list-style-type: none"> ■ Section 9 <ul style="list-style-type: none"> – “...The proponent should refer to Health Canada guidance documents such that best practices are followed in the collection of baseline information to assess real and perceived project-related impacts to human health due to changes in air quality, noise, drinking and recreational water quality, country foods and/or multiple pathways of exposure to 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ The study plan proposes to test soil samples for various parameters such as total metals, PAHs, VOCs to determine baseline levels of contaminants. However, the study plan does not explain how soil contaminants of potential concerns (COPCs) were screened for inclusion in the assessment. 	<ul style="list-style-type: none"> ■ Provide details to demonstrate the methods used to screen the proposed COPCs into the soil quality assessment and to explain the rationale for the proposed methods. ■ Describe interconnections and clarify how predicted changes in soil contaminant levels will be incorporated in the exposure pathway analysis for the human health effect assessment 	<ul style="list-style-type: none"> ■ As Project emissions of concern will be determined primarily based on the outcomes of the Air Quality Study, it is not possible at this time to screen soils for COPCs. If Air Quality Study outcomes suggest a potential for significant deposition of air emissions of concern onto local soils, then the soil contact pathway will be considered for evaluation in a HHRA. This may necessitate a need for a surface soil survey in the areas 	<ul style="list-style-type: none"> ■ Section 7.3.3 provides rational for the list of soil parameters that will be analyzed for during the baseline studies.





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	<ul style="list-style-type: none"> Nutrients (nitrate, nitrite); Volatile organic compounds (VOCs); Poly-aromatic hydrocarbons (PAHs); and/or Radionuclide parameters. <p>■ Table 6.1: Physiography, Geology, Geochemistry, Terrain, and Soils indicators</p> <ul style="list-style-type: none"> Indicator: Physiography, Terrain and Soils Expression of Change: Degradation of physical or chemical characteristics of permafrost, terrain or topography (e.g., natural hazards) and soils. Rationale for selection: Important for geotechnical stability of civil infrastructure (e.g., roads), protection of human health, and protection of aquatic and terrestrial habitat associated with natural hazards (e.g., slope failures). 	<p>contaminants. The proponent should provide a detailed rationale/explanation for any deviation from recommended baseline characterization approaches and methods, including from Health Canada's guidance, or when determining such characterization is not warranted."</p> <p>■ Section 16.1</p> <ul style="list-style-type: none"> "...With respect to biophysical determinants of health, the Impact Statement must: ... <ul style="list-style-type: none"> describe and quantify the health risk from exposure to COPCs (e.g., arsenic, chromium, mercury) via consumption of country foods and differential risk for vulnerable subgroups; ... if a Human Health Risk Assessment is required, the assessment must identify all potential contaminant exposure pathways for contaminants of concern to adequately characterize potential biophysical risks to human health. A multimedia Human Health Risk Assessment may need to be considered and conducted for any contaminant of potential concern with an identified risk and multiple pathways;..." 		<ul style="list-style-type: none"> Additionally, it is not clear how soil quality data will be used in the prediction of human health risks (e.g., from consumption of country foods). 	<p>proposed in the human health and community safety study plan.</p> <ul style="list-style-type: none"> Consult Section 7 of Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment. 	<p>predicted to receive the greatest potential deposition of air emissions, to generate baseline soil concentrations of the emissions of concern. Soil data may not be used at all in an assessment of country food consumption, should that exposure pathway be deemed necessary to assess in a HHRA. Ideally, country food item tissue data would provide the concentrations of COPCs in the harvested food items of interest. Soil data are only relevant towards estimating COPC levels in country food items if the foods are harvested from the same locations that are expected to incur soil impacts due to air emissions, and are only relevant for food items that are in direct contact with soil (such as plants, berries). Soil data are typically irrelevant to any assessment of fish or game animal country food items (due to reasons such as animal home ranges and foraging behaviours, locations where harvesting occurs relative to areas where soil impacts are predicted). The noted HC guidance will be consulted should there be a need to assess human exposure pathways related to soil and/or country foods.</p>	
GE-08	<ul style="list-style-type: none"> ■ Section 4.3.2: Soil Sampling – "As part of the ML/ARD sampling program, a single soil sampling event will be conducted to collect baseline soil quality data from proposed borrow source areas and disturbed areas.... For the purposes of this study, it is assumed that two samples from 30 individual locations (60 samples total) will be sufficient to 	<ul style="list-style-type: none"> ■ Section 4.4 – "...The determination of alternative means must be conducted in accordance with the Impact Assessment Agency of Canada's policy and guidance documents (2)..." ■ Section 8.4 – "The Impact Statement must: 	■ The Agency	<ul style="list-style-type: none"> According to Agency guidance on alternatives, a proponent is expected to select one or multiple preferred alternatives that become the focus of the impact assessment. Where multiple alternatives are brought forward, a more detailed assessment of the alternatives is required. 	<ul style="list-style-type: none"> Provide details to demonstrate that landforms, soils and sediments within both the local and regional study areas, including sediment stratigraphy; surficial geology maps and cross-sections of appropriate scale, will be described in the Impact Statement. Provide details to demonstrate that a description of the 60 (total) 	<ul style="list-style-type: none"> The baseline studies will provide details on landforms (e.g., eskers), soils and sediments within both the local and regional study areas. Surficial geology maps will be field-truthed at sampling locations. Cross-sections will not be completed at the baseline stage, but will be included at key locations in future reporting (e.g., Impact Statement). 	<ul style="list-style-type: none"> ■ Section 7.4.3 ■ Section 8.1





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	assess baseline soil conditions within the Project disturbance footprint, but outside the CAR ROW. Samples will typically be collected on the downgradient side of the ROW within the upper 1 m using a shovel or hand auger”	<ul style="list-style-type: none"> describe the landforms, soils and sediments within the local and regional project areas, including sediment stratigraphy; surficial geology maps and cross-sections of appropriate scale;...” (2) https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/guidance-need-for-purpose-of-alternatives-to-and-alternative-means.html 		<ul style="list-style-type: none"> It is unclear if the landforms, soils and sediments within the local and regional project areas will be described, as per the requirement in Section 8.4 of the Guidelines. In addition, the study plan does not clearly present the criteria used for the selection of the 30 sampling locations. 	<ul style="list-style-type: none"> samples planned to be collected (i.e., type of material such as clay, silt, sand, etc.) will be included in the Impact Statement. Ensure that all route alternatives under consideration, as well as the location of all other project components, particularly the aggregates sources (short-term and long-term), are determined prior to the baseline data collection and are scoped in the study plan. If a preferred alternative has not been identified before baseline studies start, then baseline data collection must be carried out for all route alternatives under consideration. Update the study plan to provide a map with the proposed location of the 30 sampling sites for the baseline data collection. Provide sufficient detail to demonstrate how the 30 locations represent all alternative project components. 	<ul style="list-style-type: none"> For the purposes of this study, it is assumed that two samples from 30 individual locations (60 samples total) will be sufficient to assess baseline soil conditions within the Project disturbance footprint, but outside the CAR ROW. Multiple samples will be collected from each lithology at spatially separated locations to allow for a more robust and representative dataset. Samples will typically be collected on the downgradient side of the ROW within the upper 1 m using a shovel or hand auger. If multiple landforms / surface soils are present at any station, additional soil samples will be collected to ensure multiple samples of each soil type are collected. The scope and budget of the analytical program will be refined following completions of the desktop study. Prior to field work, a plan map showing the regionally mapped surficial geology units and the proposed sampling locations will be created to ensure that samples are collected from all surficial geological units. 	
GE-09	<ul style="list-style-type: none"> Section 4.3.2: Soil Sampling <ul style="list-style-type: none"> “samples will be submitted for analysis of the following parameters: <ul style="list-style-type: none"> Total metals (including mercury, arsenic and chromium); Alkalinity; pH; Total organic carbon; Anions (chloride, bromide, fluoride and sulphate); Nutrients (nitrate, nitrite); Volatile organic compounds (VOCs); • Poly-aromatic hydrocarbons (PAHs); and/or Radionuclide parameters. The above suite of analytical parameters will be used to establish baseline soil quality and 	<ul style="list-style-type: none"> Section 8.4 <ul style="list-style-type: none"> “The Impact Statement must: ... <ul style="list-style-type: none"> describe the suitability of topsoil and overburden for use in the reclamation of disturbed areas including an assessment of the acid generating potential of overburden to be used;...” 	<ul style="list-style-type: none"> The Agency 	<ul style="list-style-type: none"> It is recommended that soil is subjected to the same ABA test method as described in Section 4.3.1 of the study plan, to suitably confirm the ARD potential of the soil and overburden and plan for appropriate use and/or management 	<ul style="list-style-type: none"> Update the study plan to describe considerations to using the same ABA test methods proposed in Section 4.3.1 of the study plan as part of the assessment of the acid generating potential of the soil and overburden. 	<ul style="list-style-type: none"> Soil sampling proposed for geochemical testing to support the development of a geochemical characterization of soil and overburden is discussed in the Groundwater and Geochemistry Study Plan. These samples will be focused on proposed quarry and pit areas. The soil samples collected as part of Section 7.4.3 in this Study Plan are intended to characterize generic soil quality and will be spatially distributed across the proposed CAR. Locations will not be focused on proposed quarry / pit areas. However, there will be some areas where soil sampling for both generic and geochemistry analysis will be conducted. 	<ul style="list-style-type: none"> Section 7.4.2 Section 7.4.3





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	identify contaminants of potential 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 permanent infrastructure, such as bridges, piles and culverts (metals). Radionuclide parameters will only be collected once from each area."						
GE-10	<ul style="list-style-type: none"> ■ Section 6: Effects Assessment Scoping 	<ul style="list-style-type: none"> ■ Section 14.3 <ul style="list-style-type: none"> – “The Impact Statement must: ... <ul style="list-style-type: none"> • describe any changes to permafrost conditions as a result of the Project; • describe any changes to eskers and similar geological features as a result of the Project; • 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); ... • describe the historical land use and the potential for contamination of soils and sediments and potential for loss of soil fertility. Describe any known or suspected soil contamination within the study area that could be re-suspended, released or otherwise disturbed as a result of the Project; ...” 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ It is unclear how the requirements in Section 14.3 of the Guidelines will be met. ■ Methodologies for many of the relevant requirements in Section 14.3 of the Guidelines are not included in the effects assessment section of the study plan. ■ 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. 	<ul style="list-style-type: none"> ■ Provide detail in the study plan to describe the approaches and methods to be used to meet the requirements identified in Section 14.3 of the Guidelines. 	<ul style="list-style-type: none"> ■ Available high-resolution imagery and regional surficial geological, terrain polygon, permafrost maps will be searched for and reviewed as part of the desktop study and ground-truthed during the field program (during soil and rock sampling). ■ A review of the provincially known / registered contaminated sites database will be conducted to determine proximal contaminated sites with potential pre-existing soil quality issues. ■ The baseline report will include the descriptions of the findings and present the location of key geological features and known contaminated sites. 	<ul style="list-style-type: none"> ■ Section 7.1 ■ Section 8.1





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GE-11	<ul style="list-style-type: none"> ■ Section 6.1: Indicators and Expression of Change ■ Table 6-1 Physiography, Geology, Geochemistry, Terrain and Soils Indicators <ul style="list-style-type: none"> – [Indicator – Physiography, Terrain and Soils] “Expression of Change: Degradation of physical or chemical characteristics of permafrost, terrain or topography (e.g., natural hazards) and soils. Rationale for Selection: Important for geotechnical stability of civil infrastructure (e.g., roads), protection of human health, and protection of aquatic and terrestrial habitat associated with natural hazards (e.g., slope failures).” 	<ul style="list-style-type: none"> ■ Section 8.3 <ul style="list-style-type: none"> – “The Impact Statement must: ... <ul style="list-style-type: none"> • identify any geological hazards that exist in the areas planned for the project facilities and infrastructure, including: • history of seismic activity in the area, including induced earthquakes, and secondary effects such as the risk of, landslides and liquefaction; • evidence of active faults; • isostatic rise or subsidence; and • history of landslides, slope erosion and the potential for ground and rock instability/ landslides, and subsidence during and following project activities..” ■ Section 8.4 <ul style="list-style-type: none"> – “The Impact Statement must: ... <ul style="list-style-type: none"> • identify any areas of ground instability; ...” 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ The study plan only describes geological or natural hazards and ground stability in Table 6-1. It is unclear how the requirements in Section 8.3 of the Guidelines regarding the data required to identify the geological hazards will be met. ■ It is also unclear how the requirements in Section 8.4 of the Guidelines regarding ground instability will be met. 	<ul style="list-style-type: none"> ■ Revise the study plan to provide details to demonstrate that all requirements in Section 8.3 of the Guidelines related to the identification of geological hazards will be met. ■ Provide details to demonstrate how areas of ground instability will be identified, as required in Section 8.4 of the Guidelines. 	<ul style="list-style-type: none"> ■ As part of the desktop study, an online search for information regarding the earthquake and natural disaster history for the Project area will be conducted. This information will be used to identify potential geological hazards that exist in the areas planned for the Project facilities and infrastructure. ■ Added a field study section (Section 7.4.4) the outlines the steps taken if any geological hazards are identified during the desktop assessment. In summary, the areas will be flagged to the Geotechnical and Project design teams so additional assessment and field truthing can be conducted, as required, based on the professional judgement of the geotechnical team. Any field study’s will be completed under other disciplines (e.g., geotechnical). The Project design team will use this information when selecting and designing the preferred CAR alignment with the overall goal of minimizing road alignment through areas with known or suspect geological hazards. 	<ul style="list-style-type: none"> ■ Section 7.1 ■ Section 7.4.4
GE-12	<ul style="list-style-type: none"> ■ Section 6.3: Magnitude of Effect Table 6-3 Geochemistry Magnitude Definition <ul style="list-style-type: none"> – “Laboratory testing indicates that all rock types disturbed by the Project is non-ML, where non-ML is defined as: <ul style="list-style-type: none"> • Predicted water quality results (dissolved metals) do not exceed applicable water quality standards or are similar to proximal baseline surface water quality results.” 	<ul style="list-style-type: none"> ■ Section 8.3 <ul style="list-style-type: none"> – “The Impact Statement must: <ul style="list-style-type: none"> • describe the bedrock geology and lithological units, including a summary table of geologic descriptions, mineralization styles (if applicable) supported by geological maps and cross-sections at appropriate scale (normally 1:50 000). Provide in the table an inferred risk rating (i.e., low, medium, high) for acid rock drainage and metal leaching potential based on the desk-top review of bedrock geology and mineralization;...” 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ It is unclear what is meant by “predicted water quality results”. It is unclear if the study plan refers to the laboratory leach test results or water quality modelling. Caution is recommended in comparing laboratory leach test results with water quality standards as laboratory leach tests do not reflect actual site conditions. 	<ul style="list-style-type: none"> ■ Update the study plan to clarify what is meant by “predicted water quality results”. Provide details to demonstrate how the requirement in Section 8.3 of the Guidelines related to inferred risk rating for ARD and ML will be met. 	<ul style="list-style-type: none"> ■ Baseline geochemistry has been moved to the Groundwater and Geochemistry Study Plan. The Groundwater and Geochemistry Study Plan is updated to change the wording to shake flask extraction. We agree that caution should be used when comparing laboratory shake flask extraction results with water quality standards. However, future studies will consider geochemical modelling, laboratory kinetic testing and field-scale testing to mimic site conditions. 	<ul style="list-style-type: none"> ■ Section 7.4.2 of the Groundwater and Geochemistry Study Plan





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GE-13	<ul style="list-style-type: none"> ■ Section 6.3 Magnitude of Effect <ul style="list-style-type: none"> – “The residual effects will therefore be described in terms of the magnitude, geographic extent, timing, duration, frequency, social and ecological context, likelihood, and whether effects are reversible or irreversible. For magnitude, VC-specific definitions are required and are proposed below in Table 6-2 for Physiography, Geology, Geochemistry, Terrain and Soils. Tables 6-3 and 6-4 provide details of the definitions of geochemistry magnitude and soils magnitude, respectively.” 	<ul style="list-style-type: none"> ■ Section 14.2 <ul style="list-style-type: none"> – ...”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: ... <ul style="list-style-type: none"> • 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; ... • 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 • describe contingency plans, monitoring during operation, decommissioning and abandonment, and maintenance plans.” 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ Any risk associated with rock cuts that will be exposed along the road alignment, and at aggregate source sites, must be clearly identified and effects must be assessed, if applicable, in both the testing program and the mitigation, contingency, and monitoring plans. ■ The study plan is proposing a phased approach to the development of an ARD/ML monitoring and mitigation plan, which would be based on the results of the proposed geochemical characterization program. ■ Details are needed on how the phased approach to developing an ARD/ML monitoring and mitigation plan would be scoped to minimize risk posed by exposed rock along the road alignment and at aggregate source sites. 	<ul style="list-style-type: none"> ■ Update the study plan to provide details to demonstrate that the geochemical characterization program summary report will identify if an ARD/ML monitoring and mitigation plan will be proposed, and if so, will provide a description of its scope and a timeline for its development and appropriate implementation. 	<ul style="list-style-type: none"> ■ Geochemistry has been moved to the Groundwater and Geochemistry Study Plan. The Groundwater and Geochemistry Study Plan has been updated accordingly. 	<ul style="list-style-type: none"> ■ Section 7.4.2 of the Groundwater and Geochemistry Study Plan
GE-14	<ul style="list-style-type: none"> ■ Table 6-4: Soils Magnitude Definition <ul style="list-style-type: none"> – Negligible <ul style="list-style-type: none"> • “Definition: There is little to no variation predicted in soil concentrations which remain within the range of natural variability. 	<ul style="list-style-type: none"> ■ Section 21 <ul style="list-style-type: none"> – “...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 	<ul style="list-style-type: none"> ■ The Agency 	<ul style="list-style-type: none"> ■ The medium and high soils magnitude criteria are defined using the threshold of a 10-fold increase above baseline conditions. It is unclear when this threshold is applied (e.g., only when no applicable soil quality criterion exists). No explanation is provided on how the proposed judgement criteria 	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ The Study Plan is updated. 	<ul style="list-style-type: none"> ■ Table 9-5 ■ Table 9-6 ■ Section 9.6





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	<ul style="list-style-type: none"> Rationale: Soil quality shows no discernable change, therefore no effect on ecological life or human health (e.g., potable water use, physical contact). <p>– Low</p> <ul style="list-style-type: none"> Definition: There is a small variation predicted in soil concentrations that is less than double current concentrations, but concentrations remain below applicable soil quality criteria. Rationale: Temporary effect or permanent change to soil quality is minor and remains protective of ecological life and human health. <p>– Medium</p> <ul style="list-style-type: none"> Definition: There is a moderate variation predicted in soil concentrations that is less than five (5) times current concentrations, but concentrations are below the applicable soil quality criteria or less than 10 times current concentrations. Rationale: Temporary effect or permanent change to soil quality is moderate but remains protective of ecological life and human health. <p>– High</p> <ul style="list-style-type: none"> Definition: There is a large variation predicted in measurable parameters, concentrations exceed applicable soil quality criteria and are greater than 10 times current concentrations. Rationale: Temporary effect or permanent change to soil quality can potentially impair ecological life or human health." 	<p>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..</p> <p>– The Impact Statement must:</p> <ul style="list-style-type: none"> 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-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;..." 		<p>were developed or how they are relevant to the protection of human health.</p> <ul style="list-style-type: none"> Furthermore, the study plan assumes that soil quality remains protective of human health as long as contaminant levels are below applicable criteria. However, there is no evidence of a health effect threshold at the population level upon exposure to certain soil contaminants, such as arsenic, chromium and lead. Although these contaminants are provided as examples of non-threshold contaminants in water (Section 21 of the Guidelines), their toxicological characteristics are applicable to other environmental media, including soils. 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. Additionally, it is unclear in Table 6.3 which "applicable water quality standards" will be used to justify that the proposed geochemistry magnitude criteria are protective of human health. 				
				<ul style="list-style-type: none"> 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 thresholds (i.e., Canadian Council of Ministers of the Environment's (CCME (3)) Soil Quality Guidelines for the Protection of Environmental and Human Health and Ontario Soil, Groundwater and Sediment Standards (4) in order to reduce the burden of soil and sediment pollution. (3) CCME, 2014. Soil Quality Guidelines for the Protection of Environmental and Human Health. Available at : http://sts.ccme.ca/en/index.html?chems=all&chapters=4&pdf=1 		<ul style="list-style-type: none"> Thank you for your comment. Data will be reviewed and relevant information will be incorporated into the IS / EA where appropriate 	<ul style="list-style-type: none"> N/A 	





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	<p>■ Table 6-3: Geochemistry Magnitude Definition</p> <p>– “(...) Minor incremental effects to surface water, groundwater and/or drinking water quality are anticipated to be discernable, but water quality remains protective of ecological life and human health for all time periods and life stages.”</p>			<p>(4) Ontario Soil, Groundwater and Sediment Standards. Available at: https://www.ontario.ca/page/soil-groundwater-and-sediment-standards-use-under-part-xv1-environmental-protection-act.</p>			

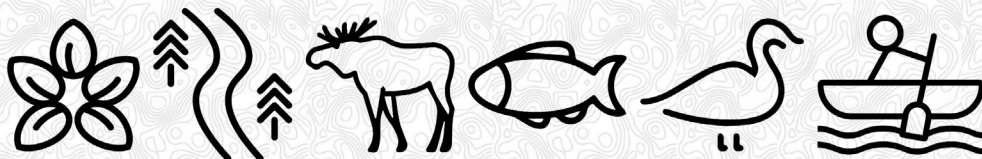




MARTEN FALLS FIRST NATION
ALL SEASON COMMUNITY ACCESS ROAD

Physiography, Terrain and Soils Study Plan

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, Vegetation, Groundwater and Climate Change work plans that may apply to this work plan		■ No comments are applicable to this Study Plan.	■ N/A
2	■ List of Acronyms	■ MECP, Environmental Assessment Branch	■ Minor typo in MFFN – Martin Falls First Nation.	■ Correct typo.	■ Corrected.	■ Abbreviations
3	■ Page 4, Figure 3-1	■ MECP, Environmental Assessment Branch	■ Figure 3-1 is titled “Physiography, Geology, Geochemistry, Terrain and Soils Local and Regional Study Areas” but it does not include the study areas. It is also missing a legend, which is necessary to explain what all the colours are.	■ Please include a map of the local and regional study areas and include a legend on Figure 3-1.	■ The figure has been updated. Note that this study plan is now titled “Physiography, Terrain and Soils”, and the figure has been updated to reflect this change.	■ Figure 6-2
1	■ Pg. 6 / s. 4.3 – Field Study Methods	■ MECP, Species At Risk Branch (Northern Species at Risk Specialist comments)	■ Insufficient details are provided describing the proposed test hole drilling program (e.g., dates, locations, duration at each site, etc.) and overburden and bedrock sample collection (e.g., dates, locations, duration at each site, methods for sample collection, etc.). Details must be provided in the draft Work Plan to ensure an appropriate review of potential impact to species at risk (e.g., removal of trees within bat habitat during maternity period, sensory disturbance to caribou during the nursery period, etc.).	<ul style="list-style-type: none"> ■ Update the draft Work Plan to describe, in detail, the methodology for the proposed test hole drilling program. ■ If, for whatever reason, these details cannot be provided in the draft Work Plan, they must be provided to MECP-SARB at SAROntario@ontario.ca prior to the activities being undertaken and with sufficient time for MECP-SARB to review (i.e., minimum of 4 weeks). 	<ul style="list-style-type: none"> ■ The overburden and bedrock sample collection are now included in the Groundwater and Geochemistry Study Plan. ■ The proposed field work program will be refined upon completion of the desktop studies for the Physiography, Terrain and Soils and Groundwater and Geochemistry Study Plans and related Study Plans (e.g., surface water). 	■ Groundwater and Geochemistry Study Plan
1	■ p. 6/Section 4.3.1 Geochemistry (ML/ARD)	■ MECP, Hydrogeologist Comments	<ul style="list-style-type: none"> ■ The consultant provided the sampling frequency based on estimated tonnage for geochemistry samples, according to the guidance materials in Table 8.2, Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, MEND Report 1.20.1, Dec. 2009. The consultant further stated that, “...geological units associated with high potential of sulphide mineralization will be sampled more intensively”. ■ The baseline geochemistry report must provide more information on geochemistry sample selection (e.g., location, dimensions, volume, geologic unit, mineralogy, sulphide classification and percentage, weathering, etc.). As stated in the Dec. 2009 MEND report (Section 8.4), compositing of material is not recommended, and “...should be avoided for samples taken: at different times; over wide distances; and from different geologic units and waste or wall material with significant variability in physical, mineralogical, geochemical, weathering or leaching properties.” 	■ The baseline geochemistry report must provide additional information on the methodology for selection of geochemical samples (e.g., location, dimensions, volume, geologic unit, mineralogy, sulphide classification and percentage, weathering, etc.). Compositing of material for geochemistry samples is not recommended.	<ul style="list-style-type: none"> ■ Baseline geochemistry is now captured as part of Groundwater and Geochemistry Study Plan. ■ Prior to sample submission, key information including location, dimensions, volume, geologic unit, mineralogy, sulphide classification and percentage and weathering will be recorded. 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. Information on expected volume and locations of disturbances and the different geological units encountered in the overburden and bedrock during field investigations will be used to determine the number and distribution of the samples submitted for ARD / ML characterization. This information will be summarized in a table as part of the baseline study report. 	■ Groundwater and Geochemistry Study Plan





Comment ID	Study Plan Section	Agency / Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
2	<ul style="list-style-type: none"> p. 12/Table 6-3: Geochemistry Magnitude Definition; and p. 7/Section 4.3.1 Geochemistry (ML/ARD) 	<ul style="list-style-type: none"> MECP, Hydrogeologist Comments 	<ul style="list-style-type: none"> Based on Table 6-3, the consultant has stated that “moderate” or “high” magnitude geochemical test results would prompt further assessment by a qualified professional geochemist and implementation of impact management measures listed on page 7. Considering the permanent nature of the road base materials and in order to remain protective of ecological life and human health over the long-term, it is recommended that “low” magnitude geochemical test results would require blending of materials if “uncertain” (NPR between 1-2) or potential metal leaching rock types exceed 10%. Management measures associated with ARD/ML geochemical test results must be assessed by a qualified professional geochemist prior to implementation. 	<ul style="list-style-type: none"> “Low” magnitude geochemical test results should require the following management measure: blending of materials if “uncertain” (NPR between 1-2) or potential metal leaching rock types exceed 10%. Management measures associated with ARD/ML geochemical test results must be assessed by a qualified professional geochemist prior to implementation. 	<ul style="list-style-type: none"> Geochemistry is now captured as part of Groundwater and Geochemistry Study Plan. Geochemistry and geology have been removed as a VC, and the geochemical test results will be used to support the assessment of the groundwater and surface water VCs as it relates to the groundwater and surface water quality indicators. The need for a ML / ARD Management Plan will be determined following the assessment of field data and completion of the baseline report. 	<ul style="list-style-type: none"> Section 7.4.2 Groundwater and Geochemistry Study Plan
3	<ul style="list-style-type: none"> p. 12/Table 6-3: Geochemistry Magnitude Definition 	<ul style="list-style-type: none"> MECP, Hydrogeologist Comments 	<ul style="list-style-type: none"> The Rationale column in Table 6-3 for “negligible”, “low” and “medium” magnitude geochemical test results states that “water quality remains protective of ecological life and human health for all time periods and life stages”. If this is accurate, then it is assumed that all water quality results will meet or remain below the more stringent of applicable provincial or federal standards/guidelines. However, the Definition column for the “low” and “medium” magnitude levels states that the predicted water quality results will exceed the applicable water quality criteria. Clarification is required. 	<ul style="list-style-type: none"> Remove the following statement from the Table 6-3 Rationale column for the “low” and “medium” magnitude categories: “...water quality remains protective of ecological life and human health for all time periods and life stages.” 	<ul style="list-style-type: none"> Geochemistry is now captured as part of Groundwater and Geochemistry Study Plan. Geochemistry and geology have been removed as a VC for assessment, and the geochemical test results will be used to support the assessment of the groundwater and surface water VCs as it relates to the groundwater and surface water quality indicators. 	<ul style="list-style-type: none"> Table 95 and Section 9.6, Groundwater and Geochemistry Study Plan
1	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> MTO, Transportation Infrastructure Management Division Comments 	<ul style="list-style-type: none"> Attached with these comments, MTO has provided a guidance document for assessing aggregate deposits that was prepared by MTO’s materials engineering office. A page at the end of this pdf lists MTO’s laboratory testing regiment for gravel and bedrock deposits. This could be a supplementary guidance document for the Marten Falls work plan should they wish to use it. <ul style="list-style-type: none"> Standard Practice for Aggregate Resource Evaluation, MTO, 2002 Provincial Pavement Engineering Investigation Guidelines, v. 1.1, MTO, 2013 		<ul style="list-style-type: none"> The Study Plan is updated to include the review of the Standard Practice for Aggregate Resource Evaluation to the desktop assessment. The provincial pavement engineering guidelines is more suited to the Geotechnical Work plan. 	<ul style="list-style-type: none"> Section 7.1
1	<ul style="list-style-type: none"> 4.3.1 – page 7 paragraph 3 	<ul style="list-style-type: none"> MTO, NWR Aggregate Supervisor Comments 	<ul style="list-style-type: none"> Concerned with assumption that ML/ARD testing may be done on bedrock samples obtained from geotechnical drill core. If drill core is tested for geotechnical purposes (i.e., Micro Deval, relative density/absorption, freeze-thaw, flat & elongates) then there might not be enough drill core left for ML/ARD testing purposes as geotechnical tests are mostly destructive tests. 	<ul style="list-style-type: none"> Generally, NWR aggregate quarry testing includes two 15 metre drill cores. Perhaps a third separate core can be taken for ML/ARD testing. 	<ul style="list-style-type: none"> Geochemistry is now captured as part of Groundwater and Geochemistry Study Plan. Geochemical static testing requires ~500 g sample and based on our experience it is expected that these samples can be collected from the geotechnical core. If additional ARD / ML characterization is required the samples will be collected from residue core or residual samples from geotechnical testing. If additional ARD/ML testing is required and there is insufficient existing core then samples of the same rock type with the same geochemical data would be collected from other boreholes. If there are still insufficient core then additional boreholes may be required. 	<ul style="list-style-type: none"> Section 7.4.2





Comment ID	Study Plan Section	Agency / Regulatory Body Comments Received From	Comment / Context	Action Item	Final Response	Study Plan Reference
2	4.3.1 – page 7 paragraph 3	MTO, NWR Aggregate Supervisor Comments	<ul style="list-style-type: none"> “The depth of the drill core samples will be shallower than the proposed depths of the quarry/blasting operations to make certain that the samples are representative of the blast/fill material” For the sentence above to be true, a significant amount of geotechnical and design component will need to be completed to know the actual depth that they want to test for ML/ARD. 	<ul style="list-style-type: none"> Start Geotech & Design prior to completion of Environmental Assessment or perform deeper cores (i.e., 15 metres) and have a geologist confirm that the entire core run is homogenous lithology or catalogue each different lithology and test each distinct unit for ML/ARD separately. 	<ul style="list-style-type: none"> Geochemistry is now captured as part of Groundwater and Geochemistry Study Plan. Text revised to match current text in that study plan. The Study Plan is updated to indicate: <i>The depth of the drill core samples will shallower than the proposed depths of quarry / blasting operations, if known, to make certain that samples are representative of blast / fill material- Additional bedrock samples may be required based on initial ML / ARD results and on the homogeneity of the geology encountered throughout the entire length of each borehole.</i> 	<ul style="list-style-type: none"> Section 7.4.2, Groundwater and Geochemistry Study Plan
3	4.2 – page 5	MTO, NWR Aggregate Supervisor Comments	<ul style="list-style-type: none"> Section indicates preliminary geotechnical investigations including peat augering, hand augering, and test hole drilling were carried out. However, a summary of this information was not included in the report. 	<ul style="list-style-type: none"> Include a brief summary of soils encountered and any laboratory testing from this investigation, including any engineering recommendations for embankment and road structure construction (realize this may be outside the scope of this report). 	<ul style="list-style-type: none"> This is out of scope for this report. A summary will be provided in the Baseline Report. 	<ul style="list-style-type: none"> Section 8.1
4	4.3 – page 6	MTO, NWR Aggregate Supervisor Comments	<ul style="list-style-type: none"> Section discusses next step in field study methods, which are primarily focused on investigation geological features that could be developed as aggregate sources. 	<ul style="list-style-type: none"> Use the information from the previous investigation discussed in Section 4.2 as a basis for developing borehole plan. Strongly consider expanding geotechnical investigation to sample subgrade material, in order to provide preliminary recommendations on embankment and road construction. The MTO’s Provincial Pavement Engineering Guidelines could be used as a tool to help scope this drilling program. 	<ul style="list-style-type: none"> The Physiography, Terrain and Soils work plan will map potential quarry and pit materials within the 6 km wide LSA, however the mapping and field assessment will not provide data necessary to comment on the suitability of the materials for road construction. Determination of whether or the identified aggregate materials are suitable for road construction will be conducted by other disciplines (e.g., geotechnical engineering). Field plots will be established within a number of potential source areas with data collected on soil texture, percent coarse fragments, type of coarse fragments (e.g., rounded, angular, etc.) and possible thickness (e.g., 1 - 3 m, > 3 m). To better assess the potential of these sources, samples are usually taken for laboratory analysis and boreholes or GPR data are collected to assess the thickness of the overall deposit. These samples could be collected during the Geotechnical field investigations and data can then be compared to Provincial standards for road building material to determine its potential for road construction. 	N/A
1	Pg 3 / Sec 3.	ENDM, Regional Land Use Geologist & Land Use Planning and Policy Co-ordinator Comments	<ul style="list-style-type: none"> “A 5 km wide study area also allows for route refinements during development of Project design...” 	<ul style="list-style-type: none"> Specify that the 5 km study area is considered the Regional Study Area 	<ul style="list-style-type: none"> The physiography, terrain and soils local and regional study areas have been updated to align with the Vegetation Study Plan. 	<ul style="list-style-type: none"> Section 6.2
2	Pg 4 / Sec 3.	ENDM, Regional Land Use Geologist & Land Use Planning and Policy Co-ordinator Comments	<ul style="list-style-type: none"> No reference to bedrock geology base map. 	<ul style="list-style-type: none"> Add a reference somewhere for the bedrock geology base map used. 	<ul style="list-style-type: none"> The Study Plan has been updated accordingly. 	<ul style="list-style-type: none"> Figure 6-2
3	Pg 10 / Sec 6.1.	ENDM, Regional Land Use Geologist & Land Use Planning and Policy Co-ordinator Comments	<ul style="list-style-type: none"> Physiography, Terrain and Soils – Rationale for Selection 	<ul style="list-style-type: none"> Perhaps also add “karst” as an example of another potential natural hazard, as there is some potential for karst formation in that area associated with the limestone bedrock. 	<ul style="list-style-type: none"> The Study Plan has been updated accordingly. 	<ul style="list-style-type: none"> Section 7.1; 7.4.4





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